Ameren Missouri Home Energy Analysis Program Impact and Process Evaluation: Program Year 2014

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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 2014 (PY14), the period from January 1, 2014, through December 31, 2014.

Program Description

Ameren Missouri added the HEA pilot program to the residential ActOnEnergy® portfolio in 2013. In PY14, Ameren Missouri changed the name of the program from PerformanceSavers (used in PY13) to the Home Energy Analysis program.This program's design seeks to encourage residents of single-family homes to reduce energy consumption by making improvements to the following: weatherization, lighting, HVAC, and water heating appliances fueled by natural gas.

The program provides direct install energy-efficient measures at no cost to participants and offers 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 receiving electricity and natural gas from Ameren Missouri are eligible to participate, the program requires participants to pay $25 for an in-home energy audit.

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

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

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

Key Impact Evaluation Findings

In PY14, the HEA program completed 959 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 technical resource manual (TRM).

We determined the program achieved an overall electric measures realization rate of 63.0%. Similarly to evaluated findings in 2013, the PY14 evaluation revealed a lower-than-expected realization rate for windows (27.2%), which negatively impacted the electric realization rate. However, a high realization rate for ceiling insulation (138.6%) offset the impacts of the window realization rate. For natural gas measures, we determined an overall realization rate of 78.3%. The evaluation revealed this realization

rate was reduced by lower-than-expected rates for high-efficiency aerators (27.3%) and windows (57.7%). However, greater-than-expected average savings for ceiling insulation (107.2%) and hot water pipe wrap (128.4%) offset these low values.

Table 1: PY14 Participation and *Ex Post* Program Gross Savings

Measure	PY14 Participation	*Ex Post* Per-Unit Savings	Realization Rate	Total *Ex Post* Savings
Electric Measures (kWh/year)				
CFLs	11,522	28.5	74.4%	328,445
LEDs	1,690	29.5	65.0%	49,551
Smart Power Strips	88	51.7	28.1%	4,550
Hot Water Setback Interactive Effect	77	(11.0)	N/A	(845)
Ceiling Insulation (per home)[1]	132	218.2	138.6%	28,805
Windows (per home)	84	300.5	27.2%	25,242
Air Sealing[2]	11	527.2	100.0%	5,799
Total	**13,604**	-	**63.0%**	**441,546**
Natural Gas Measures (therms/year)				
High Efficient Aerators	1,636	1.9	27.3%	2,602
High Efficient Showerheads	869	16.1	74.8%	14,230
Hot Water Pipe Wrap (per home)	737	13.7	128.4%	9,770
Hot Water Setback	77	4.3	40.4%	333
Ceiling Insulation (per home)[1]	132	90.6	107.2%	11,965
Windows (per home)	84	22.4	57.7%	1,883
Air Sealing[2]	11	55.9	100.0%	615
Total	**3,546**	-	**78.3%**	**41,942**

[1]The realization rate listed for ceiling insulation represents a weighted average for all ceiling insulation measures active in the PY14. Table 37 provides individual realization rates per ceiling insulation measure.
[2]As the evaluation sample did not include air sealing, this could not be evaluated. Therefore, we assumed a 100% realization rate for PY14.

Table 2 lists the program's total gross *ex post* energy savings for both fuel types. Relative precision is reported at the 90% confidence level.

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)	700.9	63.0%	441.5	9.5%
Natural Gas (therm/yr)	54,516.3	78.3%	41,941.6	10.1%

To estimate PY14 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 independently of the program. 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%. Overall, the HEA program realized a free ridership rate of 17.1% which is a small increase relative to PY13 (free ridership was 16.5%).

The Cadmus team determined a program participant spillover rate of 1.6% and limited nonparticipant spillover (NPSO) of 0.5%. We could not estimate market effects as the HEA program pilot remains too new to generate market change.

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)	441.5	17.1%	1.6 %	0.5 %	85.0%	375.4
Natural Gas (therm/yr)	41,941.6	17.1%	1.6 %	0.5 %	85.0%	35,653.6

The Missouri Public Service Commission (MPSC) approves annual energy and demand savings targets for each program year. As shown in Table 4, the PY14 HEA program realized 35.1% of its proposed net electric energy savings target (1,070 MWh) in Ameren Missouri's residential tariff and 10% of its net demand savings target (351 kW) for PY14.

Table 4: HEA program PY14 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	701	442	375	35%
Demand (kW)	351	101	43	36	10%

[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

The HEA program focused on increasing savings in PY14 by increasing the adoption of major measures. To support this effort, the program revised the program's marketing messaging to focus on increasing customer comfort and reducing energy costs through insulation. This represented a shift from the PY13 messaging, which previously focused on promotion of the audit component of the program. The program successfully realized significant increases in the uptake of major measures (a 629% increase relative to PY13). Additionally, the program increased the number of audits completed (a 147% increase relative to PY13). Despite these gains, however, the program achieved 35% of its total program savings goal for PY14 and achieved cumulatively only 21% of its overall three-year goal through the end of the second year. Ameren Missouri and Honeywell perceived the program's primary challenge in PY15 as increasing audit activity and uptake of major measures.

Regarding non-energy program performance metrics, the HEA program performed very well in PY14. Similarly to PY13, the program realized very high participant satisfaction levels (96% rated themselves as very or somewhat satisfied). Honeywell successfully remedied operational constraints identified in PY13 by hiring additional auditors, now located in various regions of Ameren Missouri's territory. This significantly reduced the time between scheduling and implementing audits. The program also increased the number of participating contractors, making the program more accessible to customers throughout Ameren Missouri's territory. Many of these contractors also take a more active role by following up directly with participants after they receive audits. Ameren Missouri and Honeywell believe this additional interaction will lead to increased major measure adoption. Ameren Missouri and Honeywell also are currently exploring options to include big-box home improvement retailers in support of major measure installations.

Lastly, Ameren Missouri reported that 7% of 2014 HEA customers participated in additional Ameren Missouri residential energy efficiency programs following their home analysis. The participation was mostly concentrated on the Lighting and HVAC programs but additional participation was noted by

Ameren Missouri within the Appliance Rebate and Appliance Recycling programs. Ameren Missouri accounts this effect due to the educational components of the HEA program.

Program Year 2013 Recommendations and Actions

In Table 5 below, we present recommendations made by the Cadmus team in presented at the conclusion of of the PY13 evaluation as well as the subsequent actions taken by the program.

Table 5: PY2013 Recommendations and Program Actions

PY13 Recommendation	Cadmus Findings	Explanation
Market aggressively the major measures and direct the home-energy auditors to emphasize customer education on the benefits—both financial and non-financial—of installing the recommended measures.	Implemented	During PY2014, a greater emphasis was made on increased major measure adoption and the increased comfort customers would experience as a result. The analysis report that each customer receives at the time of the analysis emphasizes comfort, energy savings and added home value as a result of implementing the measures.
Make the measures more affordable (by raising the rebate) or easier to purchase (through low-interest loans or on-bill financing).	Investigated	The Home Energy Analysis program design helps make major measure adoption more affordable by reducing the price of the major measure up front by the amount of the rebate. Several zero percent financing credit cards and loans were researched and information presented to program partners for their individual business consideration. In addition, 40 percent of participating Program Partners offer financing plans for customers.
Determine whether it is feasible to expand hot water measures to customers with electric water heaters and to apply the savings from new windows to customers who heat their homes with natural gas.	Investigated	A proposal to implement both of these changes has been presented to Stakeholders for their approval.
Update the Ameren TRM to account interactive effects related to water heater measures to achieve higher realization rates.	Resolved	This measure was discontinued in 2014 due to the negative electric savings identified.
Educate, engage, and motivate potential customers through channels such as community events, local retailers, fairs, and home shows.	Implemented	Marketing the program expanded in 2014 to more in-person events such as those listed in the recommendation.
Partner with local community organizations or neighborhood groups to promote “group” energy audits in their community or neighborhood.	Implemented	Ameren Missouri presented program information to four local senior community groups in 2014.
Leverage customer satisfaction to serve as program marketing, using testimonials, case studies, local news features, and online channels.	Implemented	Ameren Missouri created a case study featuring a customer who had taken both air sealing and ceiling insulation major measures. The case study was mailed to other customers with those same recommendations. Development of the case study occurred in 2014; distribution in 2015. Ameren Missouri marketed the program via Facebook and Twitter, as well as local news magazines.

Program Year 2014 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 significantly increased major measure uptake in PY14; however, even stronger uptake will be required in PY15 to achieve annual and three-year energy savings goals. Major measure adoption increased dramatically in PY14 (629% relative to PY13) and contributed greatly to PY14's greater program-level energy savings. Participants reported most commonly installing major measures to save money and increase the comfort of their home—sentiments that align closely with current focus of the program's marketing materials. However, customers typically delayed an average of three months between receiving a recommendation to install a major measure and taking action on that recommendation. This delayed response by participants may impact the program's ability to meet its three-year savings target as participants who do not install recommended major measures before December 31, 2015 may no longer be eligible for a program rebate if the program is not renewed for the 2016-2018 program cycle.

> **Recommendation 1a. Continue to aggressively promote major measures, with an emphasis on both 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.

Conclusion 2. Certain measures achieved low realization rates. The low realization rates reflected inaccuracies in the TRM-deemed savings assumptions.

> **Recommendation 2. 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, the savings realized by installing windows is significantly less than currently reported in the TRM.

Conclusion 3: Savings from lighting measures were significantly impacted by low hours-of-use, which was a result of where the bulbs were installed. 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 HEA program participant survey data (which indicated frequencies of bulb installation location by room). Based on 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 scores higher than the mean and median of the PY14 Light Metering study.

Recommendation 3. Instruct program auditors to install lighting measures in high use areas including outdoor locations, the kitchen, and the living room.

Conclusion 4: All program managers agreed that participants expressed satisfaction with the auditors and the overall program.

Recommendation 4: 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.

Introduction

Ameren Missouri 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 2014 (PY14), the period from January 1, 2014, through December 31, 2014.

Program Description

In PY14, Ameren Missouri changed the name of the program from PerformanceSavers (used in PY13) to the Home Energy Analysis program. The HEA pilot program encourages residents of single-family homes to reduce energy consumption by making improvements to weatherization, lighting, HVAC, and water-heating appliances fueled by natural gas. The program provides 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 provides 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) implements the program.

Program Participants and Savings Approaches

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

- Educating customers about their energy consumption via a detailed HEA report.
- Implementing 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.

- Identifying 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-efficient windows).

Ameren Missouri customers receiving a home audit through the program need not implement additional measures recommended by the auditor, but Honeywell uses the following strategies to encourage customers to implement improvements:

- Following up with audit customers to reinforce education about energy-savings opportunities and to answer customer questions;
- Providing estimates of measure costs, savings, and years-to-payback;
- Providing information about rebates offered through other programs in the Ameren Missouri residential portfolio; and
- Offering 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 PY14, the HEA program had 959 participants, as shown in Table 6.

