Ameren Missouri Home Energy Analysis Program Impact and Process Evaluation: Program Year 2015

Final May 13, 2016

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Executive Summary

Ameren Missouri engaged Cadmus and Nexant (the Cadmus team) to perform annual process and impact evaluations of the Home Energy Analysis (HEA) program for a three-year period, from 2013 through 2015. This annual report covers the impact and process evaluation findings for Program Year 2015 (PY15), the period from January 1, 2015, through November 30, 2015. As the program has not proven cost-effective, Ameren Missouri does not intend to continue it in subsequent program cycles: this report examines the program's final year of operation.

Program Description

Ameren Missouri added the HEA pilot program to the residential ActOnEnergy® portfolio in 2013. This program's design sought to encourage residents of single-family homes to reduce energy consumption by making improvements to the following: weatherization, lighting, HVAC, and water heating appliances.

The program provided direct install energy-efficient measures at no cost to participants and offered rebates for other measures (i.e., air sealing, ceiling insulation, and energy-efficient windows), hereafter referred to as major measures. While all single-family homes that received electricity and natural gas from Ameren Missouri were eligible to participate, the program required participants to pay $25 for an in-home energy audit.

Through the program, Ameren Missouri sought to achieve energy savings in the following three ways:

- Educate customers about their energy consumption via a detailed home energy audit report.
- Implement the following low-cost, energy-efficiency measures during the home energy audit: compact fluorescent lamps (CFLs), light-emitting diodes (LEDs), high-efficiency faucet aerators, high-efficiency showerheads, and water heater pipe wrap.
- Identify energy-saving opportunities and recommending major measure improvements to enhance the home's performance (including infiltration improvements, insulation, and high-efficiency windows).

The HEA program was implemented by the Honeywell Smart Grid Solutions Division (Honeywell).

Key Impact Evaluation Findings

In PY15, the HEA program completed 909 audits. The Cadmus team calculated the measure-specific realization rates (shown in Table 1) by comparing the evaluated (*ex post)* savings with the program's planning estimate (*ex ante*), as detailed in Ameren Missouri's 2012 Technical Resource Manual (TRM).[1]

We determined the program achieved a 60.2% overall electric measures gross realization rate. This low realization rate primarily resulted from low realization rates for CFLs (63.8%) and high-efficiency showerheads (64.4%), which both contributed to a significant portion of the program's overall electricity

1 Available at: https://www.efis.psc.mo.gov/mpsc/commoncomponents/viewdocument.asp?DocId=935690210

savings. Despite a high realization rate for ceiling insulation (124.9%), low realization rates for other measure categories reduced the overall realization rate. For natural gas measures, we determined a 74.9% overall gross realization rate. The evaluation found a low realization rate for high-efficiency showerheads (61.0%) reduced this gross realization rate, though high average savings for ceiling insulation (111.2%) and hot water pipe wrap (110.5%) helped offset the low showerhead realization rate.

Table 1. PY15 Participation and *Ex Post* Program Gross Savings

Measure	PY15 Participation	*Ex Post* Per-Unit Savings	Realization Rate	Total *Ex Post* Savings
Electric Measures (kWh/year)				
CFLs	8,267	24.3	63.8%	201,022
LEDs	1,244	27.9	59.8%	34,706
High-efficiency Aerators	384	30.3	53.2%	11,646
High-efficiency Showerheads	258	232.5	64.4%	59,979
Hot Water Pipe Wrap (per linear foot)	1,025	22.1	85.9%	22,625
Ceiling Insulation (per home)[1]	180	192.3	124.9%	34,802
Windows (per home)	84	186.9	16.9%	15,700
Air Sealing[2]	9	544.9	100.0%	4,904
Total	**11,451**	-	**60.2%**	**385,384**
Natural Gas Measures (therms/year)				
High-efficiency Aerators	1,441	1.7	24.4%	2,395
High-efficiency Showerheads	764	13.1	61.0%	10,022
Hot Water Pipe Wrap (per linear foot)	6,865	1.2	110.5%	8,118
Ceiling Insulation (per home)[1]	180	91.9	111.2%	16,638
Windows (per home)	84	17.9	46.0%	1,502
Air Sealing[2]	9	57.8	100.0%	520
Total	**9,343**	-	**74.9%**	**39,195**

[1]The realization rate listed for ceiling insulation represents a weighted average for all ceiling insulation measures active in the PY15. Table 30 provides individual realization rates per ceiling insulation measure.
[2]As the evaluation sample in PY14 did not include air sealing, this could not be evaluated. Therefore, we assumed a 100% realization rate for PY15. This measure is less than 2% of total therm savings and therefore varying this assumption would not materially affect results.

Table 2 lists the program's total gross *ex post* energy savings for both fuel types, with relative precision reported at the 90% confidence level. The reported precision reflects PY14 data, as the PY15 impact analysis did not include conducting primary data collection.

Table 2. Program Gross Realization Rates by Fuel Type

Fuel Type	*Ex Ante* Program Savings	Realization Rate	*Ex Post* Program Savings	Precision at 90% Confidence
Electricity (MWh/yr)	639.8	60.2%	385.4	9.5%
Natural Gas (therm/yr)	52,321.7	74.9%	39,194.8	10.1%

To estimate PY15 net-to-gross (NTG) ratios, the Cadmus team used the following formula:

NTG = 1.0 – Free Ridership + Participant Spillover + Nonparticipant Spillover + Market Effects

To determine NTG, we used findings from participant surveys regarding customers' likely actions independent of the program based on PY14 participant responses. Through these surveys, we determined the highest free ridership levels occurred for the following measures: CFLs (20%); windows (46%); and water heater pipe wrap (20%). LEDs exhibited a low free ridership rate of 6.3%. Based on the program's savings contribution by measure type, the PY15 HEA program realized a free ridership rate of 16.2%—a decrease from PY14's 17.1% free ridership rate (PY13 free ridership was 16.5%).

The Cadmus team applied a program participant spillover rate of 1.6%, based on findings from the PY14 evaluation, and limited nonparticipant spillover (NPSO) of 0.9%. We did not estimate market effects.

Table 3 lists the team's NTG findings and applies the results to the program's total *ex post* gross energy savings.

Table 3. Electricity and Natural Gas Net Savings

Fuel	*Total Ex Post* Gross Energy Savings	Free Ridership	Participant Spillover	NPSO	NTG Ratio	Net Savings
Electricity (MWh/yr)	385.4	16.2 %	1.6 %	0.9%	86.3%	332.8
Natural Gas (therm/yr)	39,194.8	16.2 %	1.6 %	0.9%	86.3%	33,841.4

The Missouri Public Service Commission (MPSC) approves annual energy and demand savings targets for each program year. As shown in Table 4, the PY15 HEA program realized 31.1% of its proposed net electric energy savings target (1,070 MWh) in Ameren Missouri's residential tariff and 11% of its net demand savings target (350 kW) for PY15.

Table 4. HEA program PY15 Savings Comparisons

Metric	MPSC-Approved Target[1]	*Ex Ante* Gross Savings Utility Reported (Prior to Evaluation)[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)	1,070	644	385	332	31%
Demand (kW)	350	143	45	39	11%

[1] http://www.ameren.com/-/media/missouri-site/Files/Rates/UECSheet191EEResidential.pdf

[2] Calculated by applying tracked program activity to TRM savings values.

[3] Calculated by applying tracked 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, NPSO, and market effects.

[5] Compares MPSC Approved Target and *Ex Post* Net Savings Determined by EM&V.

Key Process Evaluation Findings

Akin to efforts in PY14, the HEA program focused on achieving greater savings in PY15 by increasing the adoption of major measures. To support this, the program continued use of the program's revised marketing messaging, which focused on increasing customer comfort and reducing energy costs through the installation of major measures. This represented a shift from the PY13 messaging, which focused on promotion of the program's audit component.

Though still considered an effective marketing strategy, given major measure uptake rates up by 20% relative to PY14 performance, the program completed slightly fewer audits (a 5% decrease relative to PY14). The program closed November 30, 2015, but likely would have met or exceeded the total 2014 audits had it continued operating through December 2015. Honeywell's mid-year decision to waive the $25 audit fee also supported audit recruitment.

Overall, the program's growth sustained similar, albeit lower, performance in 2015 relative to PY14, despite losing operation personnel, facing a shortened program timeframe, and drawing from a small eligible participant population, relative to Ameren Missouri's other residential programs. The program, however, achieved just 31% of its total program savings goal for PY15, and it cumulatively achieved only 30% of its overall three-year goal through the end of its third year.

As discussed, the program functioned with fewer personnel in PY15. Honeywell reassigned prior program staff (who had managed the program since its inception) and, at the beginning of 2015, sought replacement staff. These replacement staff only managed the program into the program year's second quarter, at which time point a remotely located program manager and a local program coordinator took on program management. Ameren Missouri also reduced its program management from two to one managers.

These management changes resulted in some communication difficulties between Ameren Missouri and Honeywell. Two of the program's four auditors also left the program mid-year, reportedly due to low workloads. Still, these departures resulted in an increasing backlog (and eventual waiting list) for participant audits, further impacting the program's ability to operate optimally.

Lastly, 9% of 2014 HEA customers participated in additional Ameren Missouri residential energy efficiency programs following their home analysis. Similar to PY14, the participation was mostly concentrated on the Lighting and HVAC and Lighting programs, but additional participation was noted by Ameren Missouri within the Efficient Products and Refrigerator Recycling programs.

Program Year 2014 Recommendations and Actions

In Table 5 below, we present recommendations presented at the conclusion of the PY14 evaluation as well as the subsequent actions taken by the program.

Table 5. PY14 Recommendations and Program Actions

PY14 Recommendation	Cadmus Findings	Explanation
Continue to aggressively promote major measures, with an emphasis on financial and nonfinancial benefits. Communicate the benefits of major measures through more tangible methods, such as case studies, customer testimonials, or documentation explaining the benefits. Program marketing should pay special attention to air sealing in conjunction with insulation upgrades, as this measure offers a large potential for energy savings, but has experienced very low adoption in both PY13 and PY14.	This item continued. Letters mailed to customers included more benefits, and the program created a case study to share with customers.	Participation in major measures increased through additional promotion and an increase in the number of audits completed in the last six months of 2015.
Update the Ameren Missouri TRM to better account for program activity for the 2016–2018 program cycle. For instance, *ex ante* savings assumptions for windows assume a single home installs 350 square feet of new windows; the evaluation found, however, customers install an average of 119 square feet of new windows. Therefore, savings realized by installing windows are significantly less than currently reported in the TRM.	This will be reflected in the 2016–2018 TRM.	The 2013–2015 TRM was not subject to updates based on EMV results.
Instruct program auditors to install lighting measures in high-use areas, including outdoor locations, the kitchen, and the living room.	Auditors continued to target high usage areas.	The program design was intended to maximize savings from direct install measures.
Continue to leverage customer satisfaction to serve as program marketing, using testimonials, case studies, local news features, and online channels. These could include the following: customer testimonials on Twitter or Facebook; customer case studies or testimonials; or an interactive video, walking customers through the audit process. The HEA program landing page on Ameren Missouri's website should consider including a portion of marketing and outreach, such as the above-mentioned items.	This item continued. Letters mailed to customers included more benefits, and the program created a case study to share with customers.	The program sought to communicate the benefits of participation as well as demonstrate the successes realized by participants.

Program Year 2015 Key Conclusions and Recommendations

Based on the impact and process evaluation findings, the Cadmus team offers the following conclusions and recommendations.

Conclusion 1. The program did not prove cost-effective throughout its three-year program cycle.

Recommendation 1a. Update the Ameren Missouri TRM to better account for 2016–2018 program cycle activity. Assumed parameter inputs for each measure should be reviewed and

revised as necessary. Lighting measures especially should be updated to reflect current EISA baseline assumptions. More accurate *ex ante* savings estimates will result in higher realization rates, which ultimately will increase the return on investment for Ameren Missouri's programs.

Recommendation 1b. The HEA program cross-promoted other programs, but it did not receive credit for this education and awareness nor of any energy savings directly resulting from the cross-promotion. For future programs similar to HEA, Ameren Missouri should consider revising the program design to allow savings achieved in other programs, cross-promoted and resulting in direct participation, to be credited to the direct install program in part or full. This also would create an incentive for the direct install program to more aggressively market other programs and to serve as a gateway program to Ameren Missouri's residential program portfolio.

Recommendation 1c. For future program design, consider the time lag required for installations of major measures. As seen in the HEA program, installation of major measures continued to increase in subsequent years and included a significant portion of prior years' participants. Given it's a large, upfront investment, the direct install program requires a longer timeframe to recoup such costs than do other programs. A future program design should establish specific milestone savings targets to help keep the program on track to operate cost-effectively within a predetermined timeframe.

Conclusion 2. The program was potentially constrained due to the small, eligible population segment (customers with gas and electric service provided by Ameren Missouri). Honeywell noted difficulties in increasing recruitment as the program continued into its second and third operating years. As Honeywell broadcasted its outreach to most eligible customers during the program's first year, it felt it constantly broadcasted additional marketing to the same grouping of customers during the program's subsequent years.

Recommendation 2. In future program design, consider amending the program eligibility criteria to open the program to all Ameren customers. This would allow a significantly larger population size and provide a varied demographic for program marketing.

Conclusion 3. The program reported very strong audit recruitment after waiving the $25 fee. This fee may have served as an entry barrier for certain customers, resulting in lower participation rates during the program's life.

Recommendation 3. Future program design should consider whether use of an audit fee balances audit recruitment effects and installations of recommended major measures. If implementing a similar program in the future, Ameren Missouri should consider focus groups or other program design research with its potential target customers in regard to the benefits and costs to instituting an audit fee and the price point for such a fee. Ameren Missouri should strive to determine if a low- to no-fee structure would impact the types of customers recruited (i.e.,

whether or not a customer more likely to enroll with little to no entry fee would subsequently be less likely to follow through with a recommended major measure installation).

Conclusion 4. The program successfully developed relationships with more than 30 trade allies across remote regions of its territory. However, the program was limited in its success to partner with large retailers who could help promote major measures. Windows was the only measure to receive active promotion from a large retailer, which did result in significant installations within that region. The ceiling insulation and air sealing measures, however, were not actively promoted by any other large retailer.

Recommendation 4a. Ameren Missouri should maintain these relations with the HEA trade allies during the interim period of no program activity. These trade allies are now familiar with Ameren Missouri's programs and processes and maintaining this network of contractors and installers will help ramp up future programs implemented through Ameren Missouri.

Recommendation 4b. The program may have increased its uptake of major measures if it had targeted larger retailers (i.e., big box stores), as part of its trade ally network to help promote the installation of major measures. While this approach did occur for windows with one large retailer, both ceiling insulation and air sealing could potentially also benefit from promotion of large retailers who often sell the supplies (e.g., insulation) and will refer customers to a preferred contractor to conduct the work. For future programs, Ameren Missouri and its implementers should engage large retailers early in the program cycle to build such partnerships.

Introduction

Ameren Missouri engaged Cadmus and Nexant (the Cadmus team) to perform a process and impact evaluation of the Home Energy Analysis (HEA) program for a three-year period. This annual report covers the impact and process evaluation findings for Program Year 2015 (PY15), the period from January 1, 2015, through November 30, 2015. This was the program's final year of operation.

Program Description

The HEA pilot program encouraged residents of single-family homes to reduce energy consumption by making improvements to weatherization, lighting, HVAC, and water-heating appliances. The program provided some energy-efficient measures at no cost to participants and offers rebates for other measures (i.e., air sealing, ceiling insulation, and energy-efficient windows).

The HEA program provided the following:

- Low-cost home-energy audits ($25) and some free direct-install measures;
- Marketing and education about existing Ameren Missouri energy-efficiency programs; and
- Lists of local contractors capable of completing measures identified in the audit.

Honeywell Smart Grid Solutions Division (Honeywell) implemented the program.

Program Participants and Savings Approaches

All single-family residential homes that received both electricity and natural gas from Ameren Missouri qualify to participate in the HEA program. Through this program, Ameren Missouri sought to achieve energy savings in three ways:

- Educate customers about their energy consumption via a detailed HEA report.
- Implement the following low-cost energy-efficiency measures during the home energy audit: compact fluorescent lamps (CFLs), light-emitting diodes (LEDs), faucet aerators, energy-efficient showerheads, and water heater pipe wrap.
- Identify energy-saving opportunities and recommending improvements—which this report refers to as major measures—to enhance a home's performance (i.e., infiltration improvements, insulation, and high-efficiency windows).

Ameren Missouri customers who received a home audit through the program were not required to implement additional measures recommended by the auditor, but Honeywell used the following strategies to encourage customers to implement improvements:

- Followed up with audit customers to reinforce education about energy-savings opportunities and to answer customer questions;
- Provided estimates of measure costs, savings, and years-to-payback;

- Provided information about rebates offered through other programs in the Ameren Missouri residential portfolio; and
- Offered a list of certified contractors qualified to complete the recommended improvements, with follow-up directly from a certified contractor, per the customer's consent.

Program Activity

In PY15, the HEA program had 909 participants, as shown in Table 6.

Table 6. HEA program PY15 Program Activity

Measure	PY15 Participants	PY15 Measure Counts
Audits		
Level 1 Audit	816	n/a
Level 2 Audit	93	n/a
Direct-Install Measures		
CFLs	807	8,267
LEDs	614	1,244
Faucet Aerators	797	1,825
Energy Efficient Showerheads	746	1,022
Hot Water Heater Pipe Insulation	754	755
Major Measures		
Air Sealing	9	9
Ceiling insulation (R-5 to R-49)	15	16,592 ft^2
Ceiling insulation (R-11 to R-49)	66	88,919 ft^2
Ceiling insulation (R-19 to R-49)	96	139,510 ft^2
Ceiling insulation (R-19 to R-38)	3	4,673 ft^2
Windows	84	736

Evaluation Methodology

The Cadmus team identified the following impact and process evaluation priorities for the HEA program pilot in PY15:

- Assessing impacts of direct-install and major measures.
- Tracking adoption of major measures over time.
- Applying PY14 research for free ridership and participant spillover estimates
- Assessing the impacts of design changes, marketing activities, and program processes.
- Assessing the program's achievements against goals.

Table 7 lists evaluation activities conducted in PY15 to reach the above objectives, followed by brief summaries of each activity.

Table 7. PY15 Process and Impact Evaluation Activities and Rationale

Evaluation Activity	Process	Impact	Rationale
Review Data Tracking	•	•	Provide ongoing support to ensure accurate tracking of all necessary program data; identify gaps for EM&V purposes.
Interview Program Staff	•		Review program progress, issues, and needs from the perspective of Ameren Missouri program managers and the implementation contractor.
Cost-Effectiveness Analysis		•	Measure the program's cost-effectiveness through five standard perspectives: total resource cost, utility cost, societal cost test, participant cost test, and ratepayer impact test.

Data Tracking Review

The Cadmus team reviewed the HEA program tracking database, specifically assessing whether Honeywell gathered the data necessary to inform the evaluation and the algorithms detailed in the Ameren Missouri TRM. We found Honeywell collected the necessary data. Ameren Missouri worked with its implementers to migrate program tracking data to Ameren Missouri's central Vision database.

Program Manager Interviews

For the HEA program's PY15 evaluation, the Cadmus team interviewed Ameren Missouri and Honeywell program managers in October 2015, as shown in Table 8. We designed these interviews to accomplish the following:

- Gather information on how effectively the program operated;
- Identify challenges encountered by program staff and the implementer; and

- Determine appropriate solutions. (Appendix B presents the program manager interview guide used.)