Table 6: HEA program PY14 Program Activity

Measure	PY14 Participants	PY14 Measure Counts
Audits		
Level 1 Audit	895	n/a
Level 2 Audit	64	n/a
Direct-Install Measures		
CFLs	903	11,522
LEDs	653	1,690
Faucet Aerators	643	1,636
Energy Efficient Showerheads	612	869
Hot Water Heater Pipe Insulation	737	737
Domestic Hot Water Temperature Setback	77	77
Smart Power Strips	88	88
Major Measures		
Air Sealing	11	11
Ceiling insulation (R-5 to R-30)	1	1,783 ft^2
Ceiling insulation (R-5 to R-49)	14	19,065 ft^2
Ceiling insulation (R-11 to R-49)	40	51,417 ft^2
Ceiling insulation (R-19 to R-49)	77	110,397 ft^2
Windows	84	713

EVALUATION METHODOLOGY

The Cadmus team identified the following impact and process evaluation priorities for the HEA program pilot in PY14:

- Verifying installation and impacts of direct-install and major measures.
- Tracking adoption of major measures over time.
- Refining net-to-gross (NTG) estimates, including spillover assessments.
- Assessing the impacts of design changes, marketing activities, and program processes.
- Assessing the program's achievements against goals.
- Examining participants' experience, satisfaction, and decision-making motivations.
- Assessing how well participants understood the educational information, audit reports, energy-savings opportunities, and implementation process.

Table 7 lists evaluation activities conducted in PY14 to reach the above objectives, followed by brief summaries of each activity.

Table 7: PY14 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.
Survey Participants	•	•	Surveys with audit recipients to inform gross impacts, NTG, and process-related insights.
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. Currently, Ameren Missouri works with its implementers to migrate program tracking data to Ameren Missouri's central Vision database.

Program Manager Interviews

For the HEA program's PY14 evaluation, the Cadmus team interviewed Ameren Missouri and Honeywell program managers in December 2014 and January 2015, as shown in Table 8. We designed these interviews to accomplish the following:

- Gather information on how effectively the program operates;
- 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 (2 pp)	1
Total	**2**

HEA Participant Surveys

In PY14, the Cadmus team completed 75 telephone surveys with HEA program participants, as shown in Table 9. Based on the total program population as of December 10, 2013, we generated a random sample of participants. Drawing the sample on this date ensured we would have sufficient time to collect field data, conduct the savings analysis, and report findings to stakeholders by February 13, 2015. The average date of participation for survey respondents was December 30th, 2014.

Table 9: HEA program Participant Survey Summary

Target Audience	Survey Field Dates	Population[1]	Sample Size Target	Completed Surveys
Audit and/or Major Measure Participants[2]	Dec. 2014 – Jan. 2015	1,089	63	75

[1]Population as of December 10, 2014, when sample was drawn. Inclusive of 2014 audit customers, 2014 rebate customers , and 2013 audit/2014 rebate customers.

The Cadmus team's telephone surveys collected information for the impact evaluation and the process evaluation, covering topics such as measure verification, free ridership, spillover, and participant awareness, decision making, and satisfaction.

Survey Timing

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

time of participation. With greater recall, survey results most accurately reflect a participant's experience with a program and installation activities.

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

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

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 audit reports provided for each program participant well-documented the baseline conditions of existing equipment. We gathered additional baseline information via the phone surveys and used the baseline data to develop parameter inputs for each engineering algorithm.

Cost-Effective Analysis

Using final PY14 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.[1] 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
- 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. Process evaluations must address, at a minimum, the five questions listed in Table 10. The table provides a summary response for each specified CSR process requirement, taken from both this year's

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

evaluation and the prior year. In addition, the CSR requires that impact evaluations of demand-side program satisfy the requirements noted in Table 10. The table indicates the data used in this evaluation that satisfy the CSR impact data requirement.

Table 10: 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 mpact of efficient lighting
Survey responses	x	Surveyed program participants regarding measure verification, installation rates, free ridership, and spillover.
Audit and survey data on:		
Equipment type/size efficiency	x	Evaluation team conducted surveys 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 Ameren Missouri's HEA pilot program. We divide these findings into three sections: Program Design and Delivery, Marketing and Outreach, and Participant Feedback.

Program Design and Delivery

The HEA program is implemented by the Honeywell Smart Grid Solutions Division (Honeywell). Honeywell sub-contracted the EarthWays Center to conduct the in-home customer audits. The program marketing targets customers with the greatest savings potential—typically high-use accounts in older homes; however, all single-family residential homes receiving both electricity and natural gas from Ameren Missouri qualify to participate in the HEA program. The program seeks to serve 60,000 participants across the gas and electric regions of Ameren Missouri's territory.

Direct-Install Measures

During the home-energy audit (which costs customers $25), auditors may direct-install energy-saving measures worth up to $200, at no additional costs to the customer. Table 11 lists direct-install measures and average quantities installed per home in PY14. The quantity of direct-install measures per home did not vary significantly between PY13 and PY14, except for CFLs. In PY13, the program installed an average of 11 CFLs per home; in PY14, this number dropped to an average of six CFLs per home.

Table 11: Direct-Install Measures

Measure	Average Quantity Installed per Home[1]
High-efficiency faucet aerators	2.4
High-efficiency showerheads	1.4
Up to 10 feet of water heater pipe wrap	1.0
ENERGY STAR® certified CFL light bulbs	6.3
ENERGY STAR certified LED light bulbs	2.2

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

Ameren Missouri also removed smart power strips and the water heater setback from the direct-install measure offerings in PY14. These measures did not realize the energy savings expected by Ameren Missouri. Ameren Missouri plans to amend the program to offer water-heater measures (e.g., aerators, showerheads, and pipe wrap) to customers with electric water heaters in PY15. This should increase the program's savings opportunities, as an estimated 15% of customers eligible for the HEA program use electric water heaters.

HEA Program Major Measures

Table 12 lists the program's major measures and associated rebate amounts. When the program's home energy auditors recommend major measures, customers can qualify for a rebate on each installation if they use a HEA program-certified contractor to conduct the work. (At the close of PY14, the program had 30 certified contractors available to perform the installations.)

Table 12. 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 maintains portfolio-wide 2015 regulatory goals for energy savings. Although Ameren Missouri is 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 informs the program's three-year energy-savings goals, which the Ameren Missouri tariff contains. As of the close of PY14, the HEA program achieved 41% of its PY14 goal and 41% of its official three-year electricity energy-savings goal.

Program Implementation Challenges

The HEA program operates as a pilot. Unlike the other six residential programs—which address electric measures program exclusively—the pilot requires participants have both gas and electric in their homes.

Achieving Program Energy-Savings Goal

Both Ameren Missouri and Honeywell cited meeting the program's energy-savings goals as their greatest concern in PY14. While completed installations of major measures increased approximately 629% and completed audits increased approximately 147% relative to PY13, the HEA program realized less than one-half of its three-year savings goal. Ameren Missouri and Honeywell program managers noted a lag period averaging 88 days between recommendations and installations of major measures. This lag period may prove of particular concern in PY15 if the program does not extend beyond its three-year pilot, as customers would have only until the end of 2015 to qualify for major measure installation rebates.

Additionally, Honeywell noted the PY13 evaluation results added pressure in meeting the program's energy-savings goals. The PY13 evaluation reduced expected achieved energy savings for the program for multiple measures. Specifically, Honeywell noted PY13's very low realization rates for windows (25%) and high free ridership rates for CFLs (35%).

Delivery Successes and Program Achievements

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

- **Major Measure Rebates.** The number of rebates issued for major measure installations increased dramatically in PY14. Ameren Missouri and Honeywell program managers credited this increased uptake to the following:
  - Revised marketing messaging focused on increasing customer comfort and reducing costs through upgrading a home. This shifted from PY13's messaging, which focused on audit participant recruitment.
  - Increased participation by program partners (i.e., contractors, in both quantity and activity). The number of program partners increased to 30 (up from 25 at the end of PY13) and were more geographically dispersed. Moreover, near the end of December, the program partners began to actively pursue customer participant leads based on results from the audit report. (Note: customer consent is required prior to releasing their contact information and audit details to program partners. Ameren Missouri reported 50% of participants provided consent to be contacted.) This approach will continue into the 2015 program year.
- **Auditors.** Similarly to PY13, Ameren Missouri and Honeywell program managers felt auditors succeeded in communicating information about energy-efficiency opportunities and implementing direct-install measures. Both companies reported participants positively received the program's auditors, as manifested through very high customer satisfaction responses.
- **Audit Backlog.** Honeywell increased the number of auditors supporting the program to four (three full-time, one part-time), with each auditor geographically located to serve customers throughout Ameren Missouri's territory. This action resulted in reduced lead times to administer customer audits.
- **Program Partners (Contractors).** The HEA program increased the number of program partners (i.e., contractors installing major measures) to 30 by the end of PY14, and program partners proved more proactive in program participation:
  - Program partners were located throughout the Ameren Missouri's territory, making it easier for customers to receive job estimates and complete major measure installations in a timely manner.
- **Cross-program promotion.** The HEA program provided customer awareness regarding other residential energy efficiency program offerings.
  - Ameren Missouri reported 7% of 2014 HEA customers participated in additional Ameren Missouri residential energy efficiency programs following their home analysis. The participation was mostly concentrated on the Lighting and HVAC programs but additional participation was noted by Ameren Missouri within the Appliance Rebate and Appliance Recycling programs. Ameren Missouri accounts this effect due to the educational components of the HEA program.

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 PY14 marketing and outreach activities as reported by Ameren Missouri and Honeywell program managers.

PY14 Marketing Activities

Honeywell and Ameren Missouri collaborated to update the HEA program marketing strategy in PY14. Primary marketing efforts taken in PY14 included the following:

- **Program messaging.** Honeywell and Ameren Missouri made a concerted effort to revise program messaging to focus on ways the program could improve the comfort of a customer's home while reducing costs.
  - The prior messaging approach, which sought to drive audit sign-ups, was data heavy and directed to customers aware of and educated about their energy consumption.
  - The new messaging has been designed to be approachable to more general customers, who may not be well-informed about their energy usage.
- **Redesign of program mailer.** Honeywell changed the mailer format to a #10 envelope package, with return envelope included for customers wishing to participate in the program.
  - Honeywell reported a 3.6% program participation rate from the mailer.
- **Bill inserts.** Ameren Missouri conducted waves of billing inserts, describing the HEA program to eligible customers.
  - Ameren Missouri recently revised its billing format to a full page bill. This new format will result in bill messaging for the HEA program, beginning in PY15.
- **New program name.** Ameren Missouri changed the program's name from PerformanceSavers to the Home Energy Analysis program.
  - Ameren Missouri unilaterally implemented the name change and considers it more descriptive of the program and causes less confusion than the prior name.
- **Outreach**. In PY14, Honeywell conducted presentations throughout the year, including community presentations, senior center presentations, and a realtor presentation.
  - Honeywell is working with Ameren Missouri to approve customer testimonials and case studies to further supplement marketing and outreach efforts in PY15.
  - Ameren Missouri is in dialogue with large home improvement retailers to engage them as program partners for major measures.
- **Website improvements**. The HEA program landing page on the Ameren Missouri Act On Energy website was revised to include clearer and more direct language about the program, including a

functionality that allows customers to generate an email that is sent to Honeywell to verify if they are eligible to participate in the program.

- Honeywell noted that, despite improvements to the landing page, the page still requires support. For example, the website generates an e-mail to inform customers if they qualify for the program; therefore, it does not always resolve the confusion customers encounter in determining their eligibility.

Participant Feedback

The Cadmus team asked participants multiple questions regarding their satisfaction with the program and with Ameren Missouri as their utility.

Survey Timing

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

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

Optimally, participant surveys will be administered immediately after participation to capture greater recall and further from the time of participation to capture later installations, retention, and spillover.[12] Conducting multiple participant surveys, however, is subject to program and evaluation timelines as well as budget constraints.

In PY14, the Cadmus team completed surveys in a single wave, with surveys administered in late fall. This allowed us to include the greatest number of PY14 participants in our sample, ensuring our findings reflected programmatic changes that occurred over the course of the year and appropriately balancing the impact of recall bias with respondents' ability to address measure retention and spillover.

Customer Program Satisfaction

The Cadmus team asked participants a battery of questions regarding their experiences with the following: various aspects of program operations (e.g., the website, communication with Ameren Missouri employees or contractors); the variety of rebated major measures, the auditor's performance,

[2] Violette, M., and Rathbun, P. "Estimating Net Savings: Common Practices." The Uniform Methods Project. National Renewable Energy Laboratory. 2014.

and the major measure installation contractor's performance. Overall, 96%[3] of participants indicated they were somewhat satisfied or very satisfied with the program's operations.

Website

Just over half of surveyed participants provided comments on the program website. Almost all responses given reflected somewhat or very satisfied. However, the remaining participants did not provide a satisfaction ranking on the website which may imply the website is utilized by only half of the HEA program participants.

Communication with Ameren Missouri Employees or Contractors

Program participants rated communication with Ameren Missouri employees or contractors very highly. 97% of participants indicated they were somewhat satisfied or very satisfied with communications during their participation.

Variety of Rebate-Eligible Major Measures

The majority of participants indicated they were somewhat or very satisfied with the variety of rebated major measures. However, some participants expressed desire for more major measure options.

Auditor

Among participants surveyed, 87% rated themselves as very satisfied with the auditors and 9% as somewhat satisfied. We received comments from a few participants who expressed being less satisfied with the auditor performance for various reasons, such as: the auditor's attitude toward the customer; dissatisfaction with the need to replace installed lighting; and not getting value out of the audit process.

The energy report was described by 76% of participants as very easy to understand, while 20% found the report somewhat easy to understand. This aligns with Ameren Missouri and Honeywell program manager views that program participants successfully interpret information provided by the auditors.

Program Partners (Contractors)

Two-thirds of surveyed participants provided feedback on their experiences with the program partners that completed the major measure installations, with 77% reported as very satisfied with the work performed. The remaining respondents did not express an opinion.

Customer Satisfaction with Ameren Missouri

The Cadmus team asked participants about their overall experience as an Ameren Missouri customer and whether their opinion of the utility changed since participating in the program. Responses included the following:

- 66% said they were very satisfied with their overall experience with Ameren Missouri;
- 24% were somewhat satisfied; and

[3]Rate reflects only measureable responses. 21% of participants did not provide a measureable response, i.e., "Refused" or "Don't Know".

- 4% were not too or not at all satisfied.
- 6% did not express an opinion.

When asked if their opinion had changed since participating in the HEA program, 43% of participants said their opinions of Ameren Missouri improved, while 50% said their opinions stayed about the same. Only 3% of participants said their opinion of Ameren Missouri declined.

Suggestions to Improve the Program

When asked how the HEA program could be improved, 4% of surveyed participants said the program should provide clearer information about available rebates for major measures. An additional 4% of participants said the program should offer more rebated measures. Only one participant felt audit costs should be reduced. Two participants expressed dissatisfaction with the CFL bulbs installed and suggested removing CFLs from the program and/or providing CFLs compatible with dimmers. Ameren Missouri noted that dimmable CFLs were tested for inclusion in the program but ultimately were not included due to poor performance.

Major Measure Adoption

Table 13 lists the major measure cumulative adoption rate for each program measure from PY13 through PY14. While the adoption rate for air sealing doubled by the end of PY14, relative to the end of PY13, overall uptake of the measure remains very low. Windows and insulation saw tremendous growth in their adoption rates, which both increased than three times greater relative rate to PY13.

Table 13: Cumulative PY13 and PY14 Major Measure Adoption Rates

Major Measure	Completed Installations	Recommended Installations	Major Measure Adoption Rate
Air Sealing	13	1,118	1.2%
Ceiling Insulation	154	997	15.4%
Windows	92	446	20.6%

During participant surveys, the Cadmus team asked all participants receiving a 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 PY14, Honeywell estimated an approximate lag of three months.) 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 14. While our process evaluation findings touched on each of these topics, Table 14 provides a summary response for the specified CSR requirements.

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

Table 14: 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 common to the target market is inadequate information and/or knowledge 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?	Yes, the current market segment is appropriately designed. The program may realize higher audit rates or uptake of rebated measures through additional population segmentation of the current target market.
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 is appropriate; however, measure eligibility should be reviewed to include water heater measures with electric water heaters.
4	Are the communication channels and delivery mechanisms appropriate for the target market segment?	Yes, current communication and delivery channels are appropriate.
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 is needed regarding the benefits—financial and nonfinancial—of increasing the efficiency and comfort of their homes. This should be especially communicated with regard to air sealing.

Gross Impact Evaluation Results

The Cadmus team conducted the PY14 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, 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 PY14 gross energy-savings analysis. Table 15 shows combined installation rates for each measure.

Table 15: 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%
Domestic Hot Water Setback	70.3%
Smart Power Strips	97.6%

We found installation rates generally high for the HEA direct-install measures. Notable exceptions included CFLs and the hot water setback. 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. The installation rate for the water heater setback primarily resulted from feedback from PY13 participants, who stated they did not like the new water temperature and reverted to the initial temperature setting.

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. We determined gross energy savings for each measure, as detailed below, along with algorithms and inputs used.

Table 16: 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 PY14 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 17: Lighting PY14-PY7 Savings Assumptions

Term	Value	PY14 Source
WattINC	Based on bulb	Program and audit data
WattNEW	Based on bulb	Program and audit data
Hours	2.01	PY14 Light Metering Study and PY14 HEA program Survey Data
WHF	0.99	PY14 Engineering Simulation Modeling adjusted for heating and cooling saturations
CFL InstallationRate	95.6%	HEA PY13 and PY14 program Audit Data
LED InstallationRate	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. We adjusted baseline assumptions for affected measures based on PY14 bulb sales data weighted by the bulb types offered by the HEA program. We established baseline assumptions using a weighted average of sales in stores that offered lumen-equivalent incandescents versus stores that did not offer lumen-equivalent incancdescents.

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 HEA program participant survey data (which indicated frequencies of bulb installation location by room). Based on 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 scores 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 18 and Table 19). The difference between *ex ante* and *ex post* savings estimates primarily resulted from lower hours-of-use and lower waste heat factors than those assumed by Morgan Measure Libraries.

On average, we found a weighted realization rate of 74.4% for CFLs.

Table 18: *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	28.4	90%
18 Watt POST-EISA	37.4	26.5	71%
23 Watt POST-EISA	51.2	35.8	69%
High Wattage CFL	113.0	109.5	97%
Specialty Bulb CFL	44.1	27.6	63%
Reflector CFL	44.1	29.9	68%

On average, we found a weighted realization rate of 65.0% for LEDs.

Table 19: *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	23.4	73%
10.5 Watt Downlight	54.5	39.8	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	51.8	162%

High-Efficiency Showerheads

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

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

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 (^{o}F)
- T_{IN} = the average inlet water temperature (^{o}F)
- C_P = the specific water heat (BTU/lb-^{o}F)
- Den = the water density (lb/gal)
- 100,067 = the conversion rate between BTU and therm
- EF_{gas} = 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 20: High-Efficiency Showerhead PY14 Savings Assumptions

Term	PY14 Value	PY14 Source
People	2.55	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}	0.51	HEA program Audit Data
C_P	1	Constant (BTU/lb-°F)
Den	8.33	Constant (lb/gal)
Number of Showerheads	1.97	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 Farenheit. 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, the Cadmus team determined an *ex post* energy savings value of 16.1 therm/year for each installed and retained showerhead. This value was approximately 75% of the program's *ex ante* value (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]

[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.

- The TRM assumed one showerhead per home. Primary data collected from the participant survey found homes averaged two showerheads per home.

Table 21 shows *ex ante* and *ex post* savings.

Table 21: *Ex Ante* and *Ex Post* Comparison for High-Efficient Showerheads

Ex Ante Savings/Unit	*Ex Post* Savings/Unit	Realization Rate
21.5 therm/yr	16.1 therm/yr	75%

High-Efficiency Faucet Aerators

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

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

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
- EF_{gas} = the water heater's energy factor
- Number of Faucet Aerators = the number of faucets per home
- High-Efficiency Aerators = the number of high efficiency aerators installed by the program

Table 22: High-Efficiency Faucet Aerator PY14 Savings Assumptions

Term	PY14 Value	PY14 Source
People	2.47	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}	0.51	HEA program Audit Data[1]
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 1.9 therm/year for each installed and retained aerator. This value was approximately 27% of the program's *ex ante* value (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 23 shows *ex ante* and *ex post* savings.

Table 23: *Ex Ante* and *Ex Post* Comparison for High-Efficiency Faucet Aerators

Ex Ante Savings/Unit	*Ex Post* Savings/Unit	Realization Rate
6.8 therm/yr	1.9 therm/yr	27%

Water Heat Pipe Wrap

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

$$Energy\ Savings\ (therm/Year) = \frac{\left(\left(\frac{1}{R_{EXIST}} - \frac{1}{R_{NEW}}\right) \times L \times C \times \Delta T \times 8{,}760\right)}{EF_{gas} \times 100067}$$

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} = the water heater's energy factor
- 100,067 = the conversion rate between BTU and therm

Table 24: Water Heater Pipe Wrap PY14 Savings Assumptions

Term	PY14 Value	PY14 Source
R_{new}	3.6	HEA program Audit Data
R_{exist}	1.0	Secondary Source[1]
L	10	HEA program Audit Data
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}	0.51	HEA program Audit Data[4]
100,067	100,067	Conversion Factor (Btu/therm)
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 24 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 13.7 therms/year for pipe wrap installed on each water heater. This value was approximately 128% of the program's *ex ante* value (10.7 therm/year), as shown in Table 25.

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 25: *Ex Ante* and *Ex Post* Comparison for Hot Water Pipe Wrap

***Ex Ante* Savings/Unit**	***Ex Post* Savings/Unit**	**Realization Rate**
10.7 therm/yr	13.7 therm/yr	128%

Hot Water Setback

Turning down the temperature set point on a water heater generates savings as it requires less energy to heat the inlet water to the reduced hot water temperature. Benefits also result from lower standby losses due to a smaller temperature difference between the water tank and the surrounding air. Though the program removed this measure in PY14, the measure realized participation before its removal. Hence, our analysis includes it.

We calculated savings for hot water setback measure savings using the following algorithm:

$$Energy\ Savings\ (therm/Year) = \frac{HW_{day} \times 365 \times 8.3 \times (T_{base} - T_{new})}{EF_{gas} X\ 100{,}067}\ X\ InstallationRate$$

Where:

- HW_{day} = the average hot water use per day (gal/day)
- 365 = the number of days per year (day/yr)
- 8.3 = the water density (lb/gal)
- T_{base} = the pre-setback water heater temperature (°F)
- T_{new} = the post-setback water heater temperature (°F)
- EF_{gas} = the water heater's energy factor
- 100,067 = conversion rate between BTU and therm

Table 26. Hot Water Setback PY14 Savings Assumptions

Term	PY14 Value	PY14 Source
HW_{day}	7.32	Secondary Source[1]
T_{base}	135	Secondary Source[2]
T_{new}	120	HEA program Audit Data
EFg_{as}	0.54	HEA program Audit Data
365	365	Days/year
8.3	8.3	Density of water
100,067	100,067	Btu/therm
Installation Rate	70.3%	HEA PY13 and PY14 program Audit Data

[1]Pennsylvania TRM. 2013.
[2]Ameren Missouri TRM.