Table 8. Completed Program Manager Interviews

Program Manager	Interviews Conducted
Ameren Missouri (2 pp)	1
Honeywell (1 pp)	2
Total	**3**

HEA Participant Surveys

The Cadmus team did not conduct participant surveys in PY15. We used results from the PY14 surveys to inform components of the impact analysis including measure persistence rates as well as free ridership and spillover values. Please see the PY14 report for additional detail regarding survey design.

Engineering Analysis

To estimate per-unit gross savings for each HEA program measure, the Cadmus team used engineering algorithms and assumptions detailed in the Gross Impact Results section. These algorithms yielded estimates of the difference between the energy usage of the rebated equipment and the usage of similar or existing equipment. The PY15 audit reports provided for each program participant well-documented the baseline conditions of existing equipment. We leveraged additional baseline assumptions based on the findings of the PY14 phone surveys and used the baseline data to develop parameter inputs for each engineering algorithm.

Cost-Effective Analysis

Using final PY15 HEA program participation data, implementation data, and *ex post* gross and net savings estimates presented in this report, Morgan Marketing Partners (MMP) determined the program's cost-effectiveness using DSMore.[2] MMP also calculated measure-specific cost-effectiveness. As shown in the Cost-Effectiveness Results section, the Cadmus team assessed cost-effectiveness using the five standard perspectives produced by DSMore:

- Total Resource Cost
- Utility Cost
- Societal Cost Test
- Participant Cost Test

[2] A financial analysis tool designed to evaluate the costs, benefits, and risks of DSM programs and services.

- Ratepayer Impact Test

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.[3] Process evaluations must address, at a minimum, the five questions listed in Table 9. The table provides a summary response for each specified CSR process requirement, taken from both this year's evaluation and the prior year. In addition, the CSR requires that impact evaluations of demand-side program satisfy the requirements noted in Table 9. The table indicates the data used in this evaluation that satisfy the CSR impact data requirement.

3 Missouri Secretary of State, Title 4 Department of Economic Development 240-22.070 Resource Acquisition Strategy Selection

Table 9. 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 evaluation compares the pre-adoption load based on assumed baseline technology with the post-adoption load based on program technology, estimates of lighting hours of use and water usage (based on metered data), waste-heat impact (based on equipment simulation), and survey data (based on feedback from program participants).
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 for 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 program participants in 2013 and 2014 regarding measure verification, installation rates, free ridership, and spillover.
Audit and survey data on:		
Equipment type/size efficiency	x	Evaluation team conducted surveys in 2013 and 2014 to verify installation and use of each direct install and rebated measure type.
Household or business characteristics	x	Evaluation team verified program audit data.
Energy-related building characteristics		

Process Evaluation Findings

This section contains the Cadmus team's process evaluation findings for the final year of Ameren Missouri's HEA pilot program. We divide these findings into two sections: Program Design and Delivery and Marketing and Outreach.

Program Design and Delivery

The HEA program was implemented by the Honeywell Smart Grid Solutions Division (Honeywell) who sub-contracted the EarthWays Center to conduct the in-home customer audits. The HEA program operated as a pilot. Unlike the other six residential programs—which addressed electric measures program exclusively—the pilot required participants have both gas and electric in their homes. The program marketing targeted customers with the greatest savings potential—typically high-use accounts in older homes; however, program criteria for participation limited eligibility to only single-family residential homes that received both electricity and natural gas from Ameren Missouri. The program sought to serve 60,000 participants across the gas and electric regions of Ameren Missouri's territory.

Direct-Install Measures

During the home-energy audit, auditors could direct-install energy-saving measures worth up to $200 at no additional costs to the customer. Table 10 lists direct-install measures and average quantities installed per home in PY15. The average quantity of direct-install measures per home did not vary significantly between PY14 and PY15, except for CFLs. The program more than doubled the average number of CFLs installed per home increasing from approximately six to 13 CFLs per home. The average installation of 13 CFLs per home in PY15 was much closer to the PY13 average installation of 11 CFLs per home.

Table 10. Direct-Install Measures

Measure	Average Quantity Installed per Home[1]
High-efficiency faucet aerators	2.5
High-efficiency showerheads	1.4
Water heater pipe wrap	1.0
ENERGY STAR® certified CFL light bulbs	12.8
ENERGY STAR certified LED light bulbs	2.6

[1] Average value is representative of homes that received the measure.

Ameren Missouri amended the program mid-year to offer water-heater measures (e.g., aerators, showerheads, and pipe wrap) to customers with electric water heaters in PY15. This increased the program's savings opportunities, as an estimated 15% of customers eligible for the HEA program used electric water heaters.

HEA Program Major Measures

Table 11 lists the program's major measures and associated rebate amounts. When the program's home energy auditors recommended major measures, customers could qualify for a rebate on each installation if they used a HEA program-certified contractor to conduct the work. (At the close of PY15, the program had approximately 30 certified contractors available to perform the installations.)

Table 11. HEA Program Rebated Measures

Measure	Rebate
ENERGY STAR® certified windows[1]	$500
Air sealing	$264
Ceiling insulation[2]	$400

[1] A minimum of five windows and maximum of 10 windows may be installed at a rebate of $50 per window.

[2] $400 is the average payment; however, the program does not cap the total rebate value for insulation installed.

Progress Toward Goals

Ameren Missouri maintained portfolio-wide 2015 regulatory goals for energy savings. Although Ameren Missouri was not required by Missouri Public Service Commission (MPSC) to meet interim targets on an annual basis or at the program level, examining a program's achievements against stated goals proves important for planning purposes. Ameren Missouri's integrated resource plan informed the program's three-year energy-savings goals, which the Ameren Missouri tariff contains. As of the close of PY15, the HEA program achieved 31% of its PY15 goal and 30% of its official three-year electricity energy-savings goal.

Program Implementation Challenges

The Cadmus team discussed with program managers challenges they felt the program faced in PY15:

- Achieving Program Energy-Savings Goal. During interviews conducted with program staff at the end of 2014, both Ameren Missouri and Honeywell cited meeting the program's energy-savings goals as their greatest concern for 2015 program year. While completed PY15 installations of major measures continued to increase over PY14 installations (20% increase in uptake) and completed audits was on course to meet or exceed PY14 levels, the HEA program realized less than one-third of its three-year savings goal. Honeywell program managers noted a lag period averaging 77 days between recommendations and installations of major measures, which was a slight improvement over the prior program year lag time (88 days). However, this lag period may have impacted participants who received an audit in the late summer or fall of 2015, as those participants only had until November 30th, 2015 to submit a rebate application for the installation of a major measure.
- **Program Administration.** The program saw changes to its management amongst the Honeywell and Ameren Missouri teams. At the outset of PY15, A non-local Honeywell program manager

oversaw the program remotely while a program coordinator managed day-to-day operation. The program received a local program manager in May, but both the program manager and coordinator soon left the program and program management reverted back to the remote manager for the remainder of the year. A new program coordinator, who was also partially supported Ameren Missouri's Low Income program, was also assigned to the program. Additionally, Ameren Missouri also reduced its staffing on the program to a single program manager (in PY13 and PY14 Ameren Missouri had individual program managers assigned to the electric and the gas components of the program). Honeywell and Ameren Missouri managed to maintained weekly and often daily communications; however, Ameren Missouri felt the changes in Honeywell's personnel caused the program to not operate as smoothly in PY15. For example, several program contractors were not paid on time due to slow reporting and/or invoicing by Honeywell.

- **Audit Operations.** In PY14, Honeywell increased the number of auditors to better serve the geographically dispersed participant base and to lead times to administer customer audits. However, mid-year PY15, two of four auditors left the program which consequently reintroduced long wait times to receive an audit. Honeywell noted that after the departure of the two auditors, the program was forced to schedule audits on average of two to three weeks after the initial participant request but in certain cases the audits needed to be scheduled more than a month after the initial audit request was made. At the time of the interview, Honeywell staff reported that it was likely a waiting list would be established for certain regions.
- **Reporting.** Honeywell noted that the reporting requirements in PY15 were onerous. Particularly, Honeywell noted the difficulty in aligning three separate tracking systems including Ameren Missouri's Vision program database, Applied Energy Group's planning database, and Honeywell's own program database. Additionally, Honeywell indicated the frequency in which Ameren Missouri required reports to be submitted seemed greater than is typical of other utility clients' programs that Honeywell implements. Ameren Missouri also marked the reporting as an issue in PY15; however, as noted earlier, the Ameren Missouri program manager noted that errors or missing data in the reports were common and led to delays in processing program contractor invoices.

Delivery Successes and Program Achievements

When the Cadmus team asked program managers which program aspects worked particularly well, respondents offered the following information:

- **Audit Recruitment.** In April, Honeywell experimented with offering a limited time offer of waiving the $25 audit fee. The pilot resulted with such strong audit uptake that the program permanently removed the audit fee beginning in August. Honeywell reported the additional cost was not significantly impactful on the program. However, Honeywell did not indicate the increased audit uptake had led to increased installation of major measures.

- **Major Measure Rebates.** The number of rebates issued for major measure installations continued to increase in PY15. The program realized a 20% increase in the number of installations relative to PY14. Of the total installations conducted in PY15, 32% occurred with customers who had received an audit in either PY13 or PY14.
- **Auditors.** Similarly to PY13 and PY14, Ameren Missouri and Honeywell program managers felt auditors succeeded in communicating information about energy-efficiency opportunities and implementing direct-install measures. Both companies reported program participants positively received the auditors, as manifested through very high customer satisfaction responses to a survey administered by Honeywell.
- **Cross-program promotion.** The HEA program provided customer awareness regarding other residential energy efficiency program offerings. 9% of 2015 HEA customers participated in additional Ameren Missouri residential energy efficiency programs following their home analysis. Most of the cross-program participation appeared primarily within the HVAC (32%) and Lighting (22%) programs but additional participation was present within the Refrigerator Recycling (18%) and Efficient Products (15%) and programs.

Marketing and Outreach

During PY13, the Cadmus team conducted an in-depth marketing materials review and program marketing interviews with key Ameren Missouri and Honeywell staff. The PY13 evaluation report provides a description of this marketing and outreach review and findings. The following section summarizes PY15 marketing and outreach activities as reported by Ameren Missouri and Honeywell program managers.

PY15 Marketing Activities

Primary marketing updates made in PY15 included the following:

- **Program messaging.** Honeywell and Ameren Missouri continued to focus the program messaging on ways the program could improve the comfort of a customer's home while reducing costs. This was in contrast to the program's initial messaging approach, which sought to drive audit recruitment, was data heavy, and directed to customers aware of and educated about their energy consumption. Honeywell designed the updated messaging to be approachable to more general customers, who may not be well-informed about their energy usage.
- **Program mailer.** The program mailer remained as the primary driver to program recruitment in PY15. Honeywell reported a 1.73% program audit participation conversion rate from the mailer. Additionally, Honeywell attempted to recruit prior audit customers who had been recommended for a major measure by sending a mailer tailored to communicate the benefits of the major measures. This mailer did contain a case study; however, Honeywell noted it was a generalized case study and therefore was likely less impactful had the case study instead been formulated to communicate personal accounts and experiences.

- **Bill inserts.** Ameren Missouri continued issuance of bill inserts to promote the program and also included an online billing promotion for the program in PY15 to eligible customers.
- **Outreach**. Overall outreach efforts remained consistent with prior years. In response to initially low audit recruitment, Honeywell reported that Ameren Missouri agreed to lax the demographic criteria by removing requirements that the program target customers of older age and higher income. Honeywell felt this did positively impact the level of audit recruitment; however, Honeywell did feel the removal of the audit fee greatly outweighed the change in demographic criteria with regard to audit recruitment.

Participant Feedback

The Cadmus team conducted participant surveys in PY13 and PY14 which included feedback on the program including program experience satisfaction, communication with program staff, areas for program improvement, and satisfaction with Ameren Missouri. Surveys were not administered in PY15. The PY13 and PY14 evaluation reports provide detailed discussions on participant feedback.

Major Measure Adoption

Table 12 lists the major measure cumulative adoption rate for each program measure from PY13 through PY15. Ceiling insulation saw the greatest increase in adoption with an increase from 16% to 20% relative to PY14. Windows saw a very modest increase in adoption rate (less than 1% relative to PY14), and the air sealing adoption rate was nearly unchanged from the prior year. Honeywell did indicate it attempted to push air sealing but reported that customers did not understand the benefit of the measure despite showing the customer results of blower door testing and infrared camera imaging.

Table 12. Cumulative PY13 and PY15 Major Measure Adoption Rates

Major Measure	Completed Installations	Recommended Installations	Major Measure Adoption Rate
Air Sealing	22	1,766	1.3%
Ceiling Insulation	334	1,650	20.2%
Windows	176	826	21.3%

During participant surveys conducted in PY13 and PY14, the Cadmus team asked all sampled participants who received recommendation to install a major measure about their plans to move forward with the installation. Home audit programs commonly experience a lag between recommendations and actual installations of rebated measures. (For PY15, Honeywell estimated an approximate lag of 77 days). We also asked participants why they chose to install—or not install—a recommended major measure.

- Among participants installing only a portion of major measures recommended by the auditor, 53% of participants said they planned to install remaining measures within one year.

- Among participants not yet taking action to install recommended measures, 63% said they planned to install some measures within the next two years. However, only 20% of participants indicated they planned to install a recommended major measure within one year.

Both groups cited high initial costs as their primary reason for not following through with installation of recommended major measures (44%). Other common responses included not having sufficient time to complete the installs (9%).

Participants most often cited saving money or energy as the reason they completed installations of recommended major measures (43%). Participants also cited increasing their home's comfort (29%) and improving their home's attic insulation and air sealing as reasons for completing installation of recommended measures.

CSR Summary

According to the Missouri Code of State Regulations (CSR),[4] demand-side programs operating as part of a utility's preferred resource plan are subject to ongoing process evaluations that address, at a minimum, the five questions listed in Table 13. While our process evaluation findings touched on each of these topics, Table 13 provides a summary response for the specified CSR requirements.

[4] http://sos.mo.gov/adrules/csr/current/4csr/4c240-22.pdf

Table 13. 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?	The primary market imperfection remains largely unchanged from PY13: customers have inadequate information and/or regarding the benefits of increasing energy efficiency within existing homes.
2	Is the target market segment appropriately defined, or should it be further subdivided or merged with other market segments?	The program target market of dual fuel customers is an appropriate market segment. The program could have potentially increased overall uptake if the target market had not been limited to dual fuel customers, however, single fuel customers may provide less savings per home.
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?	The mix of end-use measures offered through the program was appropriate in PY15 with the addition of electric water heater measures.
4	Are the communication channels and delivery mechanisms appropriate for the target market segment?	Yes, communication and delivery channels were appropriate. Future program design should consider the impact of the audit fee on recruitment and overall program performance.
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?	Additional customer education and awareness was needed regarding the benefits—financial and nonfinancial—of that the program's major measures contribute to increasing the efficiency and comfort of their homes. Future programs should focus more resources on case studies to communicate the benefits of the major measures.

Gross Impact Evaluation Results

The Cadmus team conducted the PY15 impact evaluation activities to estimate gross energy savings. This section details each measure's per-unit savings calculations and installation rates.

Measure Installation Verification

During participant phone surveys and site visits conducted in PY13 and PY14, the Cadmus team confirmed that direct-install measures remained installed and operating. That is, the installation rate represented the percentage of measures installed and operating after the auditor's visit. We combined the installation rates observed in PY13 with those observed in PY14 and applied the combined installation rates to the PY15 gross energy-savings analysis. Table 14 shows combined installation rates for each measure.

Table 14. Direct-Install Measure Installation Rates

Measure	Percentage Installed and Operating Post Audit
CFLs	95.6%
LEDs	98.9%
High-Efficiency Faucet Aerators	97.7%
High-Efficiency Showerheads	98.0%
Pipe Wrap	99.1%

We found installation rates generally high for the HEA direct-install measures. Notable exceptions included CFLs. Common responses from participants who removed CFLs said the bulbs were not bright enough, burned out, or were not compatible with dimmers or ceiling fans.

Measure-Specific Gross Savings

Using the engineering algorithms outlined in the HEA program evaluation plan, the Cadmus team estimated measure-specific savings for all program measures. In the PY13 evaluation we compared our evaluation approaches to the TRM. We do not repeat this analysis here. We determined gross energy savings for each measure, as detailed below, along with algorithms and inputs used.

Table 15. Summary of Data Sources

Algorithm Inputs	Source
Audit Data	Honeywell collected a number of key parameters for each home that received an audit through the HEA program.
Survey Data	Data gathered through PY14 evaluation activities.
Site Visit Data	Data gathered through PY13 evaluation activities.
Secondary Data	Secondary data sources accompany the algorithm descriptions.

CFLs and LEDs

The Cadmus team estimated energy savings based on bulb technology and wattage using the following algorithm:

$$Energy\ Savings\ \left(\frac{kWh}{Year}\right) = \frac{(WattINC - WattNEW) \times Hours \times Days}{1{,}000} \times WHF \times InstallationRate$$

Where:

- WattINC = wattage of the original incandescent bulb replaced by a HEA program lamp
- WattNEW = wattage of new bulb installed by the HEA program
- Hours = 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 16. Lighting PY15-PY7 Savings Assumptions

Term	Value	PY15 Source
WattINC	Based on bulb	Program and audit data
WattNEW - CFL 13W	13W	Program and audit data
WattNEW - CFL 18W	18W	Program and audit data
WattNEW - CFL 23W	23W	Program and audit data
WattNEW – High Wattage	65W	Program and audit data
WattNEW - Specialty	26.5W	Program and audit data
WattNEW - Reflector	20W	Program and audit data
WattNEW – LED 8W Globe	8W	Program and audit data
WattNEW – LED 10.5W Downlight	10.5W	Program and audit data
WattNEW – LED 12W Dimmable	12W	Program and audit data
WattNEW – LED 15W Flood	15W	Program and audit data
WattNEW – LED 18W Flood	18W	Program and audit data
Hours	2.01	PY14 Light Metering Study and PY14 HEA program Survey Data
WHF	0.99	PY13 Engineering Simulation Modeling adjusted for heating and cooling saturations
CFL Installation Rate	95.6%	HEA PY13 and PY14 program Audit Data
LED Installation Rate	98.9%	HEA PY13 and PY14 program Audit Data

In conducting the analysis, we paid careful attention to the effect of the Energy Independence and Security Act (EISA), which mandated higher-efficient technologies for incandescent bulbs. In the PY13 and PY14 evaluations, we adjusted baseline assumptions to account for a mixture of new EISA-approved bulb types and old pre-EISA bulb stock based on retailer shelf stock studies. In PY15 we found that pre-

EISA type bulbs were no longer prevalent in the market and therefore used EISA-compliant halogen bulbs as the baseline wattage for calculating energy savings.

We estimated hours-of-use per bulb at 2.01 hours, basing this estimation on a combination of metering data obtained through an evaluation of the LightSavers program in PY14 (which provided hours-of-use data per room) and PY14 HEA program participant survey data (which indicated frequencies of bulb installation location by room). Based on those survey responses, the most common bulb installation locations were the bedroom (27% of installations), the bathroom (20% of installations), and the living room (17% of installations). Of these locations, only the living room scored higher than the mean and median of the PY14 Light Metering study.