While most hot water end uses (e.g., showers, sinks, washing machines) would not be affected by the new, lower hot water temperature, dishwashers containing an internal heating element to increase the temperature of incoming hot water require additional energy consumption. This technology, called a booster heater, heats incoming water to 140°F regardless of incoming water temperatures, ensuring the appliance effectively washes each load of dishes.

To calculate the incremental increase in electricity usage used by the booster heater to increase the hot water temperature, the Cadmus team used the following algorithm.

$$Energy\ Consumption\ (kWh/Year) = \frac{HW_{dishwasher} \times Cycles \times 8.3 \times (T_{base} - T_{new})}{EFdishwasher\ X\ 3{,}413} \times \%Homes \times \%Booster\ Heater$$

Where:

- $HW_{dishwasher}$= amount of hot water used per dishwasher cycle
- Cycles = number of dishwasher cycles per year
- $EF_{dishwasher}$= efficiency of electric dishwasher heating element
- 3,413 = conversion factor (Btu/kWh)
- %Homes = homes in Ameren Missouri's service territory with a dishwasher (%)
- %Booster Heater = dishwashers in Ameren Missouri's service territory that include a booster heater (%)

Table 27: Hot Water Interactive Effects PY14 Assumptions

Term	PY14 Value	PY14 Source
$HW_{dishwasher}$	4.36	Secondary Source[1]
Cycles	215	Secondary Source[1]
$EF_{dishwasher}$	1.0	Assumption
3,413	3,413	Btu/kWh
%Homes	84%	Secondary Source[2]
%Booster Heater	54%	Secondary Source[3]
Installation Rate	70.3%	HEA PY13 and PY14 program Audit Data

[1]Pennsylvania TRM. 2013.

[2]Ameren Missouri Potential Study.

[3]The Cadmus team developed the penetration of booster heater technology by applying a Bass Curve over 20 years to estimate market penetration.

In addition to quantifying the interactive effect, we considered two questions about how this savings adjustment should be applied specifically within Ameren Missouri's service territory:

- What percentage of Ameren Missouri's customers own a dishwasher?
- What is the prevalence of this booster heater technology across the dishwashers currently installed in customers' homes?

Each of these questions attempt to quantify the savings adjustment, as homes without a dishwasher (or with a dishwasher without booster heater technology) will have zero increased energy use. Ameren Missouri provided the Cadmus team with a penetration value for dishwashers, based on the Ameren Missouri potential study that found 84% of homes in the service territory contained a dishwasher. To estimate the penetration of booster heater technology throughout the customer base, we used multiple sources. Based on the most recent Residential Energy Consumption Survey (RECS), compiled in 2009, we obtained a breakdown of dishwasher vintages installed in Missouri homes, as shown in Table 28.

Table 28: Age of Dishwashers in Missouri Residential Homes[1]

Age of Dishwasher (years)	% of Missouri Residential Homes
Fewer than 2	13.3
2 – 4	26.7
5 – 9	33.3
10 – 14	13.3
15 – 19	6.7
20 or greater	6.7

[1]RECS, U.S. Energy Information Administration, 2009.

We assumed the age of dishwashers installed in 2013, in Missouri homes, comparable to data from 2009 and that statewide data could be used a proxy for Ameren Missouri's service territory. Our additional

sources[6] stated: "… all modern dishwashers have booster heaters and manufacturers do not allow the feature to be disabled." Thus, for all dishwashers less than five years old, we set the technology's market penetration rate to 100%. We could not determine when the booster heater technology first entered the residential dishwasher market, but we assumed 20 years before the market became saturated. We made use of a Bass Curve to estimate market penetration over that time frame. Applying the penetration rate of dishwasher booster heater technology to the age of dishwashers in Missouri homes, we estimated 54.4% of homes in Ameren Missouri's service territory contained a dishwasher with a booster heater.

To estimate increased electricity usage attributed to dishwasher booster heaters in homes where a domestic hot water temperature set back was applied to the water heater, we applied the dishwasher and booster heater penetration rates to the algorithm provided in Table 27.

Using these data, we calculated an *ex post* therms savings of 4.3 therms/yr and an *ex post* kWh consumption of 11.0 kWh for water heaters that received a setback. Regarding therm savings, this value was approximately 40% of the program's *ex ante* value (10.7 therms/yr) (Table 29).

Table 29: *Ex Ante* and *Ex Post* Comparison for Water Heater Setback

Fuel Type	*Ex Ante* Savings/Unit	*Ex Post* Savings/Unit	Realization Rate
Natural Gas	10.7 therms/yr	4.3 therms/yr	40%
Electricity	N/A	(11.0) kWh/yr	N/A

Smart Power Strips

Though the program removed this measure in PY14, it realized participation before removal. Hence, we included it in our analysis.

The Cadmus team used a combination of primary data and deemed per-unit savings to estimate savings for smart power strips. Our primary data provided information on types of peripherals served by smart power strips. These peripherals were categorized as home entertainment or home office devices. To establish deemed savings for the peripherals, we reviewed over 20 studies on advanced power strips and examined their assumptions for different equipment types (e.g., home office and home entertainment). The studies notably differed in the average number of controlled devices assumed in each equation and the type of smart-strip technologies used.

After this detailed review, we determined a 2011 study conducted by the New York State Energy Research and Development Authority (NYSERDA) combined the most in-depth research with the most

[6] Hoak, D., Parker, D., Hermelink, A. "How Energy Efficient are Modern Dishwashers." Proceedings of ACEEE 2008 Summer Study on Energy Efficiency in Buildings. American Council for an Energy Efficient Economy. Washington, DC, August 2008. http://www.fsec.ucf.edu/en/publications/pdf/FSEC-CR-1772-08.pdf

reasonable assumptions for calculating energy savings for load-sensing smart power strips.[7] Table 30 shows per-unit savings determined by NYSERDA for home office and home entertainment applications.

Table 30: NYSERDA Savings Values and HEA Saturations

Smart Strip Location	Savings/Unit	Saturations
Home Office	28 kWh/yr	36%
Home Entertainment	67 kWh/yr	64%

Using these data as well as the average installation rate of 97.6%, we calculated a weighted average *ex post* savings of 52.0 kWh/yr for smart power strips. This value was approximately 29% of the program's *ex ante* value (184 kWh/yr), shown in
Table 31.

Table 31: *Ex Ante* and *Ex Post* Comparison for Smart Power Strips

Ex Ante Savings/Unit	*Ex Post* Savings/Unit	Realization Rate
184 kWh/yr	52 kWh/yr	28%

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 32: High-Efficiency WindowPY14 Savings Assumptions

Term	PY14 Value	PY14 Source
Square feet of Installed Windows	119	HEA program Survey Data[1]
Home vintage (old/average/new)	23.7%/74.6%/1.7%	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	96.6%/1.7%/1.7%	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.

[7] Lockheed Martin and Energy Solutions, 2011. "Advanced Power Strip Research Report." Prepared for NYSERDA. Available at www.nyserda.ny.gov.

We sourced savings-per-square-foot, based on the assumptions provided in the MML (see Table 33). Savings were reflective of homes with central air conditioning and gas furnaces, a representative sample of HEA program participants who installed windows.

Table 33: 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 300.5 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 34: *Ex Ante* and *Ex Post* Comparison for High-Efficiency Windows

Ex Ante Savings/Unit	*Ex Post* Savings/Unit	Realization Rate
1103.4 kWh/yr	300.5 kWh/yr	27%
38.9 therm/yr	22.4 therm/yr	58%

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. Survey data we collected verified an average total installation of 119 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 survey and 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 the vintage mix was: 23.7% old vintage, 74.6% average vintage, and just 1.7% of homes were considered 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

No sampled customers completed an air-sealing project. However, 11 customers did complete air sealing in PY14. As these customers were outside of the sample, we could not collect data for this measure and, therefore, could not complete a savings analysis. Thus, we deferred to the Ameren Missouri TRM savings for air sealing in PY14.

Table 35: *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:[8]

$$\Delta kWh_{cool} = \frac{\left\{\left(\left(\frac{1}{R_{exist}} - \frac{1}{R_{new}}\right) * A_{attic} * \left(1 - \frac{Framing_{factor}}{2}\right)\right) * 24 * CDD * DUA\right\}}{(SEER \times 1000)}$$

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

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

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

- DUA= discretionary use adjustment (reflects that people do not always operate their air conditioners when conditions may call for it)
- 1000= Btu to kBtu conversion
- SEER = Seasonal Energy Efficiency Ratio of cooling system (kBtu/kWh)
- 3412 = Btu to kWh conversion
- 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 36 lists inputs we used for each algorithm.

Table 36: Insulation PY14 Savings Assumptions

Term	PY14 Value	PY14 Source
R_{new}	49	HEA program Survey Data
R_{old}	5 - 19	HEA program Survey Data
A_{attic}	1,331	HEA program Survey Data[1]
$Framing_{factor}$	15%	Secondary Source[2]
DUA	0.75	Secondary Source[3]
SEER	10.5	HEA program Audit Data[1]
ηHeat	85.8%	HEA program Audit Data[1]
CDD	1646	Secondary Source[4]
HDD	4535	Secondary Source[4]

[1]Values listed in Table 36 from HEA program Survey 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 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 37 and Table 38.

Table 37: *Ex Ante* and *Ex Post* Electric Savings Comparison for Insulation

Insulation Level	*Ex Ante* Savings/Unit	*Ex Post* Savings/Unit	Realization Rate
R5 – R30	433.9 kWh/yr	N/A[1]	N/A
R5 – R49	467.6 kWh/yr	672.7 kWh/yr	144%
R11 – R49	183.6 kWh/yr	244.0 kWh/yr	133%
R19 – R49	83.9 kWh/yr	119.4 kWh/yr	142%

[1]One participant upgraded their ceiling insulation from R5 to R30 after the evaluation sample was drawn. Therefore, we could not collect data for this measure.
[2]Weighted average based on total installations.

Table 38: *Ex Ante* and *Ex Post* Therm Savings Comparison for Insulation

Insulation Level	*Ex Ante* Savings/Unit	*Ex Post* Savings/Unit	Realization Rate
R5 – R30	227.6 therm/yr	N/A[1]	N/A
R5 – R49	251.1 therm/yr	286.0 therm/yr	114%
R11 – R49	98.6 therm/yr	98.0 therm/yr	99%
R19 – R49	45.1 therm/yr	49.5 therm/yr	110%

[1]One participant upgraded their ceiling insulation from R5 to R30 after the evaluation sample was drawn. Therefore, we could not collect data for this measure.
[2]Weighted average based on total installations.

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 13.9 and an average furnace efficiency of 85% 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 1,331 square feet.

Summary

The Cadmus team calculated the measure-specific realization rates (shown in Table 39) by comparing evaluated (*ex post)* savings with the program's planning estimate (*ex ante*), detailed in Ameren Missouri's TRM.

Table 39: 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	42.5	28.5	74.4%
LEDs	45.1	29.5	65.0%
Smart Power Strips	184.0	51.7	28.1%
Hot Water Setback Interactive Effect*	0.0	(11.0)	N/A
Ceiling Insulation (per home)	157.5	218.2	138.6%
Windows (per home)	1103.4	300.5	27.2%
Air Sealing[1]	527.2	527.2	100.0%
Overall	-	-	**63.0%**
Natural Gas Measures (therms/yr)			
High-Efficiency Aerators	6.8	1.9	27.3%
High-Efficiency Showerheads	21.5	16.1	74.8%
Hot Water Pipe Wrap	10.7	13.7	128.4%
Hot Water Setback	10.7	4.3	40.4%
Ceiling Insulation (per home)	84.3	90.6	107.2%
Windows (per home)	38.9	22.4	57.7%
Air Sealing[1]	55.9	55.9	100.0%
Overall	-	-	**78.3%**

[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 the program achieved an overall electric measures realization rate of 63.2%. The evaluation revealed lower-than-expected realization rates for windows (27.2%); however, this was offset by a high realization for ceiling insulation (138.6%).

We determined an overall realization rate for natural gas measures of 78.3%. The evaluation revealed this realization rate was reduced by lower-than-expected rates for high-efficiency aerators (27.3%). However, greater-than-expected savings for ceiling insulation (107.2%) and hot water pipe wrap (128.4%) offset these low values.

Table 40 and Table 41 apply these per-unit values to the HEA program PY14 participation rates to estimate the program's total *ex post* gross energy savings.

Table 40: Electric *Ex Post* Program Gross Savings

Measure	PY14 Participation	*Ex Post* Savings per Unit (kWh/yr)	Total *Ex Post* Savings (kWh/yr)
Electric Measures			
CFLs	11,522	28.5	328,445
LEDs	1,690	29.5	49,551
Smart Power Strips	88	51.7	4,550
Hot Water Setback Interactive Effect*	77	(11.0)	(845)
Ceiling Insulation (per home)	132	218.2	28,805
Windows (per home)	84	300.5	25,242
Air Sealing	11	527.2	5,799
Total	**13,604**	-	**441,546**

Table 41: Natural Gas *Ex Post* Program Gross Savings

Measure	PY14 Participation	*Ex Post* Savings per Unit (therm/yr)	Total *Ex Post* Savings (therm/yr)
Natural Gas Measures			
High-Efficiency Aerators	1,636	1.9	2,602
High-Efficiency Showerheads	869	16.1	14,230
Hot Water Pipe Wrap	737	13.7	9,770
Hot Water Setback	77	4.3	333
Ceiling Insulation (per home)	132	90.6	11,965
Windows (per home)	84	22.4	1,883
Air Sealing	11	55.9	615
Total	**3,546**	-	**41,013**

Table 42 lists the program's total gross *ex post* energy savings for both fuel types. Relative precision is reported at the 90% confidence level.

Table 42: Program Gross Realization Rates by Fuel Type

Fuel Type	*Ex Ante* Program Savings[1,2]	Realization Rate	*Ex Post* Program Savings	Precision at 90% Confidence
Electricity (MWh/yr)	700.9	63.0%	441.5	9.5%
Natural Gas (therm/yr)	54,516.3	78.3%	41,941.6	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 43 lists the program's net electricity impacts.

Table 43: PY14 Electricity Net Impact Results

Measure	*Ex Post* Gross Savings (MWh/yr)	Free Ridership	Participant Spillover	NPSO	NTG Ratio	Net Savings (MWh/yr)
Electricity	441.5	17.1%	1.6%	0.5%	85.0%	375.4

Table 44 lists the program's net natural gas impacts.

Table 44: PY14 Therm Net Impact Results

Measure	*Ex Post* Gross Savings therm/yr)	Free Ridership	Participant Spillover	NPSO	NTG Ratio	Net Savings (therm/yr)
Natural Gas	41,941.6	17.1%	1.6%	0.5%	85.0%	35,653.6

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 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 had plans to install the measure, but their decision about which product to purchase or when they would purchase it was influenced by the program. 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 45 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 freeridership for PY14. 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. Responses of "Yes," "No," or "Partial" relate to whether or not the specific response was indicative of free ridership.

Table 45: HEA program Incented Measure Free Ridership Results

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

Distribution of Free Ridership Scores

Figure 1 shows the distribution of insulation participant's free ridership scores. Approximately 79% of the survey respondents were scored as 0% free riders, while 11% were scored as 25% free riders. Fifty percent and 100% percent free riders each comprised 5% of the total survey sample. The overall insulation freeridership estimate is weighted by the evaluated gross program energy savings of each survey respondent.

Figure 1. Overall Distribution of HEA Insulation Incented Measure Free Ridership Scores (n=19)

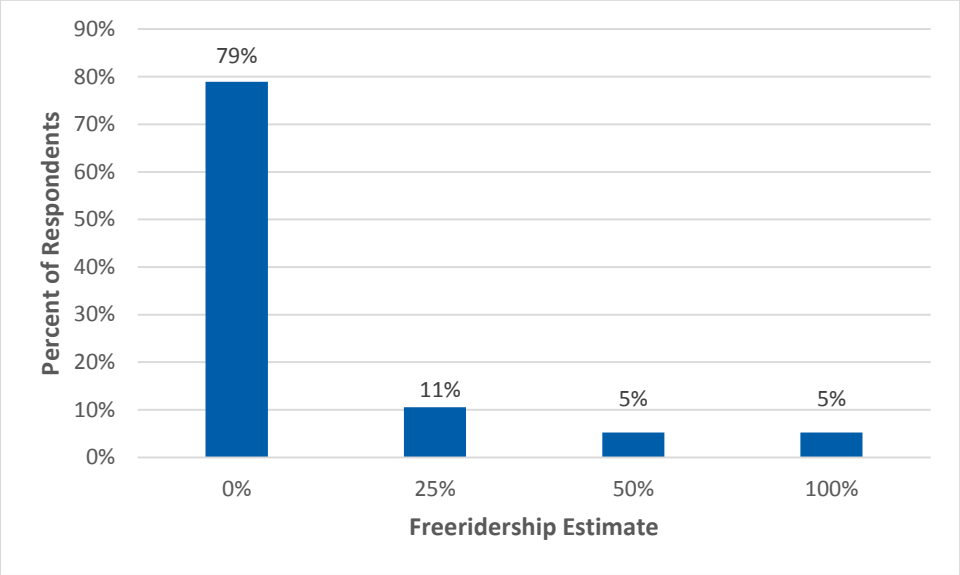
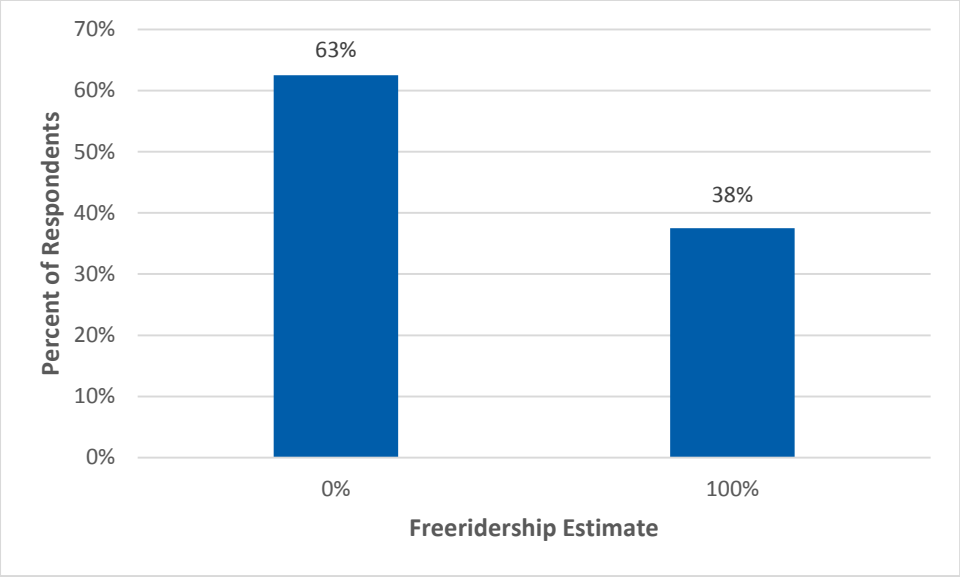


Figure 2 shows the distribution of windows participant's free ridership scores. Approximately 63% of the survey respondents were scored as 0% free riders and 38% of respondents were estimated as true free riders (100%). The overall windows free ridership estimate is weighted by the evaluated gross program energy savings of each survey respondent.

The windows measure realized a dramatic increase in free ridership in PY14 relative to PY13. The Cadmus team saw this free ridership reflected in open-ended responses from surveyed participants. Several surveyed participants explained the program did not affect their decision to install windows because they were already planning to do the upgrade for enhanced aesthetics, to replace inoperable windows, or to achieve energy savings. Additionally, one participant noted he became aware of the program from a sales person at Window World. These responses support the high free ridership calculated for the windows major measure.

Figure 2. Overall Distribution of HEA Windows Incented Measure Free Ridership Scores (n=8)



Direct Install Measure Free Ridership

The Cadmus team estimated free ridership for the HEA program direct-install measures.

CFL Free Ridership

Our method for assigning free ridership ratios for direct-install CFLs was based on survey responses. We used a free ridership curve and drew upon diffusion of innovation product-adoption concepts.[9] As shown in Table 46, at one end of the curve, we placed respondents who installed no CFLs before receiving them through the program; we assigned them a free ridership score of 0% for pre-installation of CFLs. At the other end of the curve, we placed respondents who installed 14 or more CFLs before receiving the audit; we assigned them a free ridership score of 100%.

[9] Previous NTG analyses (such as analyses performed in Indiana and Maryland) have used this approach with a free ridership curve (also referred to as a "Bass curve"). The Bass model consists of a simple differential equation that describes the process of a population's adoption of new products.

Table 46. CFL Pre-Installation Free Ridership Determined by Diffusion of Innovation Product Adoption

Number of Pre-Installed CFLs	Free Ridership Pre-Installation	Number of Customers with Pre-Installed CFLs (n=63)
0	0%	15
1	0%	5
2	5%	2
3	10%	3
4	20%	7
5	30%	12
6	40%	2
7	50%	1
8	60%	3
9	70%	0
10	80%	7
11	90%	0
12	95%	2
13	98%	0
14 or more	100%	4

In addition to applying the pre-installation free ridership percentage, we determined a planned-purchase free ridership percentage, based on the respondents 'reported intention to purchase CFLs for their homes *before* they received the audit. Table 47 shows the percentages used in the analysis.

Table 47: Planned-Purchase Free Ridership Scoring

If you had not received free CFLs during the Act On Energy HEA program in-home audit, do you think you would you have bought CFLs on your own within the next year?	Planned-Purchase Free Ridership
Yes, at roughly the same time	100%
Yes, within a few months	50%
Yes, within a year	25%
No	0%

Table 48 cross-references the number of participants with the free ridership results in Table 46 and Table 47.

Table 48: Number of Participants Cross-Referenced by Pre-Installed CFLs and Planned-Purchase Free Ridership

Number of Pre-Installed CFLs	Free Ridership Pre-Installation	Number of Participants per Planned-Purchase Free Ridership			
		100% (n=2)	50% (n=7)	25% (n=17)	0% (n=37)
0 (n=15)	0%	0	0	3	12
1 (n=5)	0%	0	0	1	4
2 (n=2)	5%	0	0	1	1
3 (n=3)	10%	0	0	2	1
4 (n=7)	20%	1	1	3	2
5 (n=12)	30%	0	2	3	7
6 (n=2)	40%	0	0	0	2
7 (n=1)	50%	0	1	0	0
8 (n=3)	60%	0	1	1	1
10 (n=7)	80%	0	0	3	4
12 (n=2)	95%	1	0	0	1
14 or more (n=4)	100%	0	2	0	2

Using a weighted average, we combined the pre-installation percentage with the planned-purchase percentages (shown in Table 46 and Table 47). We assigned past actions (the pre-installation free ridership percentages) twice as much weight as the planned action percentages (planned-purchase free ridership).From these per-participant weighted averages, we calculated an overall average, weighted by verified kWh savings across all 63 respondents. A 20.3% free ridership level resulted at ±16.6% absolute precision.