To account for interactive effects, the team applied an estimated waste heat factor of 0.99, based on our engineering simulation models. We populated the model with heating and cooling saturations, based on audit data from the HEA program.

Using the engineering algorithm described above, we determined an *ex post* energy savings value for each bulb type installed by the program (as shown in Table 17 and Table 18). The difference between *ex ante* and *ex post* savings estimates primarily resulted from lower hours-of-use than those assumed by Morgan Measure Libraries (the TRM assumes an hours-of-use from 2.3 to 2.91 hours).

On average, we found a weighted realization rate (weighted by count of installed bulbs by type) of 63.8% for CFLs.

Table 17. *Ex Ante* and *Ex Post* Comparison for CFLs

Bulb Type	*Ex Ante* Savings/Unit (Annual kWh)	*Ex Post* Savings/Unit (Annual kWh)	Realization Rate
13 Watt POST-EISA	31.5	20.1	64%
18 Watt POST-EISA	37.4	24.3	65%
23 Watt POST-EISA	51.2	32.6	64%
High-Wattage CFL	113.0	109.4	97%
Specialty Bulb CFL	44.1	27.6	63%
Reflector CFL	44.1	29.9	68%

On average, we found a weighted realization rate (weighted by count of installed bulbs by type) of 59.8% for LEDs.

Table 18. *Ex Ante* and *Ex Post* Comparison for LEDs

Bulb Type	*Ex Ante* Savings/Unit (Annual kWh)	*Ex Post* Savings/Unit (Annual kWh)	Realization Rate
8 Watt Globe Light	32.0	23.3	73%
10.5 Watt Downlight	54.5	39.7	73%
12 Watt Dimmable	48.0	24.0	50%
15 Watt Flood PAR30 Bulb	35.0	43.1	123%
18 Watt Flood PAR80 Bulb	32.0	51.7	162%

High-Efficiency Showerheads

The Cadmus team estimated savings from high-efficiency showerheads using the following algorithms:

$$Energy\ Savings\ \left(\frac{therm}{Year}\right) = \left(\frac{People \times ShowerTime \times Days \times \%Days \times \Delta GPM \times (T_{SHOWER} - T_{IN}) \times C_P \times Den}{EF_{gas} \times Total\ \#of Showerheads\ X\ 100{,}067}\right) \times Installation\ rate$$

$$Energy\ Savings\ \left(\frac{kWh}{Year}\right) = \left(\frac{People \times ShowerTime \times Days \times \%Days \times \Delta GPM \times (T_{SHOWER} - T_{IN}) \times C_P \times Den}{EF_{electric} \times Total\ \#of Showerheads\ X\ 3{,}413}\right) \times Installation\ rate$$

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 gallons per minute for the base showerhead and the new showerhead (gal/min)
- T_{SHOWER} = the average water temperature at the showerhead (°F)
- T_{IN} = the average inlet water temperature (°F)
- C_P = the specific water heat (BTU/lb-°F)
- Den = the water density (lb/gal)
- 100,067 = the conversion rate between BTU and therm
- 3,413 = the conversion rate between BTU and kWh
- $EF_{gas/electric}$ = the water heater's energy factor
- Total # of Showerheads = the number of showerheads per home

- High-Efficiency Showerheads = the number of high-efficiency showerheads installed by the program

Table 19. High-Efficiency Showerhead PY15 Savings Assumptions

Term	PY15 Value	PY15 Source
People	2.43	HEA program Audit Data[1]
Shower Time	8.66	Secondary Source[2]
Days	365	Conversion Factor (day/yr)
%Days	0.66	Secondary Source[3]
ΔGPM	0.85	HEA program Audit Data and Secondary Source[4]
T_{SHOWER}	105	Secondary Source[5]
T_{IN}	61.3	Secondary Source[6]
EF_{gas}	0.59	HEA program Audit Data
$EF_{electric}$	0.98	HEA program Audit Data
C_P	1	Constant (BTU/lb-°F)
Den	8.33	Constant (lb/gal)
Number of Showerheads	2.00	HEA program Audit Data
Installation Rate	98.0%	HEA PY13 and PY14 program Audit Data

[1]Parameter values based on HEA program Audit Data are program averages. Impact analysis used actual participant values when calculating savings.

[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]Program data confirmed retrofit showerheads were 1.5 GPM. Existing showerheads were assumed to consume 2.35 GPM, based on average of DOE-reported values for homes with domestic water pressures of 60psi and 80psi. http://energy.gov/energysaver/articles/reduce-hot-water-use-energy-savings

[5]The Bonneville Power Administration measured average shower temperatures as 104.2–106.4 degrees Fahrenheit. Bonneville Power Administration, "Energy Efficient Showerhead and Faucet Aerator Metering Study Multifamily Residences: A Measurement and Evaluation Report". October 1994.

[6]Ameren Missouri TRM. http://www.gfxtechnology.com/WaterTemp.pdf

Using this engineering algorithm, we determined an *ex post* energy savings value of 232.5 kWh/year and 13.1 therm/year for each installed and retained showerhead. These values were approximately 64% and 61% of the program's *ex ante* values, respectively (361 kWh/yr and 21.5 therm/year).

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

- The TRM assumed one shower per person per day (%showers). The study we used to inform the input reported the number of showers per person per day at 0.66.[5]
- The TRM assumed one showerhead per home. Primary data collected from the participant survey found homes averaged two showerheads per home.

Table 20 shows *ex ante* and *ex post* savings.

Table 20. *Ex Ante* and *Ex Post* Comparison for High-efficiency Showerheads

Ex Ante Savings/Unit	*Ex Post* Savings/Unit	Realization Rate
361 kWh/yr	233 kWh/yr	64%
21.5 therm/yr	13.1 therm/yr	61%

High-Efficiency Faucet Aerators

The Cadmus team estimated high-efficiency faucet aerators savings using the following algorithms:

$$Energy\ Savings\ (therm/Year) = \left(\frac{People \times FaucetTime \times Days \times \Delta GPM \times (T_{FAUCET} - T_{IN}) \times C_P \times Den}{EF_{gas} \times Number of Faucets\ X\ 100{,}067}\right) \times Installation\ Rate$$

$$Energy\ Savings\ (kWh/Year) = \left(\frac{People \times FaucetTime \times Days \times \Delta GPM \times (T_{FAUCET} - T_{IN}) \times C_P \times Den}{EF_{electric} \times Number of Faucets\ X\ 3{,}413}\right) \times Installation\ Rate$$

Where:

- People = the number of people taking showers (ppl/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 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)
- 100,067 = the conversion rate between BTU and therm
- 3,413 = the conversion rate between BTU and kWh
- $EF_{gas/electric}$ = the water heater's energy factor

[5] 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.

- Number of Faucet Aerators = the number of faucets per home
- High-Efficiency Aerators = the number of high-efficiency aerators installed by the program

Table 21. High-Efficiency Faucet Aerator PY15 Savings Assumptions

Term	PY15 Value	PY15 Source
People	2.46	HEA program Audit Data[1]
Faucet Time	3.7	PY11 MFIQ Metering Study
Days	365	Conversion Factor (day/yr)
ΔGPM	0.7	HEA program Audit Data
T_{FAUCET}	80	Secondary Source[2]
T_{IN}	61.3	Secondary Source[3]
EF_{gas}	0.59	HEA program Audit Data[1]
$EF_{electric}$	0.97	HEA program Audit Data
CP	1	Constant (BTU/lb-oF)
Den	8.33	Constant (lb/gal)
Number of faucets	3.59	HEA program Survey Data[1]
Installation Rate	97.7%	HEA PY13 and PY14 program Audit Data

[1]Parameter values based on HEA program Audit Data or Survey Data are program averages. Impact analysis used actual participant values when calculating savings.

[2]Stipulated value from Ohio, Mid-Atlantic, Delaware, and New York TRMs.

[3]Ameren Missouri TRM: http://www.gfxtechnology.com/WaterTemp.pdf

Using this engineering algorithm, we determined an *ex post* energy savings value of 30 kWh/year and 1.7 therm/year for each installed and retained aerator. These values were approximately 53% and 24% of the program's *ex ante* values, respectively (57 kWh/yr and 6.8 therm/year).

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

- The TRM assumed an outlet temperature at the faucet of 105°F, based on the 2009 Vermont TRM. Upon review, we found the Vermont TRM cited 80°F for the multifamily sector, but did not cite a temperature for single-family homes (the 105° was cited for showerhead temperatures in the Vermont TRM). As we could not identify a single-family temperature for faucets in the Vermont TRM, we used the assumed temperature of 80°F, based on the Mid-Atlantic, New York, Delaware, and Ohio TRMs.
- The TRM assumed an average faucet time of five minutes per day, based on a 1997 report by American Water Works Association Research Foundation. To remain consistent with its approach to deeming parameter inputs, we used 3.7 minutes per day based on metering conducted in PY11 for the Efficient Products program. The TRM assumed 1.9 faucets per home, based on PY10 MFIQ program site visits. We used program audit data per customer as the input in the algorithm; however, the average number of faucets was 3.6 per home.

Table 22 shows *ex ante* and *ex post* savings.

Table 22. *Ex Ante* and *Ex Post* Comparison for High-Efficiency Faucet Aerators

Ex Ante Savings/Unit	*Ex Post* Savings/Unit	Realization Rate
57 kWh/yr	30 kWh/yr	53%
6.8 therm/yr	1.7 therm/yr	24%

Water Heat Pipe Wrap

For PY15, The Cadmus team estimated pipe wrap savings per linear foot using the algorithm below. In PY14, we estimated savings per home; in PY15, however, the program amended this measure for all auditors to install various lengths of pipe wrap. To account for this change, we altered our reporting metrics:

$$Energy\ Savings\ (therm/Year) = \frac{\left(\left(\frac{1}{R_{EXIST}} - \frac{1}{R_{NEW}}\right) \times L \times C \times \Delta T \times 8{,}760\right)}{EF_{gas} \times 100{,}067}$$

$$Energy\ Savings\ (kWh/Year) = \frac{\left(\left(\frac{1}{R_{EXIST}} - \frac{1}{R_{NEW}}\right) \times L \times C \times \Delta T \times 8{,}760\right)}{EF_{electric} \times 3{,}413}$$

Where:

- R_{new} = R-value of new pipe insulation
- R_{exist} = R-value of existing insulation
- L = length of installed pipe insulation (ft)
- C = pipe circumference (ft)
- 8760 = hours per year (hr)
- ΔT = the difference temperature between the ambient room temperature and the hot water temperature (°F)
- $EF_{gas/electric}$ = the water heater's energy factor
- 100,067 = the conversion rate between BTU and therm
- 3,413 = the conversion rate between BTU and kWh

Table 23. Water Heater Pipe Wrap PY15 Savings Assumptions

Term	PY15 Value	PY15 Source
R_{new}	3.6	HEA program Audit Data
R_{exist}	1.0	Secondary Source[1]
L	1	HEA program Audit Data[4]
C	0.196	Calculated (assumed ¾" D)[2]
ΔT	57.1	HEA program Audit Data, Secondary Source[3]
8,760	8,760	Constant (Hours per year)
EF_{gas}	0.59	HEA program Audit Data[4]
$EF_{electric}$	0.95	HEA program Audit Data[4]
100,067	100,067	Conversion Factor (Btu/therm)
3,413	3,413	Conversion Factor (Btu/3,413)
Installation Rate	99.1%	HEA PY13 and PY14 program Audit Data

[1]Navigant Consulting Inc. "Measures and Assumptions for Demand Side Management Planning; Appendix C Substantiation Sheets." April 2009. Pg. 77.

[2]3/4" is the standard pipe diameter.

[3]Temperature delta was based on an assumed water heater set point of 124.6˚F (i.e., weighted average temperature of water heaters in the HEA program that did and did not receive a setback during program audit) and the ambient room temperature. The ambient air temperature was 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.

[4]Values listed in Table 23 from HEA program Survey Data and Audit Data were program averages. Actual participant values were used to calculate energy savings.

Using this engineering algorithm, we determined an *ex post* energy savings value of 22.1 kWh/year and 1.2 therms/year for pipe wrap installed on each water heater. These values were approximately 86% and 111% of the program's *ex ante* values, respectively (25.7 kWh/yr and 1.1 therm/year), as shown in Table 24.

The difference between *ex ante* and *ex post* savings estimates remains unclear as the TRM did not clearly document assumptions behind the savings estimate.

Table 24. *Ex Ante* and *Ex Post* Comparison for Hot Water Pipe Wrap

Ex Ante Savings/Unit	*Ex Post* Savings/Unit	Realization Rate
25.7 kWh/yr	22.1 kWh/yr	86%
1.1 therm/yr	1.2 therm/yr	111%

Window Replacement

The Cadmus team estimated electric savings for installation of high-efficiency windows using the following algorithm:

$$\Delta kWh = Square\ Feet\ of\ Windows\ Replaced * Savings\ per\ Square\ Foot$$

Where:

- ΔkWh = electric energy savings

Table 25. High-Efficiency WindowPY15 Savings Assumptions

Term	PY15 Value	PY15 Source
Square feet of Installed Windows	69	HEA program Data[1]
Home vintage (old/average/new)	19%-81%-0%	HEA program Audit Data[2]
Home type (SF/MF/Manufactured)	100%-0%-0%	HEA program Audit Data
HVAC system – CAC & Gas Furnace/Elec Furnace, no AC/Gas furnace, no AC	89.9%-6.3%-3.8%	HEA program Audit Data

[1]This was a program average value. Actual values per participant were used in evaluation analysis.
[2]The MML defined vintage classifications as follows: "old" refers to homes built pre-1950s; "average" refers to homes built 1950-2004; and "new" refers to homes built after 2004.

We sourced savings-per-square-foot, based on the assumptions provided in the MML which were calculated based on DOE-2.2 model simulation of residential buildings (see Table 26). Savings were reflective of homes with central air conditioning and gas furnaces, a representative sample of HEA program participants who installed windows.

Table 26. MML Window Savings Values

Home Vintage	kWh Savings/Unit	therm Savings/Unit
Old	2.77 kWh/sqft/yr	0.30 therm/sqft/yr
Average	2.33 kWh/ sqft/yr	0.10 therm/sqft/yr

Using this engineering algorithm, we determined an *ex post* energy savings value of 187 kWh/year for each home that installed windows. This value was approximately 27% of the program's *ex ante* value (1103.4 kWh/year).

Table 27. *Ex Ante* and *Ex Post* Comparison for High-Efficiency Windows

Ex Ante Savings/Unit	*Ex Post* Savings/Unit	Realization Rate
1103.4 kWh/yr	187 kWh/yr	17%
38.9 therm/yr	18 therm/yr	46%

The difference between *ex ante* estimates and *ex post* savings estimates resulted from the assumed installed square footage, segment, vintage, and heating and cooling equipment fuel type, as described below:

- The Ameren Missouri TRM assumed each home installing new windows installs a total of 350 square feet. PY15 program data provided by Honeywell verified an average total installation of 69 square feet per home.

- The Ameren Missouri TRM assumed a segment mix of 83% single-family, 13% multifamily, and 4% manufactured home for homes installing windows through the HEA program. After collecting program audit data, we found all homes that installed windows were single-family.
- The Ameren Missouri TRM assumed a vintage mix of homes installing windows as: 19% old, 70% average, and 10% new. Based on program audit data, we found a vintage mix of: 19% old vintage, 81% average vintage, and 0% new vintage.
- The Ameren Missouri TRM assumed the following mix of heating and cooling equipment type and fuel source:
  - Central air conditioning with electric furnace: 21%
  - Central air conditioning with gas furnace: 59%
  - Central air source heat pump: 4%
  - Central dual fuel heat pump: 4%
  - Electric furnace no air conditioning: 3%
  - Gas furnace no air condition: 9%

We found, however, all customers installing windows had central air conditioning with a gas furnace for their primary heating and cooling systems.

Air Sealing

As no PY14 sampled customers completed an air-sealing project, this measure did not produce collected customer data. For the nine customers who completed air sealing in PY15, the Cadmus team deferred to Ameren Missouri TRM savings. Due to the limited savings associated with this measure, the Cadmus team did not conduct additional research.

Table 28. *Ex Ante* Electric and Gas Savings for High-Air Sealing

Air-Sealing Level	*Ex Ante* Savings/Unit	*Ex Post* Savings/Unit	Realization Rate
30% - Electric	447.5 kWh/yr	N/A	N/A
30% - Natural Gas	47.5 therms/yr	N/A	N/A

Air-Sealing Level	*Ex Ante* Savings/Unit	*Ex Post* Savings/Unit	Realization Rate
50% - Electric	739.8 kWh/yr	N/A	N/A
50% - Natural Gas	78.4 therms/yr	N/A	N/A

Ceiling Insulation

The Cadmus team calculated energy savings resulting from replacing or adding ceiling insulation using the following algorithms:[6]

$$\Delta kWh_{cool} = \frac{\left\{\left(\left(\frac{1}{R_{exist}} - \frac{1}{R_{new}}\right) * A_{attic} * \left(1 - \frac{Framing_{factor}}{2}\right)\right) * 24 * CDD * DUA\right\}}{(SEER \times 1{,}000)}$$

$$\Delta therms = \frac{\left\{\left(\left(\frac{1}{R_{exist}} - \frac{1}{R_{new}}\right) * A_{attic} * \left(1 - \frac{Framing_{factor}}{2}\right)\right) * 24 * HDD\right\}}{(\eta Heat \times 100{,}067)}$$

Where:

- R_{new} = R-value of new attic assembly (including all layers between inside air and outside air)
- R_{exist} = R-value of existing assembly and any existing insulation; minimum of R-5 for uninsulated assemblies
- A_{attic} = total area of insulated ceiling/attic (ft^2)
- $Framing_{factor}$ = adjustment to account for area of framing
- 24 = converts hours to days
- CDD = cooling degree days
- DUA= discretionary use adjustment (reflects that people do not always operate their air conditioners when conditions may call for it)
- 1,000= Btu to kBtu conversion
- SEER = Seasonal Energy Efficiency Ratio of cooling system (kBtu/kWh)
- HDD = heating degree days
- ηHeat= efficiency of gas furnace
- 100,067 Btu to therm conversion

Cooling savings and heating savings resulted from insulation measures for a home with a central air conditioning and a natural gas furnace. All homes sampled that installed insulation contained this cooling and heating configuration. Table 29 lists inputs used for each algorithm.

[6] The savings protocol for Insulation measure was adopted from the 2012 Illinois TRM.

Table 29. Insulation PY15 Savings Assumptions

Term	PY15 Value	PY15 Source
R_{new}	49	HEA program Data
R_{old}	5 - 19	HEA program Data
$A_{attic\ for\ R19\text{-}R38}$	1,558	HEA program Data[1]
$A_{attic\ for\ R5\text{-}R49}$	1,106	HEA program Data[1]
$A_{attic\ for\ R11\text{-}R49}$	1,347	HEA program Data[1]
$A_{attic\ for\ R19\text{-}R49}$	1,453	HEA program Data[1]
$Framing_{factor}$	15%	Secondary Source[2]
DUA	0.75	Secondary Source[3]
$SEER_{for\ R19\text{-}R38}$	10.4	HEA program Audit Data[1]
$SEER_{for\ R5\text{-}R49}$	10.4	HEA program Audit Data[1]
$SEER_{for\ R11\text{-}R49}$	11.6	HEA program Audit Data[1]
$SEER_{for\ R19\text{-}R49}$	11.6	HEA program Audit Data[1]
$\eta Heat_{for\ R19\text{-}R38}$	81.9%	HEA program Audit Data[1]
$\eta Heat_{for\ R5\text{-}R49}$	80.6%	HEA program Audit Data[1]
$\eta Heat_{for\ R11\text{-}R49}$	85.6%	HEA program Audit Data[1]
$\eta Heat_{for\ R19\text{-}R49}$	87.8%	HEA program Audit Data[1]
CDD	1,646	Secondary Source[4]
HDD	4,535	Secondary Source[4]

[1]Values listed in Table 29 from HEA program Data and Audit Data were program averages. Actual participant values were used to calculate energy savings.