LED Free Ridership

The Cadmus team's method for assigning free ridership ratios for direct-install LEDs was based on participant survey responses. We used a free ridership curve and drew upon diffusion of innovation product-adoption concepts. As shown in Table 49, at one end of the curve, we placed respondents who installed no LEDs before receiving them through the program, assigning them a free ridership score of 0% for pre-installation of LEDs. At the other end of the curve, we placed respondents who installed 14 or more LEDs before receiving the audit, assigning them a free ridership score of 100%.

Table 49: LEDs Pre-Installation Free Ridership Determined by Diffusion of Innovation of Product Adoption

Number of Pre-Installed LEDs	Free Ridership Pre-Installation	Number of Customers with Pre-Installed LEDs (n=54)
0	0%	31
1	0%	3
2	5%	14
3	10%	1
4	20%	1
5	30%	2
6	40%	0
7	50%	0
8	60%	0
9	70%	0
10	80%	1
11	90%	0
12	95%	0
13	98%	0
14 or more	100%	1

We also determined a planned-purchase free ridership percentage, based on the respondents' reported intention to purchase LEDs for their homes *before* they received the audit. Table 50 shows percentages used in this analysis.

Table 50: Planned-Purchase Free Ridership Scoring

If you had not received free LEDs during the Act On Energy HEA program in-home audit, do you think you would you have bought LEDs on your own within the next year?	Planned-Purchase Free Ridership
Yes, at roughly the same time	100%
Yes, within a few months	50%
Yes, within a year	25%
No	0%

Table 51 cross-references the number of participants against the free ridership results shown in Table 49 and Table 50.

Table 51: Number of Participants Cross-Referenced by Pre-Installed LEDs and Planned-Purchase Free Ridership

Number of Pre-Installed LEDs	Free Ridership Pre-Installation	Number of Participants per Planned-Purchase Free Ridership			
		100% (n=0)	50% (n=5)	25% (n=8)	0% (n=40)
0 (n=31)	0%	0	1	5	25
1 (n=3)	0%	0	1	1	1
2 (n=13)	5%	0	0	1	13
3 (n=1)	10%	0	0	0	1
4 (n=1)	20%	0	1	0	0
5 (n=2)	30%	0	1	0	1
10 (n=1)	80%	0	0	1	0
14 or more (n=1)	100%	0	1	0	0

Using a weighted average, we combined the pre-installation percentage with the planned-purchase percentages (shown in Table 49 and Table 50). We assigned past actions (the pre-installation free ridership percentages) twice as much weight as the planned action percentages (planned-purchase free ridership).From these per-participant weighted averages, we calculated an overall average, weighted by verified kWh savings across all 54 respondents. A 6.3% free ridership level resulted at ±4.4% absolute precision.

Faucet Aerators Free Ridership

For each respondent who reported at least one of the faucet aerators installed by the auditor remained installed, we assigned a pre-installation free ridership score and a planned-installation free ridership score, and then combined these scores using a weighted average.

Pre-Installation Free Ridership Scores

Of 45 respondents who had at least one of the faucet aerators currently installed, 8 (18%) reported they already installed an aerator in their home before receiving the audit. Therefore, we assigned these respondents a pre-installation free ridership score of 100%.

We assigned a pre-installation free ridership score of 0% to the remaining respondents as they either did not have a faucet aerator installed prior to receiving the audit or they did not know if they had an aerator installed.

Planned-Purchase Free Ridership Scores

The Cadmus team assigned a planned-purchase free ridership score of 0% to all 45 respondents because they were not planning to buy a faucet aerator within the next year.

Calculation Methodology

For each respondent with at least one faucet aerators installed at the time of the survey, we calculated the free ridership score by taking a weighted average of the two scores described above, giving twice as much weight to the score for past actions as to the score for planned actions.

Using the free ridership score for 45 respondents, we calculated total average free ridership for the measure, weighing the scores based on verified energy savings. Across these respondents, the resulting free ridership percentage for the installed aerators averaged 9.5%, with a precision rate of ±5.7%. Table 52 presents the faucet aerator free ridership scoring.

Table 52: Faucet Aerator Free Ridership Scoring[1]

How many high-efficiency faucet aerators were you already using in your home, if any, before you received the audit?		If you had not received free faucet aerators during the Act On Energy HEA program in-home audit, how many, if any, would you have bought on your own within the next year?				
		Response	At roughly the same time (n=0)	Within a few months (n=0)	Within a year (n=0)	More than a year (n= 45)
		Score	100%	50%	25%	0%
Response	Score					
No or Don't Know (n=37)	0%		(n=0)	(n=0)	(n=0)	(n=37)
Yes (n=8)	100%		(n=0)	(n=0)	(n=0)	(n=8)
Average Free Ridership[2]						9.5%

[1]While the question asked respondents how many high-efficiency faucet aerators they had installed, the reported quantity was translated to whether or not they installed the measure at all.

[2]Weighted average based on verified energy savings.

Showerheads Free Ridership

For each respondent reporting at least one of the showerheads installed by the auditor remained installed, we assigned a pre-installation free ridership score and a planned-installation free ridership score, and then combined these scores using a weighted average.

Pre-Installation Free Ridership Scores

Of 42 respondents with at least one program high-efficiency showerhead currently installed, 8 (19%) reported installing a high-efficiency showerhead in the home before receiving the audit. Therefore, we assigned this respondent a pre-installation free ridership score of 100%.

We assigned a pre-installation free ridership score of 0% to the remaining respondents as they either did not have a high-efficiency showerhead installed prior to receiving the audit or they did not know whether they had one installed.

Planned-Purchase Free Ridership Scores

We assigned a planned-purchase free ridership score of 0% to 39 (93%) respondents who currently had at least one showerhead installed, *but* who did not plan to buy a high-efficiency showerhead for their home within the next year.

We assigned a 50% planned-purchase free ridership score to one respondent who planned to purchase a showerhead within the next few months.

We assigned a 25% planned-purchase free ridership score to two respondents as they planned to purchase a showerhead within a year.

Calculation Methodology

For each respondent with at least one high-efficiency showerhead installed at the time of the survey, we calculated the free ridership score by taking a weighted average of the scores described above, giving twice as much weight to the score for past actions as to the score for planned actions.

Using the free ridership score for 42 respondents, we calculated total average free ridership for the measure, weighing the scores based on verified energy savings. Across these respondents, the resulting free ridership percentage for the installed showerheads averaged 15.9%, with a precision rate of ±8.3%. Table 53 presents the showerhead free ridership scoring.

Table 53: Showerhead Free Ridership Scoring[1]

How many high-efficiency showerheads were you already using in your home, if any, before you received the audit?		If you had not received high-efficiency showerheads during the Act On Energy HEA program in-home audit, how many, if any, would you have bought on your own within the next year?				
		Response	At roughly the same time (n=0)	Within a few months (n=1)	Within a year (n=2)	More than a year (n= 39)
		Score	100%	50%	25%	0%
Response	Score					
No or Don't Know (n=34)	0%		(n=0)	(n=1)	(n=2)	(n=31)
Yes (n=8)	100%		(n=0)	(n=0)	(n=0)	(n=8)
Average Free Ridership[2]						15.9%

[1]While the question asked respondents how many high-efficiency showerheads were installed, the reported quantity was translated to whether or not they installed the measure at all.

[2]Weighted average based on verified energy savings.

Smart Strips Free Ridership

Ameren Missouri removed the smart strip measure midway through PY14. Consequently, we did not receive PY14 participant survey feedback on smart strips. Instead, we are using the PY13 smart strip free ridership results as a proxy. The PY13 free ridership results are described below.

For each respondent reporting at least one of the smart strips installed by the auditor remained installed, the Cadmus team assigned a pre-installation free ridership score and a planned-installation free ridership score, and then combined these scores using a weighted average.

Pre-Installation Free Ridership Scores

Of 29 respondents who had at least one of the smart strips currently installed, 17% reported they had installed the item in their home before receiving the audit. Therefore, the Cadmus team assigned these five respondents a pre-installation free ridership score of 100%.

We assigned a pre-installation free ridership score of 0% to the remaining respondents as they either did not have a smart strip installed prior to receiving the audit or they did not know if they had one installed.

Planned-Purchase Free Ridership Scores

We assigned a planned-purchase free ridership score of 0% to the 26 respondents who currently had at least one of the smart strips installed, *but* who did not plan to buy a smart strip for their home within the next year.

We assigned a 50% planned-purchase free ridership score to three respondents as they planned to purchase a smart strip within the next few months.

Calculation Methodology

For each respondent with at least one smart strip installed at the time of the survey, we calculated the free ridership score by taking a weighted average of the two scores described above, giving twice as much weight to the score for past actions as to the score for planned actions.

Using the free ridership score for the 10 respondents, we calculated total average free ridership for the measure, weighing the scores based on verified energy savings. Across these respondents, the resulting free ridership percentage for the installed smart strips averaged 13.2%, with a precision rate of ±0.8%. Table 54 presents the showerhead free ridership scoring.

Table 54: Smart Strip Free Ridership Scoring[1]

How many smart strips were you already using in your home, if any, before you received the audit?		If you had not received free smart strips during the Act On Energy HEA program in-home audit, how many, if any, would you have bought on your own within the next year?				
		Response	At roughly the same time (n=0)	Within a few months (n=3)	Within a year (n=2)	More than a year (n= 26)
		Score	100%	50%	25%	0%
Response	**Score**					
No or Don't Know (n=24)	0%		(n=0)	(n=0)	(n=0)	0% (n=24)
Yes (n=5)	100%		(n=0)	83% (n=3)	(n=0)	67% (n=2)
Average Free Ridership[2]						13.2%

[1]While the question asked respondents how many smart strips were installed, the reported quantity was translated to whether or not they installed the measure at all.

[2]Weighted average based on verified energy savings.

Water Heat Pipe Wrap Free Ridership

For each respondent reporting that water heat pipe wrap installed by the auditor remained installed, the Cadmus team assigned a pre-installation free ridership score and a planned-installation free ridership score, and then combined these scores using a weighted average.

Pre-Installation Free Ridership Scores

Of 54 respondents with water heat pipe wrap currently installed, 28% reported they already had water heater pipe wrap installed before receiving the audit. Therefore, we assigned these 15 respondents a pre-installation free ridership score of 100%.

We assigned a pre-installation free ridership score of 0% to the remaining respondents as they either did not have water heater pipe wrap installed prior to receiving the audit or they did not know if they had it installed.

Planned-Purchase Free Ridership Scores

We assigned a planned-purchase free ridership score of 0% to 46 respondents who currently had water heater pipe wrap installed, *but* who did not plan to buy water heat pipe wrap within the next year.

We assigned a 100% planned-purchase free ridership score to one respondent as they planned to purchase water heater pipe wrap at roughly the same time of the installation.

We assigned a 50% planned-purchase free ridership score to five respondents as they planned to purchase water heater pipe wrap within a few months of the original installation. Two respondents were

assigned a 25% planned-purchase free ridership score because they would have installed the pipe wrap within a year of the original installation date.

Calculation Methodology

For each respondent with water heater pipe wrap installed at the time of the survey, the Cadmus team calculated the free ridership score by taking a weighted average of the two scores described above, giving twice as much weight to the score for past actions as to the score for planned actions.

Using the free ridership score for the 54 respondents, we calculated total average free ridership for the measure, weighing the scores based on verified energy savings. Across these respondents, the resulting free ridership percentage for the installed water heat pipe wrap averaged 20.4%, with a precision rate of ±7.0%. Table 55 presents the water heater pipe wrap free ridership scoring.

Table 55: Water Heater Pipe Wrap Free Ridership Scoring

Did you already have water heater pipe wrapping installed before you received the Act On Energy HEA program in-home audit?		If you had not received the free water heater wrap during the Act On Energy HEA program in-home audit, would you have bought it on your own within the next year?				
		Response	At roughly the same time (n=1)	Within a few months (n=5)	Within a year (n=2)	More than a year (n= 46)
		Score	100%	50%	25%	0%
Response	Score					
No or Don't Know (n=39)	0%		(n=0)	(n=3)	(n=1)	(n=35)
Yes (n=15)	100%		(n=1)	(n=2)	(n=1)	(n=11)
○ Average Free Ridership[1]						20.4%

[1]Weighted average based on verified energy savings.

Water Heater Setback Free Ridership

Ameren Missouri removed the water heater setback measure midway through PY14. Consequently, we did not receive PY14 participant survey feedback on this measure. Instead, we are using the PY13 water heater setback free ridership results as a proxy. The PY13 free ridership results are described below.

For each respondent who reported their water heat temperature was turned down by the auditor and the settings remained in place, we estimated a planned-installation free ridership score.

Planned-Purchase Free Ridership Scores

We assigned a planned-purchase free ridership score of 0% to 18 respondents with their hot water temperature turned down by the auditor, *but* did not planning turn it down themselves within the next year in the audit's absence.

We assigned a 50% planned-purchase free ridership score to two respondents because they planned to turn down the temperature on their hot water heater within the next few months.

Calculation Methodology

For each respondent whose water heater temperature remained turned down at the time of the survey, we calculated the free ridership score by using the planned-purchase free ridership score.

Using the planned-purchase free ridership score for the 21 respondents, we calculated total average free ridership for the measure, weighing the scores based on verified energy savings. The resulting free ridership percentage for the hot water temperature turndown averaged 9.5%, with a precision rate of ±9.2%. However, we did not use the self-report survey-based free ridership score estimated for the water heater temperature turndown as it is a no-cost measure and presumably auditors only turned down water heaters not already turned down. We assume free ridership of 0% for net impact purposes.

Participant Spillover

To calculate spillover, the Cadmus team asked HEA program participants if they undertook any additional energy-efficient actions since participating in the program. Then we asked them to rate how important receiving the in-home audit was to their decisions to purchase subsequent energy-efficient equipment.

We considered measures attributable to program spillover only if the respondent's answer to the question was *important*. Five survey respondents reported they installed additional energy-efficient measures for which their participation in the HEA program was *important* to their purchasing decisions. These measures were a refrigerator, dehumidifier, two insulation installations and two pipe wrap installations.

We also eliminated responses that indicated the respondent received an incentive through another Ameren Missouri Missouri program to avoid double-counting savings already counted by a concurrent program.

Several respondents indicated they purchased CFLs or LED bulbs. We did not, however, include these lighting measures in our analysis to avoid double-counting savings that are already being claimed through the upstream lighting program. The lighting spillover analysis from the home inventory study accounted for non-program bulbs purchased by Ameren Missouri customers.

We applied deemed savings estimates to the refrigerator, freezer, insulation, and pipe wrap measures, arriving at total survey sample spillover savings.

Next, we divided the sample spillover savings by the program gross savings from the survey sample, as described in this equation:

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

This yielded a program-level spillover estimate of 1.6%, with the details presented in Table 56.

Table 56: Participant Spillover by Data Collection Method and Measure

Program Measure	Participant Spillover Electric BTU Savings	Participant Spillover Gas BTU Savings	Total Participant Spillover BTU Savings	Total Survey Sample Program BTU Savings	Spillover
ENERGY STAR® Refrigerator	344,626	0	344,626	290,591,762	1.6%
ENERGY STAR® Dehumidifier	600,537	0	600,537		
Insulation	690,652	0	690,652		
Pipe Wrap	0	2,942,455	2,942,455		
All	**1,635,815**	**2,942,455**	**4,578,270**	**290,591,762**	**1.6%**

Nonparticipant Spillover

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

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

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

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

Methodology

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

We also limited the NPSO analysis to the same efficiency measures rebated through Ameren Missouri programs (known as "like" spillover). Examples 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 represent electric spillover savings, Cadmus asked customers questions about fuel type for water heaters, heating systems, and cooling systems. Only savings associated with measures where there was a corresponding electric water heater, electric heat, or central air conditioning were counted as spillover in the analysis.

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

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

Results

Of 365 nonparticipants surveyed, 11 cited Ameren Missouri's marketing as "very important" or "somewhat important" in their decisions to purchase non-rebated, high-efficiency measures during 2013.[10]

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

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

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

Table 57 shows measures and PY13 gross evaluated kWh savings attributed to Ameren Missouri, with average savings per spillover measure of 242 kWh.

Table 57: NPSO Response Summary

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

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

To arrive at a single savings estimate (Variable A in Table 58), the Cadmus team used numbers in the Total kWh Savings column to calculate an average for the 11 measures assessed for NPSO. Thus, the estimate of 242 kWh 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 2013, we used the following variables (as shown in Table 58):

- **A** is the average kWh savings per NPSO response.
- **B** is the number of NPSO measures attributed to the program.
- **C** is the number of nonparticipants contacted by the survey implementer.
- **D** is Ameren Missouri's total residential customer population.
- **E** is NPSO energy savings, extrapolated to the customer population, and calculated by dividing B by C, and then multiplying the result by A and D.
- **F** is Ameren Missouri's total reported 2014 program year *ex ante* gross savings for Appliance Recycling, HVAC, Lighting, Home Energy Performance, and Efficient Products. (Similarly to PY13, the PY14 analysis did not include the Low Income and New Homes programs.)11
- **G** (representing NPSO as a percentage of total evaluated savings) is the nonparticipant percentage used in the NTG calculations.

Using this information, the Cadmus team estimated overall, portfolio-level NPSO at 3.6% of total PY14 reported *ex ante* gross savings, as shown in Table 58. While, in percentage terms, a larger amount than last year (2.8% in PY13), this NPSO value represents the same number of MWH NPSO savings (7,592); it is only larger because total reported gross savings were lower in PY14. As discussed, the program's marketing expenditure in PY14—the primary driver of NPSO—was nearly identical ($1.55M vs. $1.53M) between PY13 and PY14.

Table 58: NPSO Analysis

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

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

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

as well as programs' designs and scales, an alternate approach likely produces a better attribution estimate.

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

1. **Even Allocation**: The most straightforward approach, this allocates NPSO evenly across residential programs (i.e., makes a 3.6% adjustment to each program's NTG). Doing so, however, is equivalent to applying NPSO at the portfolio-level, which, as noted, assumes all programs contribute equally to generating NPSO.
2. **"Like" Programs:** This approach allocates NPSO savings to specific programs, based on the measure installed by the nonparticipant or by the action they took. For example, one nonparticipant reported tuning up their CAC, based on energy-efficiency messaging from Ameren Missouri. Using this approach, we would assign NPSO savings associated with an HVAC tune-up. While this approach establishes a clear connection between a reported NPSO measure and Ameren Missouri's program promoting that measure, our research has found this direct measure-program relationship does not prove as straightforward as it appears. Specifically, while our study found all 11 respondents reporting NPSO were familiar with Act on Energy or Ameren Missouri's energy-efficiency messaging, only nine could cite specific program names. Further, just over one-half of the customers (six of 11) reporting NPSO measures were unfamiliar with the program or the programs corresponding to the measure they installed. These findings indicate Ameren Missouri generated NPSO through the cumulative effects of various program-specific and portfolio-level marketing efforts. Mapping NPSO measures solely to the program offering that measure could undervalue overall impacts of cumulative and sustained energy-efficiency messaging.
3. **Marketing Budget and Program Size.** The final allocation approach the Cadmus team considered—and eventually chose to use—assigns overall NPSO as a function of each program's marketing and program budget. This approach remains consistent with the theory that NPSO results from the cumulative effect of program-specific and Act On Energy marketing and program activity over a period of time, not necessarily by a single, program-specific marketing effort. In addition, while NPSO most commonly is associated with mass media marketing campaigns, the scale of program activity proves to be a factor. For example, even without a significant marketing campaign, a program's size can drive NPSO through word-of-mouth and in-store program messaging. We find this approach accurately reflects and attributes NPSO to programs, ensuring proper accounting for total costs (including marketing) and total benefits (net savings, including NPSO) when assessing overall program cost-effectiveness.

The Cadmus team distributed the portfolio-level result of 7,592 MWh NPSO to Ameren Missouri's residential programs (excluding Low Income and New Homes). As noted, we considered the PY14 program size (in terms of total gross *ex ante* MWh savings) and each program's marketing budget (as shown in Table 59) when allocating NPSO across programs.

Table 59: Program-Specific Savings and Marketing

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

The results of this approach—shown in Table 60 and Table 61—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 60: Combined Savings and Marketing Allocation Approach

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

Analysis credited two programs with the greatest NPSO: HVAC (accounting for over one-half of all marketing dollars) at 5,171 MWh; and Lighting (accounting for 70% of total energy savings) at 1,799 MWh. As NPSO impacts program-specific NTG results,[12] all NPSO estimates have been reported as a percentage of each program's total gross energy savings.

As shown in Table 61, the Cadmus team allocated 3 MWh of NPSO to HEA program, representing less than one-tenth of a percent (0.04%) of the combined residential portfolio savings and marketing expenditure. This resulted in a 0.5% adjustment to the program's PY14 NTG—findings generally similar to the PY13 NPSO analysis.

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

Table 61: NPSO by Program

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

Ex Post NTG

To estimate the overall program NTG ratio, the Cadmus team used total population *ex post* gross kWh savings to weight results for each measure type in order. Table 62 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 84.8% for the program overall.

Table 62: NTG by Measure

Measure	% of Program Savings	Free Ridership	Participant Spillover	NPSO	NTG
CFL	18.4%	20.3%	1.6%	0.5%	81.8%
LED	3.1%	6.3%			95.8%
Faucet Aerator	4.8%	9.5%			92.6%
Showerhead	21.6%	15.9%			86.2%
Smart Strips	0.4%	13.2%			88.9%
WH Pipe Wrap	18.2%	20.4%			81.7%
WH Temperature Setback	0.1%	0.0%			102.1%
Insulation - Incented	28.2%	10.9%			91.2%
Windows - Incented	5.3%	46.1%			56.0%
Total	**100.0%**	**17.1%**	**1.6%**	**0.5%**	**85.0%**

Benchmarking

The Cadmus team researched other utilities that offered similar measures as Ameren Missouri Missouri's HEA program. Table 63 and Table 64 compare—by measure type—the participation levels and gross and net savings of those utilities with Ameren Missouri.

On a savings-per-participant metric, the HEA program performed very similarly to the previous year with approximately 0.45 MWh/yr per participant. This shows the HEA continues to perform strongly as only the program implemented by Georgia Power had a higher savings per participant (1.17 MWh/yr per participant). The Georgia Power program began operating in 2007, which has allowed the program to build recognition. The design of the Georgia Power program also differs in that it only offered rebated measures and rebates for whole-house energy reduction performance. Therefore, each measure implemented by Georgia Power's program achieves greater savings than most measures implemented by the HEA program.