[2]Based on Oak Ridge National Lab, Technology Fact Sheet for Wall Insulation. The factor was used directly for walls, but reduced by one-half for attics, assuming the average joist is 5.5" and R-38 requires 11" of cellulose; therefore, at each joist, one-half the thickness of insulation had been added between the joists.

[3]This factor's source was: Energy Center of Wisconsin, May 2008 metering study: "Central Air Conditioning in Wisconsin, A Compilation of Recent Field Research," p31.

[4]Ameren Missouri TRM

Using the engineering algorithm, we calculated *ex post* electric and therm savings values for various insulation levels installed at program homes, as shown in Table 30 and Table 31.

Table 30. *Ex Ante* and *Ex Post* Electric Savings Comparison for Insulation

Insulation Level	*Ex Ante* Savings/Unit	*Ex Post* Savings/Unit	Realization Rate
R19 – R38	68.5 kWh/yr	108.1 kWh/yr	158%
R5 – R49	467.6 kWh/yr	525.0 kWh/yr	112%
R11 – R49	183.6 kWh/yr	224.8 kWh/yr	122%
R19 – R49	83.9 kWh/yr	117.1 kWh/yr	140%

Table 31. *Ex Ante* and *Ex Post* Therm Savings Comparison for Insulation

Insulation Level	*Ex Ante* Savings/Unit	*Ex Post* Savings/Unit	Realization Rate
R19 – R38	36.8 therm/yr	50.3 therm/yr	137%
R5 – R49	251.1 therm/yr	248.1 therm/yr	99%
R11 – R49	98.6 therm/yr	111.6 therm/yr	113%
R19 – R49	45.1 therm/yr	53.7 therm/yr	119%

The difference between *ex ante* and *ex post* savings estimates as well as the varying realization rates resulted from assumed heating and cooling efficiencies as well as the total area insulated, described as follows:

- The Ameren Missouri TRM assumed a SEER efficiency of 10 and a natural gas furnace efficiency of 70%. Based on program audit data, we found an average SEER efficiency of 11 and an average furnace efficiency of 86% for homes that installed insulation.
- The Ameren Missouri TRM assumed that each home installed 950 square feet of insulation. Based on program audit and survey data, however, we calculated average installed insulation per home at 1,387 square feet.

Summary

The Cadmus team calculated the measure-specific realization rates (shown in Table 32) by comparing evaluated (*ex post)* savings with the program's planning estimate (*ex ante*), detailed in Ameren Missouri's TRM.

Table 32. Comparison of *Ex Ante and Ex Post* Per-Unit Gross Savings

Measure	*Ex Ante* Savings per Unit	*Ex Post* Savings per Unit	Realization Rate
Electric Measures (kWh/yr)			
CFLs	38.1	24.3	63.8%
LEDs	46.7	27.9	59.8%
High-efficiency Aerators	57.0	30.3	53.2%
High-efficiency Showerheads	361.0	232.5	64.4%
Hot Water Pipe Wrap (per linear foot)	25.7	22.1	85.9%
Ceiling Insulation (per home)	153.9	192.3	124.9%
Windows (per home)	1,103.4	186.9	16.9%
Air Sealing[1]	544.9	544.9	100.0%
Overall	-	-	**60.2%**
Natural Gas Measures (therms/yr)			
High-Efficiency Aerators	6.8	1.7	24.4%
High-Efficiency Showerheads	21.5	13.1	61.0%
Hot Water Pipe Wrap (per linear foot)	1.1	1.2	110.5%
Ceiling Insulation (per home)	82.7	91.9	111.2%
Windows (per home)	38.9	17.9	46.0%
Air Sealing[1]	57.8	57.8	100.0%
Overall	-	-	**74.9%**

[1]Weighted average of *ex ante* savings. Air Sealing was not included in the evaluation sample and could not be evaluated. Therefore, the evaluation assumed a 100% realization rate.

We determined that the program achieved a 60.2% overall electric measures gross realization rate—a low realization rate primarily due to low realization rates for CFLs (63.8%) and high-efficiency showerheads (64.4%), which both contributed significant savings to the program. Despite a high realization rate for ceiling insulation (124.9%), low realization rates for other measure categories reduced the overall electric realization rate.

The evaluation found natural gas measures produced a 74.9% overall realization rate, a realization rate reduced by a low realization rate for high-efficiency showerheads (61.0%). However, high average savings for ceiling insulation (111.2%) and hot water pipe wrap (110.5%) helped to offset the low showerhead realization rate.

Table 33 and Table 34 apply these per-unit values to the HEA program PY15 participation rates to estimate the program's total *ex post* gross energy savings.

Table 33. Electric *Ex Post* Program Gross Savings

Measure	PY15 Participation	*Ex Post* Savings per Unit (kWh/yr)	Total *Ex Post* Savings (kWh/yr)
Electric Measures			
CFLs	8,267	24.3	201,022
LEDs	1,244	27.9	34,706
High-efficiency Aerators	384	30.3	11,646
High-efficiency Showerheads	258	232.5	59,979
Hot Water Pipe Wrap (per linear foot)	1,025	22.1	22,625
Ceiling Insulation (per home)	180	192.3	34,802
Windows (per home)	84	186.9	15,700
Air Sealing	9	544.9	4,904
Total	**11,451**	-	**385,384**

Table 34. Natural Gas *Ex Post* Program Gross Savings

Measure	PY15 Participation	*Ex Post* Savings per Unit (therm/yr)	Total *Ex Post* Savings (therm/yr)
Natural Gas Measures			
High-Efficiency Aerators	1,441	1.7	2,395
High-Efficiency Showerheads	764	13.1	10,022
Hot Water Pipe Wrap (per linear foot)	1,025	7.9	8,118
Ceiling Insulation (per home)	180	91.9	16,638
Windows (per home)	84	17.9	1,502
Air Sealing	9	57.8	520
Total	**3,503**	-	**39,195**

Table 35 lists the program's total gross *ex post* energy savings for both fuel types. Relative precision is reported at the 90% confidence level.

Table 35. Program Gross Realization Rates by Fuel Type

Fuel Type	*Ex Ante* Program Savings	Realization Rate	*Ex Post* Program Savings	Precision at 90% Confidence
Electricity (MWh/yr)	639.8	60.2%	385.4	9.5%
Natural Gas (therm/yr)	52,321.7	74.9%	39,194.8	10.1%

Net Impact Evaluation Results

This section discusses the Cadmus team's methodology for calculating net savings by measure for the HEA program. We calculated the program NTG ratio using the following formula:

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

We could not estimate market effects as the HEA program pilot was too new to generate market changes. Table 36 lists the program's net electricity impacts. Additionally, we applied free ridership and spillover results from PY14 to PY15 as participant data had not been collected for the current program year.

Table 36. PY15 Electricity Net Impact Results

Measure	*Ex Post* Gross Savings (MWh/yr)	Free Ridership	Participant Spillover	NPSO	NTG Ratio	Net Savings (MWh/yr)
Electricity	385.4	16.2%	1.6%	0.9%	86.3%	332.8

Table 37 lists the program's net natural gas impacts.

Table 37. PY15 Therm Net Impact Results

Measure	*Ex Post* Gross Savings therm/yr)	Free Ridership	Participant Spillover	NPSO	NTG Ratio	Net Savings (therm/yr)
Natural Gas	39,194.8	16.2%	1.6%	0.9%	86.3%	33,841.4

Major Measure Free Ridership

The Cadmus team determined free ridership using a self-report approach, in which a sample of participants was asked the following standard battery of questions:

- Had the participant already purchased the product before learning about the incentive?
- Was the participant planning to purchase the same product before learning about the incentive?
- Would the participant have purchased a product that was just as energy-efficient without the incentive?
- Would the participant have purchased the product at the same time as when they went through the HEA program?

We then applied a free ridership score, ranging from 0% to 100%, to all participants individually, based on their collective responses to the survey questions. (In Appendix C, a flow chart illustrates our free ridership scoring approach.) We used the following process for determining the free ridership score:

- We categorized customers as 0% free riders in the following instances: (1) they had no plans to install the measure in the absence of program incentives and would not have installed the measure within one year in the program's absence; (2) they 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 installed the measure before learning about the program or would have installed the same measure at the same time without the program.
- We assigned a partial free ridership score (ranging from 12.5% to 75%) to customers who said they already planned to install the measure, but the program influenced their decision about which product to purchase or when they would purchase it. For customers who were highly likely to install an energy-efficient measure right away and for whom the program had less influence over their decision, we assigned a higher free ridership percentage than for those saying the program may not have been as large an influence or whose purchase may have occurred later in the program's absence.

After translating survey responses into each participant's free ridership score, we used the evaluated energy savings in calculating a weighted average free ridership estimate for each incented measure. (Appendix D shows the conversion of each raw survey response into the free ridership scoring matrix values, along with the free ridership score combinations and scoring legend we used to categorize customer survey responses for incented measures.)

Major Measure Free Ridership Results

Table 38 provides free ridership by measure for added insulation and windows. The Cadmus team combined the PY14 and PY13 participant survey samples to estimate major measure free ridership for PY15. Appendix D contains the full set of unique free ridership survey response combinations, the free ridership score assigned to each combination, and the number of responses. "Yes," "No," or "Partial" responses relate to whether or not the specific response was indicative of free ridership.

Table 38. HEA program Incented Measure Free Ridership Results

Program Measure	PY14 Sample Size	Free Rider Estimate	Free Rider Absolute Precision
Insulation	19	10.9%	±5.3%
Windows	8	46.1%	±0.0%

Direct Install Measure Free Ridership

As discussed, the Cadmus team estimated free ridership for the HEA program direct-install measures based on participant survey data collected in PY14. Table 39 presents the results from that analysis.

Table 39. Free Ridership by Direct-Install Measure

Measure	Free Ridership
CFL	20.3%
LED	6.3%
Faucet Aerator	9.5%
Showerhead	15.9%
WH Pipe Wrap	20.4%
Insulation - Incented	10.9%
Windows - Incented	46.1%

Participant Spillover

Similarly, the Cadmus team applied PY14 spillover results to PY15. This yielded a 1.6% program-level spillover estimate.

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 PY15, Ameren Missouri spent over $1.91 million dollars to market individual residential efficiency programs (excluding low-income) and the portfolio-wide Act on Energy campaign—an amount more than Ameren Missouri's PY14 marketing expenditure ($1.53M).

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 PY15 to determine the general population's energy efficiency awareness and non-program participants energy efficiency actions. This approach is consistent with the Uniform Methods Project protocols, and does not double count any savings attributed to the program directly or spillover from program participants. [7]

Methodology

In PY15, the Cadmus team selected and surveyed 200 customers, based on a randomly generated sample frame of approximately 20,000 of Ameren Missouri's residential customers. Through screening survey respondents, we determined that the sample contained a number of customers (n=23) self-reporting that they participated in an Ameren Missouri residential program during PY15. When estimating NPSO, we excluded these customers from analysis, focusing on the 177 remaining random

[7] http://energy.gov/sites/prod/files/2015/02/f19/UMPChapter23-estimating-net-savings_0.pdf

nonparticipants; this avoided potential double-counting of program savings and/or program-specific spillover. The sample of 200 is valid at 90% confidence level and within +-6% for estimating proportions.

We also limited the NPSO analysis to the same efficiency measures rebated through Ameren Missouri programs (known as "like" spillover) because Ameren Missouri focuses its marketing primarily on promoting the program portfolio, rather than through broad energy efficiency education. Program specific marketing doesn't preclude customers from implementing other energy efficiency improvements as a result of their exposure to the programs, however since spillover estimates are somewhat uncertain, restricting spillover to "like" measures adds a degree of conservativeness.8 Examples of "like" spillover included 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 represented electric spillover savings, Cadmus asked customers questions about fuel type for water heaters, heating systems, and cooling systems. The analysis only counted savings associated with measures where there was a corresponding electric water heater, electric heat, or central air conditioning as spillover.

To confirm a relationship between Ameren Missouri's energy efficiency programs, Ameren Missouri's awareness campaign, and actions taken by nonparticipants, our survey asked about nonparticipants' familiarity with Ameren Missouri's energy-efficiency programs and associated campaign. 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.

If a reported spillover measure type was offered under an Ameren Missouri rebate program, respondents were asked why they or their contractor did not apply for a rebate through Ameren Missouri. We did not count measures towards spillover if respondents reported applying for an Ameren Missouri rebate but did not receive one because their product did not qualify. We compared the names, addresses, and phone numbers of respondents to tracking databases to ensure that the respondents were not confused by the questions and had, in fact, participated in the program. We did not find any, which would have eliminate the measure as nonparticipant spillover. Since it was the largest savings measure, we further investigated the logic of refrigerator recycling as a spillover measure—i.e. why would someone find out about the program, then recycle the refrigerator own their own? Although motivations aren't known, Ameren Missouri staff indicate that in PY15, and similar to other years, 18.2% of customers who originally sign up for recycling, cancel the pickup. Possible reasons might be inability

8 Ameren Missouri promoted the portfolio of programs in a number of channels including pre-game shows at St. Louis Cardinals games, an outfield sign at Busch Stadium, digital banners, key word searches, metro link signs, social media, and Cardinals sweepstakes.

to agree upon a schedule or a perceived opportunity to earn more money for parts. Thus it is logical that due to Ameren Missouri's marketing efforts, customers may recycle on their own.

For measure types where it applied, we also asked respondents how they know their product is energy efficient. Examples of answers that would keep reported measures in consideration for spillover are:

- It's ENERGY STAR rated
- The retailer/dealer/contractor told me it was

We eliminated two measures from spillover consideration because the respondents 'did not know' how to justify their product was energy efficient.

Results

Of 177 nonparticipants surveyed, 12 cited Ameren Missouri's marketing as "very important" or "somewhat important" in their decisions to purchase non-rebated, high-efficiency measures during 2015:9

- Among nonparticipants citing their knowledge of Ameren Missouri's energy efficiency programs or the Ameren Missouri's campaign as "very important," we counted *ex post,* gross, per-unit savings, determined through the PY15 evaluation towards the NPSO analysis.
- If nonparticipants found Ameren Missouri "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 campaign were "not very important" or "not at all important" to their efficiency actions.

Table 40 shows measures and PY15 gross evaluated kWh savings attributed to Ameren Missouri, with average savings per spillover action of 171 kWh.

9 This translates to approximately 7% of the general population, with a range of 90% confidence of 4% to 10%. Despite the range, the 7% middle point remains the most likely value. With 7% of the population undertaking actions on their own, a sample size of nearly 5,000 surveys would be needed to detect such a level with ±10% (6.3% to 7.7%) —clearly a prohibitive undertaking.

Table 40. NPSO Response Summary

Individual Reported Spillover Measures	Influence of Ameren Missouri Information on Purchase	Quantity	PY15 Measure Savings Per Unit (kWh)	Allocated Savings	Total kWh Savings	Avg kWh Per Spillover Measure
Ceiling Insulation	Somewhat	1 project	192***	50%	96	A
Low Flow Showerhead	Very	1	222†	100%	222	
Programmed thermostat to reduce usage	Very	1	83*	100%	83	
Programmed thermostat to reduce usage	Somewhat	1	83*	50%	41	
Programmed thermostat to reduce usage	Very	1	83*	100%	83	
Programmed thermostat to reduce usage	Very	1	83*	100%	83	
Programmed thermostat to reduce usage	Somewhat	1	83*	50%	41	
Removed Refrigerator/Freezer	Very	1	1,000ˆ	100%	1,000	
Scheduled central air conditioner tune-up	Somewhat	1	126*	50%	63	
Smart strip plug outlets	Very	3	64†	100%	193	
Lowered temperature on water heater	Very	1	163**	100%	163	
Windows	Somewhat	9 windows	187***	50%	93	
Windows	Very	3 windows	62***	100%	62	
Total (n=13 spillover actions)					**2,224**	**171**

†Based on savings calculated for the Efficient Products program.
ˆBased on savings calculated for the Refrigerator Recycling program.
* Based on savings calculated for the Heating and Cooling program.
** Based on deemed savings from the Ameren Missouri Technical Resource Manual (TRM)
***Based on savings calculated for the Home Energy Performance program.

We estimated measure savings based upon PY15 ex post evaluation results using the following assumptions:

- For ceiling insulation measure we used the ex post weighted average ceiling insulation savings per home from the Home Energy Performance program.
- For the low flow showerhead measure we used the ex post average savings per showerhead from the Efficient Products program.
- For the programmed thermostat to reduce usage measure we used the ex post weighted average per setback savings from the Heating and Cooling program.
- For the removed refrigerator or freezer measure we used the ex post population weighted average of the part-use adjusted refrigerator and freezer per-unit savings estimates.

- For tune-ups we assumed the system was a central air conditioner receiving a condenser cleaning (the most common program tune-up measure). We applied the Heating and Cooling program ex post savings for this measure of 251.4 kWh. For purposes of NPSO, we conservatively de-rated the estimated savings by 50% to get 125.7 kWh savings considering that a non-program tune-up may not meet the program quality standards and would save less.
- For smart strip plug outlets we used the ex post average savings for smart strips from the Efficient Products program.
- For the lowered temperature on water heater measure we used the deemed savings from the Ameren Missouri Technical Resource Manual which assumes a 40 gallon residential tank and a current typical existing market baseline of electric water heater thermostat set at 135 degrees F and a minimum threshold for savings credit of a post set point at 120 degrees F.
- For the respondent who installed 9 energy efficient windows we used the ex post average window savings per home from the Home Energy Performance program of 186.9 kWh.
- For the windows respondent who installed 3 energy efficient windows we applied one-third of the ex post average window savings per home from the Home Energy Performance Program.

To arrive at a single savings estimate (Variable A in Table 40), the Cadmus team used numbers in the Total kWh Savings column to calculate an average for the 15 measures assessed for NPSO. Thus, the 171 kWh estimate represented 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 2015, we used the following variables (as shown in Table 41):

- **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 (excluding PY15 participants).
- **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 2015 program year *ex post* gross savings for Refrigerator Recycling, Heating and Cooling, Lighting, Home Energy Performance, and Efficient Products. (Similarly to PY14, the PY15 analysis did not include the Low Income program.)10

10 We excluded the Low Income program as it exclusively worked directly with property managers of low-income buildings; so marketing for this program would likely generate little NPSO.

- **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 8.6% of total PY15 reported *ex post* gross savings, as shown in Table 41. Smaller NPSO savings were reported in PY14 (7,592 MWH) than in PY15 (12,247 MWH). This combined with lower total *ex post* residential portfolio savings in PY15 (142,016 MHW) than in PY14 (210,530 MH). Consequently, this resulted in a higher NPSO as a percent of total *ex post* residential portfolio savings values in PY15 (8.6%) than estimated for PY14 (3.6%). Both years identified a similar list of measures installed. A growing proportion of nonparticipant spillover is consistent with what we would expect from long running marketing of a program portfolio.

Table 41. NPSO Analysis

Variable	Metric	Value	Source
A	Average kWh Savings per Spillover Measure	171	Survey Data/Impact Evaluation
B	Number of Like Spillover Nonparticipant Actions	13	Survey data
C	Number Contacted	177	Survey disposition
D	Total Residential Population minus PY15 participants	974,784	Customer database minus PY15 participants
E	Non-Part SO MWh Savings Applied to Population	12,247	(((B÷C)×A) × D)/1000
F	Total Reported Gross *Ex Post* Savings (MWh)	142,016	2015 Program Evaluations
G	NPSO as Percent of Total Evaluated Savings	8.6%	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 an 8.6% 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. This approach may be most appropriate when NPSO derives from a broad energy efficiency education campaign, rather than the program specific marketing approach Ameren Missouri used.
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 central air conditioner, based on energy efficiency messaging from Ameren Missouri. Using this approach, we would assign NPSO savings

associated with a central air conditioner 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. There are indications 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 Ameren Missouri marketing and program activity over a period of time, not necessarily by a single, program-specific marketing effort and not by a broad education campaign. 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 12,247 MWh NPSO to Ameren Missouri's residential programs (excluding Low Income). As noted, we considered the PY15 program size (in terms of total gross *ex post* MWh savings) and each program's marketing budget (as shown in Table 42) when allocating NPSO across programs.

Table 42. Program-Specific Savings and Marketing

Program	Program *Ex Post* Gross Savings (MWh)	Percentage of Portfolio Savings	Total Marketing	Percentage of Total Marketing
Refrigerator Recycling	10,774	7.6%	$630,194	32.9%
Heating and Cooling	54,622	38.5%	$955,454	49.9%
Lighting	68,326	48.1%	$71,804	3.8%
Home Energy Performance	385	0.3%	$46,670	2.4%
Efficient Products	7,908	5.6%	$209,907	11.0%
Total	**142,016**	**100%**	**$1,914,029**	**100%**

The results of this approach—shown in Table 42 and Table 43—reflect each program's impact on the nonparticipant population, based on marketing expenditures and the magnitude of the program's intervention in the regional marketplace.

Table 43. Combined Savings and Marketing Allocation Approach

Program	*Ex Post* Gross Energy Savings (A)	Marketing Spending (B)	Combined Savings/ Marketing (AxB)	Percentage of Combined Savings/ Marketing
Refrigerator Recycling	7.6%	32.9%	2.5%	10.4%
Heating and Cooling	38.5%	49.9%	19.2%	79.6%
Lighting	48.1%	3.8%	1.8%	7.5%
Home Energy Performance	0.3%	2.4%	0.01%	0.03%
Efficient Products	5.6%	11.0%	0.6%	2.5%
Total	**100%**	**100%**	**24.1%**	**100%**

Analysis credited two programs with the greatest NPSO: Heating and Cooling (accounting for one-half of all marketing dollars and 38% of total energy savings) at 9,749 MWh; and Refrigerator Recycling (accounting for 33% of marketing dollars and 8% of total energy savings) at 1,268 MWh. As NPSO impacts program-specific NTG results,11 all NPSO estimates have been reported as a percentage of each program's total gross energy savings.

As shown in Table 44Table 44, we allocated 3 MWh of NPSO to HEA program, representing less than one-tenth of a percent (0.03%) of the combined residential portfolio savings and marketing expenditure. This resulted in a 0.9% adjustment to the program's PY15 NTG—findings generally similar to the PY14 NPSO analysis.

Table 44. 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	10,774	12,247	10.4%	1,268	11.8%
Heating and Cooling	54,622		79.6%	9,749	17.8%
Lighting	68,326		7.5%	916	1.3%
Home Energy Performance	385		0.03%	3	0.9%
Efficient Products	7,908		2.5%	310	3.9%
Total	**142,016**		**100%**	**12,247**	**8.6%**

11 NTG = 1 – Free Ridership + Participant Spillover + NPSO + Market Effects

Ex Post NTG

To estimate the overall program NTG ratio, the Cadmus team used total population *ex post* gross savings to weight results for each measure type in order. Table 45 shows the components of each program measure's NTG estimate (free ridership and spillover) as well as the percentage of total program savings related to each measure.

We used the percentage of total program savings and NTG ratios specific to each measure to arrive at a savings-weighted NTG estimate of 86.3% for the program overall.

Table 45. NTG by Measure

Measure	% of Program Savings	Free Ridership	Participant Spillover	NPSO	NTG
CFL	13.3%	20.3%	1.6%	0.9%	82.1%
LED	2.3%	6.3%			96.1%
Faucet Aerator	5.4%	9.5%			92.9%
Showerhead	23.3%	15.9%			86.5%
WH Pipe Wrap	17.2%	20.4%			82.0%
Insulation - Incented	34.4%	10.9%			91.5%
Windows - Incented	4.1%	46.1%			56.3%
Total	**100.0%**	**16.2%**	**1.6%**	**0.9%**	**86.3%**

Benchmarking

The Cadmus team researched other utilities that offered similar measures as Ameren Missouri Missouri's HEA program. Table 46 and Table 47 compare—by measure type—participation levels and gross and net savings of those utilities with Ameren Missouri.

On a savings-per-participant metric, the HEA program performed similarly to PY14, with approximately 0.37 MWh/yr per participant, an amount slightly less per participant than in PY14 (0.45 MWh/yr). Given the program's ending and its slightly truncated year, it performed well relative to other, similar programs across the country on a savings--per participant metric.

Table 46. HEA Program Benchmarking Results: Electricity Saving

State or Utility	Participation	*Ex Post* Savings (MWh/yr)	NTG	Net Savings (MWh/yr)
Ameren Missouri	909	385.4	0.86	332.8
Midwest Utility A[1]	769	234.6	0.76	201.1
Midwest Utility B[1]	4,627	1,904.6	0.92	1,753.0
Midwest Utility C[1]	4,944	1,131.4	0.73	824.4
Georgia Power[2]	4,949	7,332.7	0.79	5,803.8

[1]Report is not publicly available.

[2]Impact Evaluation of Georgia Power Company's 2011 DSM Programs. Nexant, Inc. December 21, 2012.

Table 47. HEA Program Benchmarking Results: Natural Gas Saving

State or Utility	Participation[1]	*Ex Post* Savings (therm/yr)	NTG	Net Savings (therm/yr)
Ameren Missouri	909	39,195	0.86	33,841
Ameren Illinois[2]	1,455[2]	4,816	N/A	N/A
Idaho Power Company	650	1,905	0.92	1,753
East North Central Utility[4]	415[3]	43,545	0.81	35,272

[1]Represents program participation unless otherwise noted.

[2]2008 program year.

[3]Report is not publicly available.

Cost-Effectiveness Results

To analyze PY15 program cost-effectiveness, MMP used DSMore and assessed cost-effectiveness using the following five tests, defined by the California Standard Practice Manual:12

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

DSMore took hourly energy prices and hourly energy savings from specific measures installed through the Lighting Program and correlated prices and savings to 30 years of historic weather data. Using long-term weather ensured the model captured and appropriately valued low probability but high consequence weather events. Consequently, the model's produced an accurate evaluation of the demand-side efficiency measures relative to alternative supply options. In PY15, Ameren Missouri updated its avoided energy, capacity, and transmission and distribution (T&D) costs to be consistent with its 2014 Integrated Resource Plan (IRP).

Table 48 presents the key cost-effectiveness analysis assumptions and corresponding source.

Table 48. Assumptions and Source for Cost-Effectiveness Analysis

Assumption	Source
Discount Rate = 6.95%	Ameren Missouri 2012 MEEIA Filing
Line Losses = 5.72%	
Summer Peak occurred during the 16th hour of a July day, on average	
Escalation rates for different costs occurred at the component level, with separate escalation rates for fuel, capacity, generation, transmission and distribution, and customer rates carried out over 25 years.	
Avoided Energy and Capacity Costs	Ameren Missouri 2014 IRP
Avoided Electric T&D = $23.60/kW	

In addition, MMP used the Batch Tools (model inputs) that Ameren Missouri used in its original analysis as input into the *ex post* DSMore analysis, then modified these solely with new data from the evaluation (e.g., PY15-specific Lighting participation counts, per-unit gross savings, and NTG), which ensured consistency. For HVAC, we also updated the per-unit demand reduction based on our analysis of primary sub-meter data.

Particularly, model assumptions were driven by measure load shapes, which indicated when the model should apply savings during the day. This ensured that the load shape for an end-use matched the

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

system peak impacts of that end use and provided the correct summer coincident savings. MMP used measure lifetime assumptions and incremental costs based on the program database, the Ameren Missouri TRM, or the original Batch Tool.

A key step in the analysis process required acquiring PY15 Ameren Missouri program spending data: actual spending, broken down into implementation, incentives, and administration costs. MMP applied these numbers at the program level, not the measure level. While applying incentives at the measure level can be useful for planning purposes, it proves unnecessary for cost-effectiveness modeling since results are based on a program overall.

In addition, all the program-specific cost-effectiveness results include the program's share of portfolio-level or indirect costs ($1,429,220). The Cadmus team determined each program's share of these costs using the present value of each program's UCT lifetime benefits (i.e., the present value in 2013 dollars of avoided generation costs, as well as deferral of capacity capital and transmission and distribution capital costs).

Table 49 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 Annual Net Shared Benefits or (sometimes referred to as UCT net lifetime benefits).[13] The HEA program only passes the PART test and generated negative Annual Net Shared Benefits, unlike PY14 results. This difference is primarily due to the updated avoided energy costs, which are significantly lower than those assumed in PY14.

Table 49. Cost-Effectiveness Results (PY15)

	UCT	TRC	RIM	Societal	PART	Annual Net Shared Benefits[1]
Home Energy Analysis	0.74	0.55	0.32	0.70	1.91	($51,503)

[1] Annual Net Shared Benefits shown meet the definition in 4 CSR 240-20.094(1)(C) and use avoided costs or avoided utility costs as defined in 4 CSR 240-20.094(1)(D).

13 Net avoided costs minus program costs.

Appendix A. *Ex Post* Demand Reductions

MMP determined *ex post* demand reductions using *ex post* energy savings estimated in this PY15 report and DSMore (using load shapes provided by Ameren Missouri).

Table 50. PY15 Summary: Net *Ex Post* Per-Unit Demand Reductions

Measure	PY15 Participation	Per-Unit Net *Ex Post* Demand Reduction (kW)	Total Net *Ex Post* Savings (kW)*
CFLs	8,267	0.0009	2.77
LEDs	1,244	0.0010	0.51
High-efficiency Aerators	384	0.0029	1.13
High-efficiency Showerheads	258	0.0025	5.80
Hot Water Pipe Wrap (per linear foot)	1,025	0.0021	2.19
Ceiling Insulation	180	0.0738	4.65
Windows	84	0.0717	6.02
Air Sealing	9	0.2091	0.97
Total	**11,451**	**-**	**38.97**

*Accounts for line losses; may not sum due to rounding and using average kW reductions for measures with different kWh reductions.

Appendix B. Program Manager Interview Guide

Respondent name:_____

Respondent phone: _____

Interview date:_____ Interviewer initials:_____

For the PY13, PY14 and PY15 evaluations, Cadmus will interview stakeholders annually.

Introduction

1) Please explain the changes in the implementation team's management.

2) Please describe any significant changes to your primary responsibilities, regular tasks, and time commitments for the HEA Program.

Program Design and Implementation

4) Have any significant changes occurred in communication, both formal and informal, between Honeywell and Ameren?

5) How did the integration process with Ameren's Vision database work out?

6) What would you say worked particularly well in PY15? Why is that?

7) The program realized a strong uptake of major measures in PY2015.

   a. What factors do you believe are responsible for this uptake?

8) Conversely, what did not work as well as anticipated? Why is that?

Program Goals

9) Were there changes in program performance expectations for PY15?

    a. If yes, what are PY15 savings and participation goals?

Measures

10) Have there been any changes to the measure mix offering in PY15?

Marketing Efforts

11) Were there any changes made to the marketing strategy for the program in PY2015 (e.g., target customer or market)? If yes, please describe.

12) Were there any new challenges in PY15 to engage the target market segment? Were there any changes that you think have helped the marketing efforts be more effective in engaging these customers?

13) Were you satisfied with the response to Home Energy Analysis marketing efforts so far in PY2015?

Program Partners

14) Was the number of auditors sufficient to keep up with audit demand in PY15?

15) Is the number of certified program contractors sufficient to meet the demands of the program?

16) What feedback have you received on the performance of the program certified contractors?

Quality Control

17) Have there been any changes to the program's quality control process?

Customer Feedback

18) Have PY15 customers expressed opinions about the $25 audit fee? What about the incentive amounts for the rebated measures?

19) Do you think your customers continue to understand the energy-related recommendations presented to them in the home energy audit report?

20) Are there any recurring or common customer praises or complaints? If so, what are they?

    a. Follow up: Any issues regarding time to complete audit, number of call backs, etc.

Program Closure and Feedback

A. Does Ameren anticipate continuing the HEA program into the 2016-2018 cycle?

   a. (If no), when was it decided to end the program?

   b. (If no), what were the reasons that led to the decision to end the program?

   c. (If no), can you share your perspectives on why you feel the program was not successful enough to continue it in the next cycle?

   a. (If yes), will the program have the same structure and design, or will changes be made?

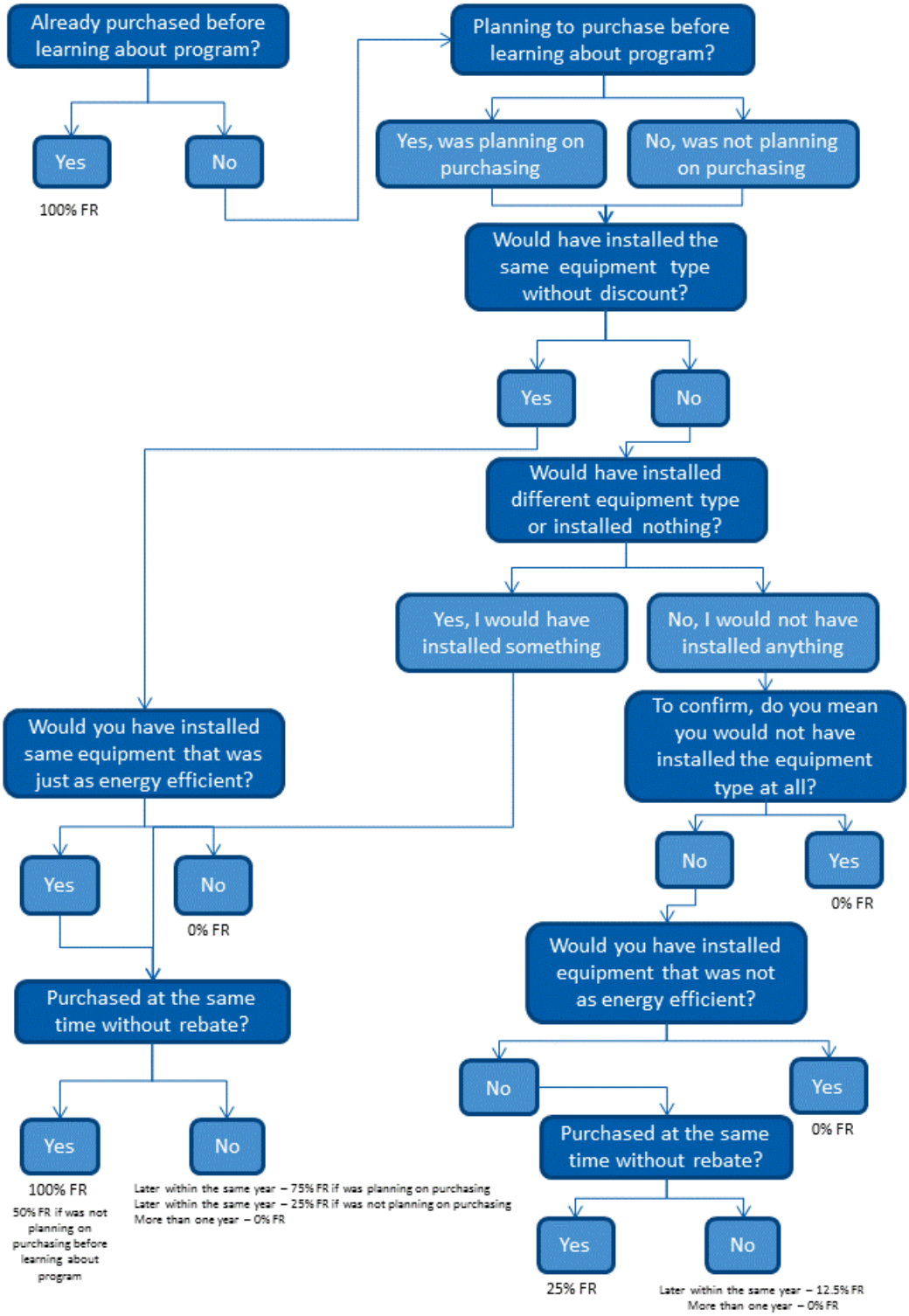
Summary

I. What would you say are the biggest lessons learned since the launch of the program?

21) (if program is continuing) From your perspective, what are the biggest challenges facing the program in the next cycle?

22) Anything else you'd like us to know?

Appendix C. Free Ridership Scoring Flow Chart



Appendix D. Incented Measure Free Ridership Scoring Tables

Table 51 illustrates how initial survey responses are translated into the responses "yes," "no," or "partially" to indicate free ridership (in parentheses).

Table 51: Raw Survey Responses Translation to Free Ridership Scoring Matrix Terminology

FR1. Had you already purchased your new [SURVEYMEASURE] before hearing about Ameren's ActOnEnergy PerformanceSavers in-home audit?	FR1a. To confirm, you purchased your new [SURVEYMEASURE] and then found out about Ameren's ActOnEnergy PerformanceSavers in-home audits, is that correct?	FR2. Before hearing about Ameren's ActOnEnergy PerformanceSavers in-home audit, were you already planning to purchase [SURVEYMEASURE]?	FR3. Would you have purchased the same type of [SURVEYMEASURE] had you not heard about Ameren's ActOnEnergy PerformanceSavers in-home audit?	FR4. Help me understand, without having heard of Ameren's ActOnEnergy PerformanceSavers in-home audit, would you have purchased a different type of [SURVEYMEASURE], or would you have decided not to purchase at all?	FR5. When you say you would have purchased [SURVEYMEASURE] without having heard of Ameren's ActOnEnergy PerformanceSavers in-home audit, would you have purchased [SURVEYMEASURE] that were just as energy efficient?	FR6. Without having heard of Ameren's ActOnEnergy PerformanceSavers in-home audit, would you have purchased the same amount of [SURVEYMEASURE]?	FR7. Thinking about timing, without hearing of Ameren's ActOnEnergy PerformanceSavers in-home audit, is it most likely that you would have purchased the [SURVEYMEASURE]…	FR8. To confirm, you indicated that without hearing of Ameren's ActOnEnergy PerformanceSavers in-home audit, you would not have purchased your [SURVEYMEASURE] at all, is that correct?	FR9. Without the Ameren ActOnEnergy PerformanceSavers in-home audit, would you have purchased [SURVEYMEASURE] that was just as energy-efficient?	FR10. Without having heard of Ameren's ActOnEnergy PerformanceSavers in-home audit, would you have purchased the same amount of [SURVEYMEASURE]?	FR11. With respect to timing, without hearing about Ameren's ActOnEnergy PerformanceSavers in-home audit, would you have purchased the [SURVEYMEASURE]…
Yes (Yes)	Yes, that's correct (Yes)	Yes (Yes)	Yes (Yes)	I would have purchased a different type (Yes)	Yes (Yes)	Yes, I would have purchased same amount (Yes)	At the same time (Yes)	Yes (No)	Yes (Yes)	Yes (No)	At the same time (Yes)
No (No)	No, that's not correct (No)	No (No)	No (No)	I would not have purchased at all (No)	No (No)	No, I would have purchased less (No)	Within the same year (Partial)	No (Yes)	No (No)	No (No)	Within the same year (Partial)
Don't Know (No)	Don't Know (No)	Don't Know (Partial)	Don't Know (Partial)	Don't Know (No)	Don't Know (Partial)	Don't Know (Partial)	One to two years out (No)	Don't Know (Partial)	Don't Know (Partial)	Don't Know (Partial)	One to two years out (No)
Refused (No)	Refused (No)	Refused (Partial)	Refused (Partial)	Refused (No)	Refused (Partial)	Refused (Partial)	More than two years out (No)	Refused (Partial)	Refused (Partial)	Refused (Partial)	More than two years out (No)
							Never (No)				Never (No)
							Don't Know (Partial)				Don't Know (Partial)
							Refused (Partial)				Refused (Partial)

Table 52 shows how the string of responses from Table 51 is then translated into a free ridership score.

Table 52: Sample of Incented Measure Free Ridership Scores

FR1. Had you already purchased your new [SURVEYMEASURE] before hearing about Ameren's ActOnEnergy PerformanceSavers in-home audit?	FR1a. To confirm, you purchased your new [SURVEYMEASURE] and then found out about Ameren's ActOnEnergy PerformanceSavers in-home audits, is that correct?	FR2. Before hearing about Ameren's ActOnEnergy PerformanceSavers in-home audit, were you already planning to purchase [SURVEYMEASURE]?	FR3. Would you have purchased the same type of [SURVEYMEASURE] had you not heard about Ameren's ActOnEnergy PerformanceSavers in-home audit?	FR4. Help me understand, without having heard of Ameren's ActOnEnergy PerformanceSavers in-home audit, would you have purchased a different type of [SURVEYMEASURE], or would you have decided not to purchase at all?	FR5. When you say you would have purchased [SURVEYMEASURE] without having heard of Ameren's ActOnEnergy PerformanceSavers in-home audit, would you have purchased [SURVEYMEASURE] that were just as energy efficient?	FR6. Without having heard of Ameren's ActOnEnergy PerformanceSavers in-home audit, would you have purchased the same amount of [SURVEYMEASURE]?	FR7. Thinking about timing, without hearing of Ameren's ActOnEnergy PerformanceSavers in-home audit, is it most likely that you would have purchased the [SURVEYMEASURE]…[READ LIST]	FR8. To confirm, you indicated that without hearing of Ameren's ActOnEnergy PerformanceSavers in-home audit, you would not have purchased your [SURVEYMEASURE] at all, is that correct?	FR9. Without the Ameren ActOnEnergy PerformanceSavers in-home audit, would you have purchased [SURVEYMEASURE] that was just as energy-efficient?	FR10. Without having heard of Ameren's ActOnEnergy PerformanceSavers in-home audit, would you have purchased the same amount of [SURVEYMEASURE]?	FR11. With respect to timing, without hearing about Ameren's ActOnEnergy PerformanceSavers in-home audit, would you have purchased the [SURVEYMEASURE]…	FR Score
Yes	Yes	x	x	x	x	x	x	x	x	x	x	100%
Yes	No	Yes	Yes	x	x	x	Yes	x	x	x	x	100%
Yes	No	Yes	Yes	x	x	x	Partial	x	x	x	x	75%
Yes	No	Yes	Yes	x	x	x	No	x	x	x	x	0%
Yes	No	Yes	Yes	x	x	x	Partial	x	x	x	x	75%
Yes	No	Yes	Partial	Yes	Yes	Yes	Yes	x	x	x	x	75%
Yes	No	Yes	Partial	Yes	Yes	Yes	Partial	x	x	x	x	50%
Yes	No	Yes	Partial	Yes	Yes	Yes	No	x	x	x	x	0%
Yes	No	Yes	Partial	Yes	Yes	Partial	Yes	x	x	x	x	50%
Yes	No	Yes	Partial	Yes	Yes	Partial	Partial	x	x	x	x	25%
Yes	No	Yes	Partial	Yes	Yes	Partial	No	x	x	x	x	0%
Yes	No	Yes	Partial	Yes	Yes	No	Yes	x	x	x	x	25%
Yes	No	Yes	Partial	Yes	Yes	No	Partial	x	x	x	x	12.5%
Yes	No	Yes	Partial	Yes	Yes	No	No	x	x	x	x	0%
Yes	No	Yes	Partial	Yes	Partial	Yes	Yes	x	x	x	x	50%
Yes	No	Yes	Partial	Yes	Partial	Yes	Partial	x	x	x	x	25%
Yes	No	Yes	Partial	Yes	Partial	Yes	No	x	x	x	x	0%
Yes	No	Yes	Partial	Yes	Partial	Partial	Yes	x	x	x	x	25%
Yes	No	Yes	Partial	Yes	Partial	Partial	Partial	x	x	x	x	12.5%
Yes	No	Yes	Partial	Yes	Partial	Partial	No	x	x	x	x	0%
Yes	No	Yes	Partial	Yes	Partial	No	Yes	x	x	x	x	12.5%
Yes	No	Yes	Partial	Yes	Partial	No	Partial	x	x	x	x	0%
Yes	No	Yes	Partial	Yes	Partial	No	No	x	x	x	x	0%
Yes	No	Yes	Partial	Yes	No	x	x	x	x	x	x	0%

Each participant free ridership score starts with 100%, which we decrement based on their responses to the 12 questions shown in Table 53.

Table 53: Incented Measure 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	50% 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"
FR11	50% decrement for "No," 25% decrement for "Partial"
FR12	100% decrement for "No," 25% decrement for "Partial"

Below, we illustrate the unique response combinations from applicants answering the Performance Savers online survey (with 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. We calculated free ridership scores for each measure category based on the distribution of scores within the matrix.

Table 54: Frequency of Insulation Incented Measure Free Ridership Scoring Combinations

FR2. Before hearing about Ameren's ActOnEnergy PerformanceSavers in-home audit, were you already planning to purchase [SURVEYMEASURE]?	FR3. Would you have purchased the same type of [SURVEYMEASURE] had you not heard about Ameren's ActOnEnergy PerformanceSavers in-home audit?	FR4. Help me understand, without having heard of Ameren's ActOnEnergy PerformanceSavers in-home audit, would you have purchased a different type of [SURVEYMEASURE], or would you have decided not to purchase at all?	FR5. When you say you would have purchased [SURVEYMEASURE] without having heard of Ameren's ActOnEnergy PerformanceSavers in-home audit, would you have purchased [SURVEYMEASURE] that were just as energy efficient?	FR6. Without having heard of Ameren's ActOnEnergy PerformanceSavers in-home audit, would you have purchased the same amount of [SURVEYMEASURE]?	FR7. Thinking about timing, without hearing of Ameren's ActOnEnergy PerformanceSavers in-home audit, is it most likely that you would have purchased the [SURVEYMEASURE]...	FR8. To confirm, you indicated that without hearing of Ameren's ActOnEnergy PerformanceSavers in-home audit, you would not have purchased your [SURVEYMEASURE] at all, is that correct?	FR9. Without the Ameren ActOnEnergy PerformanceSavers in-home audit, would you have purchased [SURVEYMEASURE] that was just as energy-efficient?	FR10. Without having heard of Ameren's ActOnEnergy PerformanceSavers in-home audit, would you have purchased the same amount of [SURVEYMEASURE]?	FR11. With respect to timing, without hearing about Ameren's ActOnEnergy PerformanceSavers in-home audit, would you have purchased the [SURVEYMEASURE]...	FR Score	Frequency
Yes	Yes	x	x	x	Yes	x	x	x	x	100%	1
No	Yes	x	x	x	Yes	x	x	x	x	50%	1
No	Yes	x	x	x	Partial	x	x	x	x	25%	2
No	No	No	x	x	x	No	x	x	x	0%	6
No	No	Yes	No	x	x	x	x	x	x	0%	1
No	No	No	No	x	x	x	x	x	x	0%	2
No	Partial	Yes	No	x	x	x	x	x	x	0%	1
No	Yes	x	x	x	No	x	x	x	x	0%	2
Yes	Yes	x	x	x	No	x	x	x	x	0%	3

Table 55: Frequency of Windows Incented Measure Free Ridership Scoring Combinations

FR1. Had you already purchased your new [SURVEYMEASURE] before hearing about Ameren's ActOnEnergy PerformanceSavers in-home audit?	FR1a. To confirm, you purchased your new [SURVEYMEASURE] and then found out about Ameren's ActOnEnergy PerformanceSavers in-home audits, is that correct?	FR2. Before hearing about Ameren's ActOnEnergy PerformanceSavers in-home audit, were you already planning to purchase [SURVEYMEASURE]?	FR3. Would you have purchased the same type of [SURVEYMEASURE] had you not heard about Ameren's ActOnEnergy PerformanceSavers in-home audit?	FR4. Help me understand, without having heard of Ameren's ActOnEnergy PerformanceSavers in-home audit, would you have purchased a different type of [SURVEYMEASURE], or would you have decided not to purchase at all?	FR5. When you say you would have purchased [SURVEYMEASURE] without having heard of Ameren's ActOnEnergy PerformanceSavers in-home audit, would you have purchased [SURVEYMEASURE] that were just as energy efficient?	FR6. Without having heard of Ameren's ActOnEnergy PerformanceSavers in-home audit, would you have purchased the same amount of [SURVEYMEASURE]?	FR7. Thinking about timing, without hearing of Ameren's ActOnEnergy PerformanceSavers in-home audit, is it most likely that you would have purchased the [SURVEYMEASURE]…	FR8. To confirm, you indicated that without hearing of Ameren's ActOnEnergy PerformanceSavers in-home audit, you would not have purchased your [SURVEYMEASURE] at all, is that correct?	FR9. Without the Ameren ActOnEnergy PerformanceSavers in-home audit, would you have purchased [SURVEYMEASURE] that was just as energy-efficient?	FR10. Without having heard of Ameren's ActOnEnergy PerformanceSavers in-home audit, would you have purchased the same amount of [SURVEYMEASURE]?	FR11. With respect to timing, without hearing about Ameren's ActOnEnergy PerformanceSavers in-home audit, would you have purchased the [SURVEYMEASURE]…	FR Score	Frequency
No	No	x	Yes	Yes	x	x	x	Yes	x	x	x	100%	3
No	No	x	Yes	No	Partial	x	x	x	x	x	x	0%	1
No	No	x	No	Yes	x	x	x	No	x	x	x	0%	1
No	x	Yes	No	No	x	x	x	No	x	x	x	0%	1
No	x	Yes	Yes	No	x	x	x	No	x	x	x	0%	2

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Appendix F. Participant Survey Instruments

Participant Survey – Home Energy Analysis

Hello, I'm [INSERT NAME on behalf of Ameren Missouri.

May I speak with [CONTACT NAME]?

1. Yes- continue
2. No - [If contact is not available, schedule a time to call back].
3. Refused - thank and terminate]

[Once contact is reached] Hello, my name is _____ and I'm calling on behalf of Ameren Missouri. I am calling to ask some questions about your household's participation in Ameren Missouri's program where you received a home energy analysis.

All your answers are confidential. Are you the correct person to speak to about this?

1. Yes - Continue
2. No - [IF NO, ASK FOR CORRECT PERSON]
3. Refused – thank and terminate

[IF NEEDED] If you have any questions, you may contact Laureen Welikson with Ameren at (314) 206-0201.

Screener

1. **Our records show that you participated in Ameren's Home Energy Analysis Program through which you received an in-home energy analysis, is that correct?**
   1. Yes - Continue
   2. No - thank and terminate
   3. Refused – thank and terminate

Program Awareness

1. **How did you first learn about Ameren's home energy analysis program?**

   a) Ameren website
   b) Bill insert
   c) Program mailer
   d) Billboard
   e) Contractor
   f) Family, friend, co-worker
   g) Online research

h) Radio
i) Other. Please specify: ____
j) DON'T KNOW **[DO NOT READ]**
k) REFUSED **[DO NOT READ]**

2. What was the primary reason for your participation in the program [DO NOT READ]?

a) To replace broken equipment
b) To replace aging equipment
c) To improve the comfort of my home
d) To save money on energy costs
e) To help the environment
f) To learn more about your home's energy efficiency
g) Other. Please specify: _____
h) DON'T KNOW **[DO NOT READ]**
i) REFUSED **[DO NOT READ]**

3. You received an energy analysis report on the energy usage in your home and the opportunities to save energy. Was the information in the report very easy to understand, somewhat easy to understand, not too easy to understand, not at all easy to understand?

a) Very easy to understand
b) Somewhat easy to understand
c) Not too easy to understand
d) Not at all easy to understand
e) Did not receive a report
f) DON'T KNOW **[DO NOT READ]**
g) REFUSED **[DO NOT READ]**

4. [If 3 **= c or d]** How could the information be made more understandable? **[Record response]**

5. Did the auditor provide you with any written information about the home energy analysis program or other energy efficiency programs being offered by Ameren Missouri? [Probe about other program or measure recommendations]

a) Tear sheet on ActOnEnergy programs
b) Other, please describe:_____
c) No written information provided
d) DON'T KNOW **[DO NOT READ]**
e) REFUSED **[DO NOT READ]**

Direct Install NTG questions

Now we would like to ask you some questions about the free energy saving products that were installed in your home by the auditor.

AERATORS [ASK 6-11 IF DIRECT-INSTALL ON CUSTOMER LIST = Low Flow Faucet Aerator]

6. **Our records indicate you had [INSERT NUMBER FROM CUSTOMER LIST] high efficiency faucet aerators installed, which are designed to save energy and water at your sinks, is that correct?**
   a) Yes
   b) No
   c) DON'T KNOW **[DO NOT READ]- Skip to 7**
   d) REFUSED **[DO NOT READ]- Skip to 7**

6.1 [ASK IF 6 = B-No] How many aerators were installed? **[Record response]**
   a) _____ enter number
   b) Don't Know -Skip to 9
   c) Refused - Skip to 9

7. **How many of the high efficiency aerators installed by the auditor are still installed?**
   a) _____ enter number
   b) None **Skip to 8.1**
   c) Don't Know - Skip to 9
   d) Refused – Skip to 9

8.1 [If 7<6 **OR 7< 6.1]** Why did you remove the aerators? [Record response]
8.2 **[If** 7>6 **OR 7> 6.1]** Why did you install additional aerators? [Record response]

9 **How many high efficiency faucet aerators were you already using in your home, if any, before you received the before you received the home in-home analysis?**

a) _____ enter number

b) None
c) DON'T KNOW **[DO NOT READ]**
d) REFUSED **[DO NOT READ]**

10. **How many <u>high efficiency</u> faucet aerators, if any, were you already planning to purchase prior to having the home in-home analysis?**
    a)_____ enter number
    b) None
    c) DON'T KNOW **[DO NOT READ]**
    d) REFUSED **[DO NOT READ]**

[IF 10= b or c or d, SKIP TO 12]

11. And, when would you have purchased those high efficiency faucet aerators on your own, would it be…

a. At roughly the same time
b. Within a few months
c. Within a year
d. More than a year **[DO NOT READ]**
e. DON'T KNOW **[DO NOT READ]**
f. REFUSED **[DO NOT READ]**

SHOWERHEADS [ASK 12-17 IF DIRECT-INSTALL ON CUSTOMER LIST = Low Flow Showerhead]

12. Our records indicate you had [INSERT NUMBER FROM CUSTOMER LIST] high efficiency showerheads installed, which are designed to save energy and water in your showers, is that correct?

a. Yes
b. No
c. DON'T KNOW **[DO NOT READ] Skip to 13**
d. REFUSED **[DO NOT READ] Skip to 13**

12.1 **[IF 12=b]** How many high efficient showerheads were installed?

c) ____ enter number
d) Don't Know **Skip to 15**
e) Refused **Skip to 15**

13. How many of the high efficiency showerheads installed by the auditor are still installed?

a. **____** enter number

b. None **Skip to 14.1**
c. DON'T KNOW **[DO NOT READ] Skip to 15**
d. REFUSED **[DO NOT READ] Skip to 15**

14.1 [If 0<12 OR 13<12]Why did you remove the high efficiency showerhead? [Record Response]

14.2 [If 0>12 OR 13>12.1] Why did you install additional high efficiency showerheads? [Record response]

15 How many high efficiency showerheads were you already using in your home, if any, before you received the in-home analysis?

a. _____ enter number
b. None
c. DON'T KNOW **[DO NOT READ]**
d. REFUSED **[DO NOT READ]**

16. **How many high efficiency showerheads, if any, were you already planning to purchase prior to having the in-home analysis?** ***[NTG]***

a. _____ enter number
b. None
c. Don't Know
d. Refused

[IF 16= b or c or d, SKIP TO 18]

17. **And, when would you have purchased those high efficiency showerheads on your own, would it be…*[NTG]***

a. At roughly the same time
b. Within a few months
c. Within a year
d. More than a year **[DO NOT READ]**
e. DON'T KNOW **[DO NOT READ]**
f. REFUSED **[DO NOT READ]**

CFL [ASK 18-26 IF DIRECT-INSTALL ON CUSTOMER LIST = CFL 13W, CFL 18W, CFL 23W, CFL High Wattage, CFL Reflector, CFL Specialty Bulb]

18. **Our records indicate you had [INSERT SUMMATION OF ALL CFLS FROM CUSTOMER LIST] ENERGY STAR® certified CFL light bulbs installed, is that correct?**

a. Yes
b. No
c. DON'T KNOW [DO NOT READ] Skip to 19
d. REFUSED [DO NOT READ] Skip to 19

18.1 **[IF 18=b]** How many CFLs were installed?

a. ___enter number
b. None Skip to 21
c. [DNR] Don't Know Skip to 21
d. [DNR] Refused Skip to 21

19. **How many of the CFLs installed by the auditor are still installed?**

a)_____ enter number
b) None Skip to 20.1
c) Don't Know (DO NOT READ) Skip to 21

d) Refused (DO NOT READ) Skip to 21

20.1 [If 19<18 **OR 19 <**0**] Why did you remove some of the installed bulbs? [Record response]**

20.2 [If 19>18 OR 19>18.1**] Why did you install additional bulbs? [Record response]**

21 How many of the CFLs currently installed are in the :

___ a. Living room
___ b. Bedroom
___ c. Kitchen
___ d. Bathroom
___ e. Den
___ f. Garage
___ g. Hallway
___ h. Basement
___ i. Outdoors
___ j. Other location
k. [DNR] Don't Know

NOTE COMMENT: WE <u>SHOULD NOT</u> BE FORCING THE SUM TO MATCH –
CHECK <u>THAT</u> SUM OF 21.1 adds up to response in 19 or 19.1, and if not, probe for where remaining CFLs are located]

22. How many of the CFLs currently installed replaced

___ a. Incandescent or the traditional light bulb type?
____ b. Existing CFLs?
___ c. Another type of fluorescent light bulbs?
d. [DNR] Don't Know

22.1 [IF SUM of 0a AND 22b AND 22c < 19**]** How many replaced another light bulb type?

___ a. enter number
b.[DNR] Don't Know Skip to 23
c.[DNR] Refused Skip to 23

22.2 [If 22.1 response a >0] What other kind of light bulb type did you replace?

NOTE COMMENT: WE <u>SHOULD NOT</u> BE FORCING THE SUM TO MATCH –

CHECK TO MAKE SUM OF 0**2 and 22.1 add up to Q19 and if not probe for what remaining CFLs replaced]**

23. How many CFLs were installed in your home, if any, before the home energy analysis?

a. ___ enter number

b None

c. [DNR] Don't Know

d. [DNR] Refused

24. If you had not received free CFLs during the in-home analysis, how many CFLs, if any, do you think you would you have bought on your own within the next year? ***[NTG]***

____ a. enter number

b None

c DON'T KNOW **[DO NOT READ]**

d REFUSED **[DO NOT READ]**

[IF 234 = b or c or d SKIP to 26]

25. And, when would you have purchased those CFLs on your own, would it be…*[NTG]*

a. At roughly the same time
b. Within a few months
c. Within a year
d. More than a year **[DO NOT READ]**
e. DON'T KNOW **[DO NOT READ]**
f. REFUSED **[DO NOT READ]**

26. Will you describe in your own words how the in-home analysis affected how you purchase and use CFLs. [RECORD VERBATIM] _____ ***[NTG]***

LEDs [ASK 27-35 IF DIRECT-INSTALL ON CUSTOMER LIST = LED 10.5W Downlight, LED 12W Dimmable, LED 15W Flood, LED 18W Flood, LED 8W Globe]

27. Our records indicate you had [INSERT SUMMATION OF ALL LEDS FROM CUSTOMER LIST] ENERGY STAR® certified LED light bulbs installed, is that correct?

a. Yes
b. No
c. DON'T KNOW **[DO NOT READ] Skip to 28**
d. REFUSED **[DO NOT READ] Skip to 28**

27.1 [If 27 = b] How many LEDs were installed?

___ a) Record number

b) None Skip to 30

c) [DNR] **Don't Know Skip to 30**

d) [DNR] Refused Skip to 30

28. How many of the LEDs installed by the auditor are still installed?

___a) Record response

b) None Skip to 29.1

c) [DNR] Don't Know Skip to 30

d) [DNR] Refused Skip to 30

29.1 [If 288<277 OR Error! Reference source not found.] Why did you remove some of the installed bulbs?

29.2 [If 288>277 OR 27.1] Why did you install additional bulbs?

30. How many of the LEDs currently installed are in the :

a. Living room ___
b. Bedroom ___
c. Kitchen ___
d. Bathroom ___
e. Den ___
f. Garage ___
g. Hallway ___
h. Basement ___
i. Outdoors___
j. Other area ___
k. [DNR] Don't Know

NOTE COMMENT: WE SHOULD NOT BE FORCING THE SUM TO MATCH
CHECK THAT SUM OF Error! Reference source not found.0 adds up to response in 28 or 28.1, and if not, probe for where remaining LEDs are located]

31. .How many of the LEDs currently installed replaced:

___a. Incandescent or the traditional light bulb type?
___ b. A CFL?
___ c. Another type of fluorescent light bulbs?

31.1 [IF SUM of 31 a AND 31b AND 31c < q28] How many replaced another light bulb type?

a. enter number
b. Don't know Skip to 32
c. Refused Skip to 32

31.2 [If 31.1 response a >0]What kind of light bulb did you replace?

NOTE COMMENT: WE SHOULD NOT BE FORCING THE SUM TO MATCH –

[CHECK TO MAKE SUM OF 31 a,b,c and 31.1 responses add up to 28 and if not probe for what remaining LEDs replaced]

32. How many LEDs were installed in your home, if any, before the analysis?

___A. RECORD NUMBER

B. NONE

C. DON'T KNOW

D. REFUSED

33. If you had not received free LEDs during the in-home analysis, how many LEDs, if any, would you have bought on your own within the next year? *[NTG]*

___ a. ENTER NUMBER
b. None
c. Don't know
d. Refused

[IF 33= b or c or d SKIP TO 05]

34. And, when would you have purchased those LEDs on your own, would it be…*[NTG]*

a. At roughly the same time
b. Within a few months
c. Within a year
d. [DNR] More than a year
e. [DNR] (Don't know)
f. [DNR] (Refused)

35. **Will you describe in your own words how the in-home analysis affected your purchase and use of LEDs. [RECORD VERBATIM] _____ *[NTG]***

WATER HEATER TEMPERATURE SET BACK [ASK 36-37 IF DIRECT-INSTALL ON CUSTOMER LIST = Water Heater, Thermostat Setback]

36. Our records indicate you had your water heater temperature set back, is that correct?

a. Yes
b. No
c. DON'T KNOW **[DO NOT READ]**

d. REFUSED **[DO NOT READ]**

37. **[IF 36 =YES] Are those temperature settings made by the auditor still in place?**
    a. Yes
    b. No
    c. DON'T KNOW **[DO NOT READ]**
    d. REFUSED **[DO NOT READ]**

    37.1 [If 37 =b], Why did you change the temperature settings made by the auditor? [Record response]

PIPE WRAP [ASK 38-44 IF DIRECT-INSTALL ON CUSTOMER LIST = Pipe Wrap (10 LF)]

38. Our records indicate you had pipe wrap installed around your water heater piping, is that correct?
    a. Yes
    b. No
    c. DON'T KNOW **[DO NOT READ]**
    d. REFUSED **[DO NOT READ]**

39. **[If 38 =a], Approximately how many feet of piping was covered with insulation?**

    a. **[Record response]**
    b. **Don't Know**
    c. **Refused**

40. **[If 38 =a], Is the pipe wrap still in place?**
    a. Yes
    b. No
    c. DON'T KNOW **[DO NOT READ]**
    d. REFUSED **[DO NOT READ]**
    e.

41. **[If 40 =No], Please explain why you removed the pipe wrap. [Record response]**

42. **Did you already have pipe wrap installed before you received the in-home analysis? *[NTG]***

    a. Yes
    b. No
    c. DON'T KNOW **[DO NOT READ]**
    d. REFUSED **[DO NOT READ]**

43. **Approximately how many feet of pipe wrap, if any, would you have purchased if you had not received the free pipe wrap during the in-home analysis? *[NTG]***
    a. [Record #]
    b. None
    c. DON'T KNOW **[DO NOT READ]**

d. REFUSED **[DO NOT READ]**

[IF 43 = b or c or d, SKIP TO 45]

44. **And, when would you have purchased the pipe wrap on your own, would it be…*[NTG]***
    a. At roughly the same time
    b. Within a few months
    c. Within a year
    d. More than a year **[DO NOT READ]**
    e. DON'T KNOW **[DO NOT READ]**
    f. REFUSED **[DO NOT READ]**

45. **Which of the following energy efficient upgrades did the auditor recommend to be installed?**

    45.1 Attic Insulation Yes/No/Don't Know/ Refused
    45.2 Air Sealing Yes/No/Don't Know/Refused
    45.3 Windows Yes/No /Don't Know /Refused
    45.4 Any Other ? Yes/No/Don't Know /Refused

    45.4a [IF 45.4 = yes] What other upgrade? Specify_____)

    SKIP TO SO1 IF 45.1 = No OR Don't Know OR refused
    AND 45.2 = No OR Don't Know OR refused
    AND 45.3 = No OR Don't Know OR refused
    AND 45.4 = No OR Don't Know OR refused

46. [If 45.1 **OR 45.2 OR 45.3 OR 45.4 = Yes] Have you completed any upgrades recommended by the auditor?**
    a. Yes
    b. No **[Skip to Question 49]**
    c. DON'T KNOW **[DO NOT READ] [Skip to Q49]**
    d. REFUSED [Skip to Q49]

47. **[If** 46 **= yes] Which upgrades have you completed? [Allow multiple responses]**

    47.1 [Ask if 45.1 = yes] Attic Insulation Yes /No / Don't Know /Refused
    47.2 [Ask if 45.2 = yes] Air Sealing Yes/Know /Don't Know/Refused
    47.3 [Ask if 45.3 = yes] Windows Yes /Know/Don't Know/Refused
    47.4 (Ask if 45.4 = yes][display specify from 45.4a] Yes/Know/Don't Know/Refused

48. **[ASK IF Q47.1 OR 47.2 OR 47.3 OR 47.4 = Yes] Why did you decide to complete these upgrades? [Record Response]**

49. [ASK if [45.1 = Yes AND 47.1 <> YES] OR [45.2=yes AND 47.2 <> yes] OR [45.3 = yes AND 47.3 <> yes] OR [45.4 = yes AND 47.4 <> yes]

Why haven't you completed the other recommended upgrades [do not read answers; accept multiple responses]?

a. High initial cost
b. Long payback period
c. Don't have time
d. Too difficult to get measure installed
e. Perceived lower quality measure due to heightened efficiency
f. Other, please describe
g. DON'T KNOW **[DO NOT READ]**
h. REFUSED **[DO NOT READ]**

50. [Ask if [45.1= Yes AND 47.1 <> YES] OR [45.2=yes AND 47.2 <> yes] OR [45.3 = yes AND 47.3 <> yes] OR [45.4 = yes AND 47.4 <> yes]

Do you plan to install the remaining recommended upgrades?

a. Yes
b. No
c. DON'T KNOW **[DO NOT READ]**
d. REFUSED **[DO NOT READ]**

51.[Ask if 50 = Yes] Which of the remaining upgrades do you plan to install?

1. [Display if 45.1 = yes AND 47.1 <> yes] Attic Insulation
2. [Display if 45.2 =yes AND 47.2 <> yes] Air Sealing
3. [Display if 45.3 = yes AND 47.3 <> Yes] Windows
4. [Display if 45.4 = yes AND 47.4 <> yes] Other upgrades

51.1 **[If 51 = response 1] What is your timeframe for installing Attic Insulation?**

a. Within the year
b. Within next year
c. Other _specify _____
d. DON'T KNOW **[DO NOT READ]**
e. REFUSED **[DO NOT READ]**

51.2 **[If 51 = response 2] What is your timeframe for installing Air Sealing?**

a. Within the year
b. Within next year
c. Other _specify _____
d. DON'T KNOW **[DO NOT READ]**
e. REFUSED **[DO NOT READ]**

51.3 **[If** 51 **= response 3] What is your timeframe for installing Windows?**

a. Within the year

b. Within next year
c. Other _specify _____
d. DON'T KNOW **[DO NOT READ]**
e. REFUSED **[DO NOT READ]**

51.4 **[If** 51 **= response 4] What is your timeframe for installing the other upgrades?**
a. Within the year
b. Within next year
c. Other _specify _____
d. DON'T KNOW **[DO NOT READ]**
e. REFUSED **[DO NOT READ]**

52. ASK **[If 45.1 = yes AND 47.1 <>yes] AND [45.2 = yes AND 47.2 <> yes] AND [45.3 = yes AND 47.3 <> yes] AND [45.4 = yes AND 47.4 <> yes]**
Why haven't you completed any of the upgrades [DO NOT READ]?
a. High initial cost
b. Long payback period
c. Don't have time
d.Too difficult to get measure installed
e.Perceived lower quality measure due to heightened efficiency
f.Other, please describe
g.DON'T KNOW **[DO NOT READ]**
h.REFUSED **[DO NOT READ]**

53. ASK **[If 45.1 = yes AND 47.1 <>yes] AND [45.2 = yes AND 47.2 <> yes] AND [45.3 = yes AND 47.3 <> yes] AND [45.4 = yes AND 47.4 <> yes]**
Do you plan to install any of the recommended upgrades?
a. Yes
b. No
c. DON'T KNOW **[DO NOT READ]**
d. REFUSED **[DO NOT READ]**

54. **[If 53 =a] What is your timeframe for installing the recommended upgrades?**
a. Within the year?
b. Within next year
c. Other_____
d. DON'T KNOW **[DO NOT READ]**
e. REFUSED **[DO NOT READ]**

55. **[If** 533 **=a] Which upgrades do you plan to install?**
55.1 [IF 45.1 = yes AND 47.1 <> yes] **Attic Insulation** yes/no/DK/Refused
55.2 [IF 45.2 = yes AND 47.2 <> yes] **Air Sealing** yes/no/DK /refused
55.3 [IF 45.3 = yes AND 47.3 <> yes]**Window** yes/no/DK/ refused
55.4 [IF 45.4 = yes AND 47.4 <> yes] **Other upgrades** yes/no/DK/refused

56 [If 47.3 = yes] How many windows did you replace? [Record response]

57 [IF 47.3 = yes] What is the approximate size of each window? [if exact value unknown, ask participant to estimate the dimensions of each window replaced, for example, 3 feet by 5 feet]

[Open End] Record Response- probe for each window size replaced

NTG Questions for Major Measures

Windows / Ceiling Insulation Incented Measure Freeridership Questions

[If installed windows and insulation, run through FR1 to FR12, twice, once while referring to each measure]

[If 47.1 = yes ELSE SKIP TO FR1.W INTRO] Now I am going to ask you about the **[ATTIC INSULATION]** for which you received an incentive from Ameren.

FR1.I [IF Q47.1 = yes] Had you already purchased your new *[ATTIC INSULATION]* before hearing about Ameren's in-home analysis?

57.1 (Yes)
57.2 (No) **[SKIP TO 0.I]**
57.3 DON'T KNOW **[DO NOT READ] [SKIP TO 0.I]**
57.4 REFUSED **[DO NOT READ] [SKIP TO 0.I]**

FR1a.I To confirm, you purchased your new *[ATTIC INSULATION]* and *then* found out about Ameren's in-home analysis, is that correct?

a) (Yes, that's correct) **[SKIP TO FR12.I]**
b) (No, that's not correct)
c) DON'T KNOW **[DO NOT READ]**
d) REFUSED **[DO NOT READ]**

FR2.I Before hearing about Ameren's in-home analysis, were you already planning to purchase *[ATTIC INSULATION]?*

a) (Yes)
b) (No)
c) DON'T KNOW **[DO NOT READ]**
d) REFUSED **[DO NOT READ]**

FR3.I Would you have purchased the same type of *[ATTIC INSULATION]* at the full price had you not heard about Ameren's in-home analysis?

a) (Yes) [SKIP TO 0.I]
b) (No)
c) DON'T KNOW **[DO NOT READ]**
d) REFUSED **[DO NOT READ]**

FR4.I Help me understand, without having heard of Ameren's in-home analysis, would you have purchased a different type of *[ATTIC INSULATION],* or would you have decided not to purchase at all?

a) (I would have purchased a different type) **[Continue]**

b) (I would not have purchased at all) **[SKIP TO 0.I]**
c) DON'T KNOW **[SKIP TO FR12.I]**
d) REFUSED **[SKIP TO FR12.I]**

100% FREERIDER PATH

FR5.I When you say you would have purchased *[ATTIC INSULATION]* without having heard of Ameren's in-home analysis, would you have purchased *"INSULATION WITH THE SAME R VALUE OR THICKNESS",* at the regular price?

a) (Yes)
b) (No)
c) DON'T KNOW **[DO NOT READ]**
d) REFUSED **[DO NOT READ]**

FR6.I Without having heard of Ameren's in-home analysis, would you have purchased the same amount of *[ATTIC INSULATION]* ?

a) (Yes, I would have purchased same amount)
b) (No, I would have purchased less)
c) DON'T KNOW **[DO NOT READ]**
d) REFUSED **[DO NOT READ]**

FR7.I Thinking about timing, without hearing of Ameren's in-home analysis, is it most likely that you would have purchased the *[ATTIC INSULATION]…[*READ LIST]

a) At the same time
b) Within the same year
c) One to two years out
d) More than two years out
e) Never
f) DON'T KNOW **[DO NOT READ]**
g) REFUSED **[DO NOT READ]**

[SKIP TO FR12]

PARTIAL FREE RIDER PATH

FR8.I To confirm, you indicated that *without* hearing of in-home analysis, you would not have purchased your *[ATTIC INSULATION]* at all, is that correct?

a) (Yes) **[SKIP TO FR12.I]**
b) (No)
c) DON'T KNOW **[DON'T READ]**
d) REFUSED **[DON'T READ]**

FR9.I **Without the Ameren in-home analysis, would you have purchased *"INSULATION WITH THE SAME R VALUE OR THICKNESS",* at the regular price?**

a) (Yes)
b) (No)
c) DON'T KNOW **[DON'T READ]**
d) REFUSED **[DON'T READ]**

FR10.I Without having heard of Ameren's in-home analysis, would you have purchased the same amount of *[ATTIC INSULATION]* ?

a) (Yes, I would have purchased same amount)
b) (No, I would have purchased less)
c) DON'T KNOW **[DON'T READ]**
d) REFUSED **[DON'T READ]**

FR11.I With respect to timing, without hearing about Ameren's in-home analysis, would you have purchased the *[ATTIC INSULATION]…*

a) At the same time
b) Within the same year
c) One to two years out
d) More than two years out
e) Never
f) DON'T KNOW **[DON'T READ]**
g) REFUSED **[DON'T READ]**

FR12.I **Will you describe in your own words on the in-home analysis affected your decision to purchase the [ATTIC INSULATION] [RECORD VERBATIM]** _____

[If 47.3 = yes , ELSE SKIP TO AS1] Now I am going to ask you about the **[WINDOWS]** for which you received an incentive from Ameren.

FR1.W [IF Q47.3 = yes] Had you already purchased your new *[WINDOWS]* before hearing about Ameren's in-home analysis?

a (Yes)
b. (No) **[SKIP TO 0**.W**]**
c. DON'T KNOW **[DO NOT READ] [SKIP TO 0**.W**]**
d. REFUSED **[DO NOT READ] [SKIP TO 0**.W**]**

FR1a.W To confirm, you purchased your new *[WINDOWS]* and *then* found out about Ameren's in-home analysis, is that correct?

a. (Yes, that's correct) **[SKIP TO FR12.W]**
b. (No, that's not correct)
c. DON'T KNOW **[DO NOT READ]**
d. REFUSED **[DO NOT READ]**

FR2.W Before hearing about Ameren's in-home analysis, were you already planning to purchase *[WINDOWS]?*

a. (Yes)
b. (No)
c.DON'T KNOW **[DO NOT READ]**
d.REFUSED **[DO NOT READ]**

FR3.W Would you have purchased the same type of *[WINDOWS]* at the full price had you not heard about Ameren's in-home analysis?

a. (Yes) [SKIP TO 0.W]
b. (No)
c. DON'T KNOW **[DO NOT READ]**
d. REFUSED **[DO NOT READ]**

FR4.W Help me understand, without having heard of Ameren's in-home analysis, would you have purchased a different type of *[WINDOWS],* or would you have decided not to purchase at all?

a. (I would have purchased a different type) **[Continue]**
b. (I would not have purchased at all) **[SKIP TO 0**.W**]**
c.DON'T KNOW **[SKIP TO FR12.W]**
d.REFUSED **[SKIP TO FR12.W]**

100% FREERIDER PATH

FR5.W When you say you would have purchased *[WINDOWS]* without having heard of Ameren's in-home analysis, would you have purchased *"WINDOWS that were just as energy efficient"* at the regular price?

a.(Yes)
b.(No)
c.DON'T KNOW **[DO NOT READ]**
d.REFUSED **[DO NOT READ]**

FR6.W Without having heard of Ameren's in-home analysis, would you have purchased the same amount of *[WINDOWS]* ?

A. (Yes, I would have purchased same amount)
B. (No, I would have purchased less)
C. DON'T KNOW **[DO NOT READ]**
D. REFUSED **[DO NOT READ]**

FR7.W Thinking about timing, without hearing of Ameren's in-home analysis, is it most likely that you would have purchased the *[WINDOWS]…[*READ LIST]

57.4.1 At the same time
57.4.2 Within the same year
57.4.3 One to two years out
57.4.4 More than two years out
57.4.5 Never
57.4.6 DON'T KNOW **[DO NOT READ]**
57.4.7 REFUSED **[DO NOT READ]**

[SKIP TO FR12.W]

PARTIAL FREE RIDER PATH

FR8.W To confirm, you indicated that *without* hearing of in-home analysis, you would not have purchased your *[WINDOWS]* at all, is that correct?

A. (Yes) [**SKIP TO FR12.W]**
B. (No)
C. DON'T KNOW **[DON'T READ]**
D. REFUSED **[DON'T READ]**

***FR9 .W W*ithout the Ameren in-home analysis, would you have purchased *"WINDOWS that were just as energy efficient"* at the regular price at the regular price?**

A. (Yes)
B. (No)
C. DON'T KNOW **[DON'T READ]**
D. REFUSED **[DON'T READ]**

FR10.W Without having heard of Ameren's in-home analysis, would you have purchased the same amount of *[WINDOWS]* ?

A. Yes, I would have purchased same amount)
B. (No, I would have purchased less)

C. DON'T KNOW **[DON'T READ]**
D. REFUSED **[DON'T READ]**

FR11.W With respect to timing, without hearing about Ameren's in-home analysis, would you have purchased the *[WINDOWS]…*

h) At the same time
i) Within the same year
j) One to two years out
k) More than two years out
l) Never
m) DON'T KNOW **[DON'T READ]**
n) REFUSED **[DON'T READ]**

FR12.W **Will you describe in your own words how the in-home analysis affected your decision to purchase the [WINDOWS] [RECORD VERBATIM]** _____

Air Sealing Incented Measure Freeridership Questions

AS1. **[ASKI IF Q47.2= YES, ELSE SKIP TO SO1]Had you already had the *[AIR SEALING]* performed before you heard about the in-home analysis?**

a) (Yes)
b) (No) ***[SKIP TO AS2***
c) DON'T KNOW ***[SKIP TO AS2***
d) REFUSED ***[SKIP TO AS2***

AS1a. **To confirm, you had the *[AIR SEALING]* performed and *then* found out about the in-home analysis and rebates, is that correct?**

a) (Yes, that's correct) ***[SKIP TO AS12]***
b) (No, that's not correct)
c) DON'T KNOW ***[DON'T READ]***
d) REFUSED ***[DON'T READ]***

AS2. **Before learning about the Ameren's in-home analysis, were you already planning to have AIR SEALING*]* performed?**

a) (Yes)
b) (No)
c) DON'T KNOW ***[DON'T READ]***
d) REFUSED ***[DON'T READ]***

AS3. **Would you have had *[AIR SEALING]* performed at the regular price had you not heard about the Ameren in-home analysis or the rebate?**

a) (Yes) ***[SKIP TO AS5]***
b) (No)
c) DON'T KNOW ***[DON'T READ]***
d) REFUSED ***[DON'T READ]***

AS4. **Without having heard of Ameren's in-home analysis, would you have had a different level of AIR SEALING performed, or would you have decided not to *HAVE DONE AIR SEALING* at all?**

A. (I would have had a different type of ***[SURVEYMEASURE]***) ***[CONTINUE]***
B. (I would not have purchased at all) ***[SKIP TO AS8]***
C. DON'T KNOW ***[SKIP TO AS12]***
D. REFUSED ***[SKIP TO AS12]***

100% FREERIDER PATH

AS5. **When you say you would have had *[AIR SEALING]* performed without having heard of Ameren's in-home analysis, would you have had the same amount of *[AIR SEALING]* performed?**

a) (Yes)
b) (No)
c) DON'T KNOW ***[DON'T READ]***
d) REFUSED ***[DON'T READ]***

AS7. **Thinking about timing, without hearing about Ameren's in-home, is it most likely that you would have performed the *[AIR SEALING]…[READ LIST]***

a) At the same time
b) Within the same year
c) One to two years out
d) More than two years out
e) Never
f) DON'T KNOW ***[DON'T READ]***
g) REFUSED ***[DON'T READ]***

[SKIP TO AS12]

PARTIAL FREE RIDER PATH

AS8. **To confirm, you indicated that *without* hearing of Ameren's in-home analysis, you would not have had *[AIR SEALING]* performed at all, is that correct?**

a) (Yes) ***[SKIP TO AS12]***
b) (No)
c) DON'T KNOW ***[DON'T READ]***

d) REFUSED ***[DON'T READ]***

AS9. **Without the Ameren in-home analysis, would you have had** the same amount of AIR SEALING **performed?**

a) (Yes)
b) (No)
c) DON'T KNOW ***[DON'T READ]***
d) REFUSED ***[DON'T READ]***

AS10. **Without having heard of Ameren's in-home analysis, would you have purchased the same amount of *[AIR SEALING]*?**

a) (Yes)
b) (No)
c) DON'T KNOW ***[DON'T READ]***

AS11. **With respect to timing, without hearing about Ameren's in-home analysis, would you have performed the *[AIR SEALING]…***

a) At the same time
b) Within the same year
c) One to two years out
d) More than two years out
e) Never
f) DON'T KNOW ***[DON'T READ]***
g) REFUSED ***[DON'T READ]***

AS12. **Will you describe in your own words how the in-home analysis affected your decision to purchase the *[AIR SEALING] [RECORD VERBATIM]*** _____

Spillover Questions

SO1. Did you purchase any other energy-efficient products after you received Ameren's in-home analysis that were not rebated through an Ameren energy efficiency program? This could include things like ENERGY STAR appliances, compact fluorescent light bulbs (CFLs), installing home insulation, etc.

1. Yes
2. No **[SKIP TO NEXT SECTION- SATISFACTION]**

SO2 [ASK IF SO1=1] **Please tell me the additional energy-efficient products that you purchased since receiving the in-home analysis that you did not receive a rebate from Ameren. [DO NOT READ]**

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 water heater
12. ENERGY STAR Central air conditioner
13. ENERGY STAR Air source heat pump
14. Geothermal heat pump
15. Heat pump hot water heater
16. High efficiency showerhead or faucet aerator
17. Gas Furnace
18. Programmable thermostat
19. Installed insulation? [#of Insulation]
20. Installed windows? [# in Square Feet of Windows]
21. Other. ***[SPECIFY VERBATIM]*** _____

SO3. [ASK FOR PRODUCT 1-3; 8- 18 and 21 MENTIONED IN SO2, Do not ask SO3 if SO2 is 4-7]

How many *[INSERT APPLIANCE FROM RESPONSE LIST]* did you purchase?

1. CFLs ___
2. LED light bulbs ___
3. ENERGY STAR light fixtures or ceiling fan ___
4. [Not Asked] ENERGY STAR refrigerator
5. [Not Asked]ENERGY STAR freezer
6. [Not Asked] ENERGY STAR clothes washer
7. [Not Asked] 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 water heater ___
12. ENERGY STAR Central air ___
13. ENERGY STAR Air source heat pump ___
14. Geothermal heat pump ___
15. Heat pump hot water heater ___
16. High efficiency showerhead or faucet aerator ___
17. Gas Furnace ___
18. Programmable thermostat ___

21.Other Product ___

SO3.1 [ASK If SO2= 19 Installed insulation] How much insulation did you install? [OPEN END]

SO3.2 [Ask if SO2= 20 Windows] How many Square Feet of windows did you install? [OPEN END]

SO4. [ASK if SO2=19] **In what location in your home was the insulation installed?**

Location: ___
D. DON'T KNOW

SO5. [ASK FOR EACH PRODUCT MENTIONED IN SO2][SKIP IF SO2=1,2,3,4,5,6,7,9,10,16,18,19]

SO5.8 [ASK IF SO2 =8] **Did you receive or apply for an Ameren Missouri rebate for** the ***Energy Star Air Conditioner?***?

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

SO5.11 [ASK IF SO2 =11] **Did you receive or apply for an Ameren Missouri rebate for** the ***Energy Star Water Heater***?

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

SO5.12 [ASK IF SO2 =12] **Did you receive or apply for an Ameren Missouri rebate for** the ***Energy Star Central Air Conditionerr***?

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

SO5.13 [ASK IF SO2 =13] **Did you receive or apply for an Ameren Missouri rebate for** the ***Energy Star Air Source Heat Pump***?

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

SO5.14 [ASK IF SO2 =14] **Did you receive or apply for an Ameren Missouri rebate for** the ***Geothermal Heat Pump***?

1. Yes
2. No

98. Don't Know
99. Refused

SO5.15 [ASK IF SO2 =15] **Did you receive or apply for an Ameren Missouri rebate for** the ***Heat Pump Hot Water Heater***?

1. Yes
2. No

98. Don't Know
99. Refused

SO5.17 [ASK IF SO2 =17] **Did you receive or apply for an Ameren Missouri rebate for** the ***Gas Furnacer***?

1. Yes
2. No

98. Don't Know
99. Refused

SO5.20 [ASK IF SO2 =20] **Did you receive or apply for an Ameren Missouri rebate for** the ***Installed Windowsr***?

1. Yes
2. No

98. Don't Know
99. Refused

SO5.21 [ASK IF SO2 =21] **Did you receive or apply for an Ameren Missouri rebate for** the other products you installed?

1. Yes
2. No

98. Don't Know
99. Refused

SO6. [ASK FOR EACH PRODUCT MENTIONED IN SO2][SKIP IF SO2=14-19]

SO6.1 [ASK if SO2= 1] Did the *CFLs have an ENERGY STAR label on it*?

1. Yes
2. No

98. Don't Know
99. Refused

SO6.2 [ASK if SO2= 2] Did the LED light Bulbs *have an ENERGY STAR label on it*?

1. Yes
2. No

98. Don't Know
99. Refused

SO6.3 [ASK if SO2= 3 Did the Energy Star Light Fixture or Ceiling Fan *have an ENERGY STAR label on it*?

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

SO6.4 [ASK if SO2= 4] Did the Energy Star Refrigerator *have an ENERGY STAR label on it*?

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

SO6.5 [ASK if SO2= 5] Did the Energy Star Freezer *have an ENERGY STAR label on it*?

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

SO6.6 [ASK if SO2= 6] Did the Energy Star clothes washer *have an ENERGY STAR label on it*?

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

SO6.7 [ASK if SO2= 7] Did the Energy Star dishwasher *have an ENERGY STAR label on it*?

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

SO6.8 [ASK if SO2= 8] Did the *Energy Star room air conditioner have an ENERGY STAR label on it*?

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

SO6.9 [ASK if SO2= 9] Did the Energy Star electronics *have an ENERGY STAR label on it*?

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

SO6.10 [ASK if SO2= 10] Did the Energy Star dehumitifier *have an ENERGY STAR label on it*?

1. Yes
2. No

98. Don't Know
99. Refused

SO6.11 [ASK if SO2= 11] Did the Energy Star water heater *have an ENERGY STAR label on it*?

1. Yes
2. No

98. Don't Know
99. Refused

SO6.12 [ASK if SO2= 12] Did the Energy Star central air conditioner *have an ENERGY STAR label on it*?

1. Yes
2. No

98. Don't Know
99. Refused

SO6.13 [ASK if SO2= 13] Did the Energy Star source heat pump *have an ENERGY STAR label on it*?

1. Yes
2. No

98. Don't Know
99. Refused

SO6.20 [ASK if SO2= 20] Did the installed windows *have an ENERGY STAR label on it*?

1. Yes
2. No

98. Don't Know
99. Refused

SO6.21 [ASK if SO2= 21] Did the other product *have an ENERGY STAR label on it*?

1. Yes
2. No

98. Don't Know
99. Refused

SO7. [ASK FOR EACH PRODUCT MENTIONED IN SO2]

***SO7.*1 [ASK if SO2=1] How important was the fact that you received Ameren's in-home analysis in your decision to purchase *CFLS*? Would you say it was:**

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

98. Don't Know
99. Refused

SO7.2 **[ASK if SO2=2] How important was the fact that you received Ameren's in-home analysis in your decision to purchase** LED light bulbs**? Would you say it was:**

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

98. Don't Know
99. Refused

SO7.3 **[ASK if SO2=3] How important was the fact that you received Ameren's in-home analysis in your decision to purchase** Energy Star light fixtures or ceiling fan**? Would you say it was:**

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

98. Don't Know
99. Refused

SO7.4 **[ASK if SO2 = 4] How important was the fact that you received Ameren's in-home analysis in your decision to purchase** Energy Star refrigerator**? Would you say it was:**

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

98. Don't Know
99. Refused

SO7.5 **[ASK if SO2=5] How important was the fact that you received Ameren's in-home analysis in your decision to purchase** Energy Star freezer**? Would you say it was:**

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

98. Don't Know
99. Refused

SO7.6 **[ASK if SO2=6] How important was the fact that you received Ameren's in-home analysis in your decision to purchase** Energy Star clothes washer**? Would you say it was:**

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

98. Don't Know
99. Refused

SO7.7 **[ASK if SO2=7] How important was the fact that you received Ameren's in-home analysis in your decision to purchase Energy Star dishwasher? Would you say it was:**

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

98. Don't Know
99. Refused

SO7.**8 [ASK if SO2=8] How important was the fact that you received Ameren's in-home analysis in your decision to purchase** Energy Star room air conditioner**? Would you say it was:**

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

98. Don't Know
99. Refused

SO7.9 **[ASK if SO2=9] How important was the fact that you received Ameren's in-home analysis in your decision to purchase** Energy Star electronics**? Would you say it was:**

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

98. Don't Know
99. Refused

SO7.**10 [ASK if SO2=10] How important was the fact that you received Ameren's in-home analysis in your decision to purchase** Energy Star dehumitifier**? Would you say it was:**

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

98. Don't Know
99. Refused

SO7.**11 [ASK if SO2=11] How important was the fact that you received Ameren's in-home analysis in your decision to purchase** Energy Star water heater**? Would you say it was:**

1. Important

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

98. Don't Know
99. Refused

***SO7.*12 [ASK if SO2=12] How important was the fact that you received Ameren's in-home analysis in your decision to purchase** Energy Star central air conditioner**? Would you say it was:**

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

98. Don't Know
99. Refused

***SO7.*13 [ASK if SO2=13] How important was the fact that you received Ameren's in-home analysis in your decision to purchase** Energy Star air source heat pump**? Would you say it was:**

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

98. Don't Know
99. Refused

***SO7.*14 [ASK if SO2=14] How important was the fact that you received Ameren's in-home analysis in your decision to purchase** Geothermal heat pump**? Would you say it was:**

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

98. Don't Know
99. Refused

***SO7.*15[ASK if SO2=15] How important was the fact that you received Ameren's in-home analysis in your decision to purchase** Heat pump hot water heater**? Would you say it was:**

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

98. Don't Know
99. Refused

***SO7.*16 [ASK if SO2=16] How important was the fact that you received Ameren's in-home analysis in your decision to purchase** High efficiency showerhead or faucet aerator**? Would you say it was:**

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

98. Don't Know
99. Refused

***SO7.*17 [ASK if SO2=17] How important was the fact that you received Ameren's in-home analysis in your decision to purchase** Gas furnace**? Would you say it was:**

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

98. Don't Know
99. Refused

***SO7.*18 [ASK if SO2=18] How important was the fact that you received Ameren's in-home analysis in your decision to purchase** Programmable thermostat**? Would you say it was:**

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

98. Don't Know
99. Refused

***SO7.*19 [ASK if SO2=19] How important was the fact that you received Ameren's in-home analysis in your decision to purchase** insulation**? Would you say it was:**

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

98. Don't Know
99. Refused

***SO7.20* [ASK if SO2=20] How important was the fact that you received Ameren's in-home analysis in your decision to purchase** windows**? Would you say it was:**

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

4. Not important
98. Don't Know
99. Refused

SO7.21 **[ASK if SO2=21] How important was the fact that you received Ameren's in-home analysis in your decision to purchase** other products**? Would you say it was:**

1. Important
2. Somewhat Important
3. Not too Important
4. Not important
98. Don't Know
99. Refused

Satisfaction

Now I'd like to ask you a few questions about your satisfaction with the program

80. Thinking about your overall experiences with Ameren Missouri as your utility, how satisfied would you say you are with Ameren Missouri?

a) Very satisfied
b) Somewhat satisfied
c) Not too satisfied
d) Not at all satisfied
e) [DNR] Don't Know
f) [DNR] Refused

81. [If 80 = c or d] Why did you give this rating?

82. Please tell me if you were very satisfied, somewhat satisfied, not too satisfied, or not at all satisfied with the following aspects of Ameren's energy analysis program…? (request explanation for any rating of 'not too satisfied' or 'not satisfied at all)

a) The information provided on Ameren's website (if applicable)
b) Communication with Ameren and/or the program employees
c) The variety of products that are eligible for rebates from the program
d) The auditor who provided the analysis and direct install measures
e) **[ASK IF 44= a or b or c]** the contractor who installed the upgrades

1. very satisified
2. somewhat satisfied
3. not too satisfied
4. not at all satisfied
5. Don't know
6. Refused

82.1 Why do you say that you are not too or not at all satisfied with:

a) [Ask if 82a = 3,4]The information provided on Ameren's website (if applicable) **Open End**
b) [Ask if 82b = 3,4]Communication with Ameren and/or the program employees **Open End**
c) [Ask if 82c = 3,4]The variety of products that are eligible for rebates from the program **Open End**
d) [Ask if 82d = 3,4]The contractor who provided the analysis and direct install measures **Open End**
e) [Ask if 82e = 3,4] the contractor who installed the upgrades **Open End**

81. In your opinion, why do you think some people would not take advantage of this program from Ameren? [Do not Read, multiple responses okay]

a) Initial analysis cost is too high
b) Rebate amounts are too low/installation cost too high
c) No time to look into it
d) Don't want anyone in their home
e) Other (Specify) _____
f) DON'T KNOW **[DO NOT READ]**
g) REFUSED **[DO NOT READ]**

82. Is there anything Ameren could improve about the program? [Do not Read, multiple responses okay]

a) Lower analysis cost
b) Provide clearer information about available rebates
c) Give larger incentives/rebate amounts
d) Increase awareness of all rebates available
e) Offer more rebated measures
f) Create a more user-friendly website
g) No, no improvements needed
h) Other (Specify)
i) DON'T KNOW **[DO NOT READ]**
j) REFUSED **[DO NOT READ]**

83. Would you recommend this program to a friend or neighbor?

a) Yes, Why?
b) No, Why? _____
c) DON'T KNOW **[DO NOT READ]**
d) REFUSED **[DO NOT READ]**

84. Generally speaking, how satisfied are you with your experience as an Ameren Missouri customer overall? Would you say…

a) Very satisfied,
b) Somewhat satisfied,
c) Not very satisfied, or
d) Not at all satisfied
e) DON'T KNOW **[DO NOT READ]**
f) REFUSED **[DO NOT READ]**

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

a) Increased,
b) Stayed about the same, or
c) Decreased?
d) DON'T KNOW **[DO NOT READ]**
e) REFUSED **[DO NOT READ]**

THANK RESPONDENT FOR THEIR TIME