Table 63: HEA Program Benchmarking Results: Electricity Saving

State or Utility	Participation	*Ex Post* Savings (MWh/yr)	NTG	Net Savings (MWh/yr)
Ameren Missouri	959	511.7	0.85	433.9
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 64: HEA Program Benchmarking Results: Natural Gas Saving

State or Utility	Participation[1]	*Ex Post* Savings (therm/yr)	NTG	Net Savings (therm/yr)
Ameren Missouri	3,546	42,473	0.85	36,017
Ameren Illinois[2]	1,455	4,816	N/A	N/A
Idaho Power Company	650[3]	1,905	0.92	1,753
East North Central Utility[4]	415[3]	43,545	0.81	35,272

[1]Represents implemented measures unless otherwise noted.

[2]2008 program year.

[3]Participation represents program participants.

[4]Report is not publicly available.

Cost-Effectiveness Results

MMP utilized DSMore to analyze the PY14 HEA program's cost-effectiveness. MMP assessed cost-effectiveness using the following five tests, as defined by the California Standard Practice Manual:[13]

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

DSMore takes hourly prices and hourly energy savings from specific measures installed through the HEA program, and correlates prices and savings to 30 years of historic weather data. Using long-term weather ensures the model captures low probability, high consequence weather events and appropriately values them. As a result, the model's produces an accurate evaluation of the demand-side efficiency measure relative to other alternative supply options.

Table 65 lists key assumptions the Cadmus team used in the analysis, and the source of each assumption.

Table 65: Key Assumptions for Cost-effectiveness Analysis

Assumptions	Source
Discount Rate = 6.95%	Ameren Missouri 2012 MEEIA Filing (2013 – 2015 Energy Efficiency Plan)
Line Losses = 5.72%	
Summer Peak occurred during the 16th hour of a July day, on average.	
Avoided Electric T&D = $31.01/kW	
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.	

In addition, MMP leveraged the "Batch Tools" (model inputs) used by Ameren Missouri in its original analysis as input into the *ex post* DSMore analysis. Starting with the original DSMore Batch Tool used by Ameren Missouri and only modifying it with new data from the evaluation (PY14-specific HEA program participation counts, per-unit gross savings, and NTG) ensured consistency. In particular, assumptions in the model are driven by measure load shapes, which tell the model when to apply savings during the day. This ensures the load shape for that end use matches the system peak impacts of that end use and provides the correct summer coincident savings. MMP used measure lifetime assumptions and

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

incremental costs based on the program's database, the Ameren Missouri Missouri TRM, or the original Batch Tool.

Acquiring PY14 Ameren Missouri program spending data proved a key step in the analysis process: 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 is useful for planning purposes, it is unnecessary for cost effectiveness modeling, as the results are based on the program overall.

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

Table 66 summarizes cost-effectiveness findings by test. Any benefit/cost score above 1.0 passed the test as cost-effective. In addition, the table includes the net present value (in 2013 dollars) of the UCT net lifetime benefits (net avoided costs minus program costs). The HEA program only passes the PART test and generated negative UCT net lifetime benefits.

Table 66: Cost-Effectiveness Results (PY14)

	UCT	TRC	RIM	Societal	PART	UCT Net Lifetime Benefits Less Costs
Home Energy Analysis	0.75	0.58	0.38	0.74	2.47	($77,106)

Appendix A. *Ex Post* Demand Reductions

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

Table 67: PY14 Summary: Net *Ex Post* Per-Unit Demand Reductions

Measure	PY14 Participation	Per-Unit Net *Ex Post* Demand Reduction (kW)	Total Net *Ex Post* Savings (kW)*
CFLs	11,522	0.0013	13.07975
LEDs	1,690	0.0012	1.844993
Smart Power Strips	88	0.0072	0.569467
Ceiling Insulation	132	0.0854	10.10635
Windows	84	0.1176	8.856102
Air Sealing	11	0.2063	2.03472
Water Heater Setback	77	0.0000	0
Total	**13,604**	**0**	**36**

*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. The PY14 interviews planned for the summer of 2014 are intended to provide feedback on the second program year. The interview will assess the program and identify recommendations for improving subsequent program years. The PY14 evaluation will focus on the successes and failures of the Home Energy Analysis (formerly PerformanceSavers) within Ameren Missouri's residential portfolio.

Introduction

1. Please describe any significant changes to your primary responsibilities, regular tasks, and time commitments for Ameren Missouri Missouri's Home Energy Analysis Program.
    - If so, is your schedule more or less focused on this program?

Program Design and Implementation

2. Have any significant changes occurred in communication, both formal and informal, between Honeywell and Ameren Missouri?
3. Can you describe any changes to the program's tracking database use and complexity?
    - How is the integration process with Ameren Missouri's Vision database progressing?
4. What would you say worked particularly well in PY14? Why is that?
5. Conversely, what did not work as well as anticipated? Why is that?
6. Have there been any changes to the program design since the launch of the PerformanceSavers and rebranding as Home Energy Analysis?
    - Is the program still being operated as a pilot?
    - Are there any program design changes made to date that have either caused challenges or increased facilitation of the program's implementation?
7. The program realized a strong uptake of major measures in PY2014.
    - What factors do you believe are responsible for this uptake? [Probe with possible answers if needed: rebates, direct install measures, assessment process, assessment report, etc.?]
    - Which major measures were particularly well received? Please explain.

Program Goals

8. Were there changes in program performance expectations for PY14?

9. What were the program's participation and savings goals for PY14? (Confirm that the PY13 goals were adjusted due to underperformance and how that impacted the PY14 goals).
10. In your opinion, how did the program performed so far in PY14 (in terms of both savings/participation and other non-savings/participation goals)?

Measures

11. Did you anticipate any impacts (other than lost energy savings) to the program after smart strip or the water heater setback measures are removed from the program, such as participation, customer satisfaction, etc.?
12. In your opinion, should any additional measures be considered for inclusion in HEA? If so, what measures? (Probe: did HVAC contractors regularly request a specific measure not included in the program? If so, what measure? Did home-owners?)
13. Conversely, should any current measures be excluded?

Marketing Efforts

14. Did you observe any impact due to the program name change? If yes, please describe.
15. Were there any changes made to the marketing strategy for the program in PY2014 (e.g., target customer or market)? If yes, please describe.
16. Were there any new challenges in PY14 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?
17. Were you satisfied with the response to Home Energy Analysis marketing efforts so far in PY2014?

Program Partners

18. Was the number of auditors sufficient to keep up with audit demand in PY14?
19. Is the number of certified program contractors sufficient to meet the demands of the program?
20. What have been the key challenges and lessons in engaging qualified contractors?
21. What feedback have you received on the performance of the program certified contractors?

Quality Control

22. Please explain any changes to the program's quality control process.

Customer Feedback

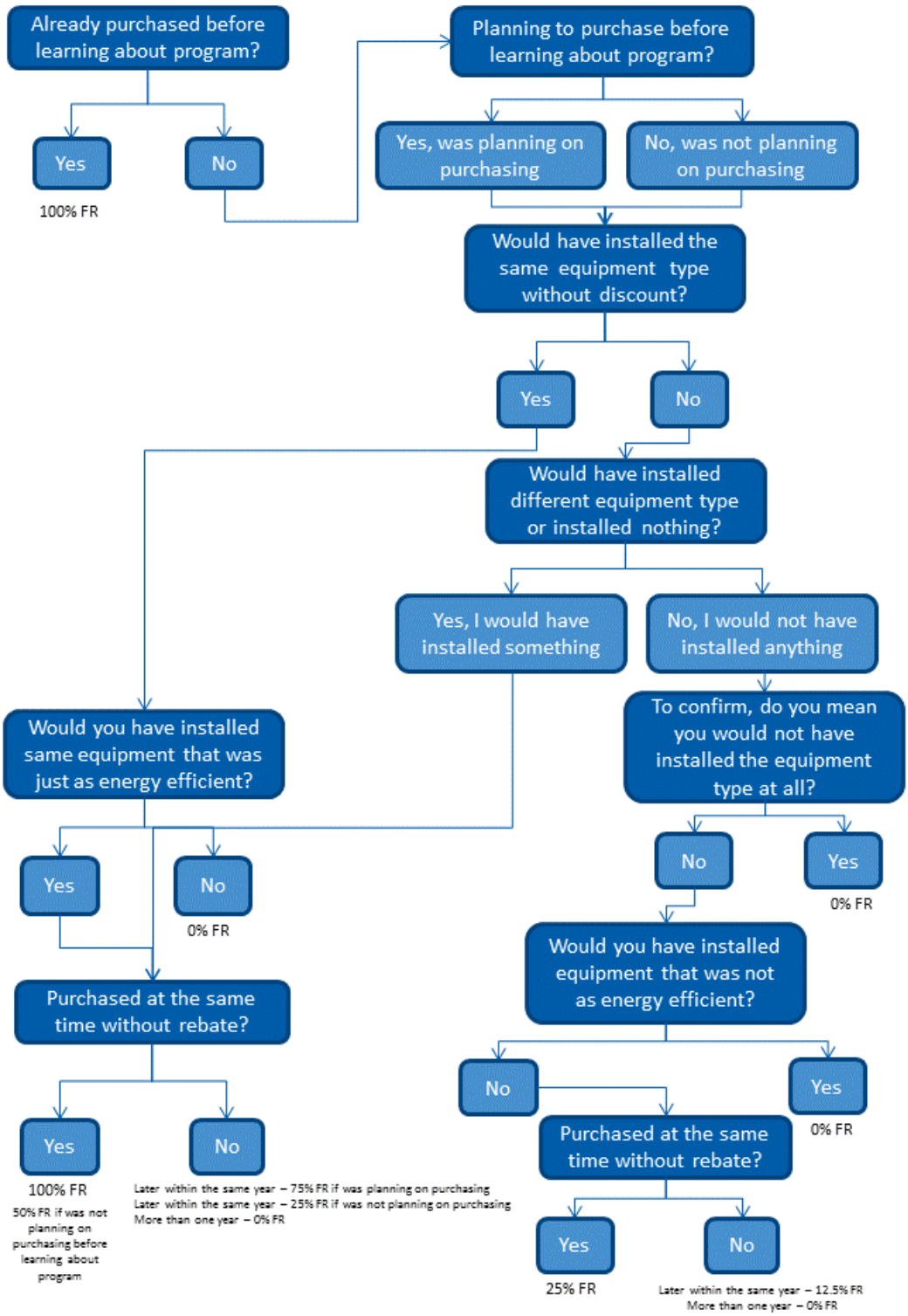
23. Have PY14 customers expressed opinions about the $25 audit fee? What about the incentive amounts for the rebated measures?
24. Do you think your customers continue to understand the energy-related recommendations presented to them in the home energy audit report?

25. Are there any recurring or common customer praises or complaints? If so, what are they?
26. Follow up: Any issues regarding time to complete audit, number of call backs, etc.

Summary

27. From your perspective, what are the biggest challenges facing the program in PY15?
28. What do you consider as the main lessons learned since the program kicked off in 2013?

Appendix C. Freeridership Scoring Flow Chart



Appendix D. Incented Measure Free Ridership Scoring Tables

Table 68 illustrates how initial survey responses are translated into the responses "yes," "no," or "partially" to indicate free ridership (in parentheses).

Table 68: 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 69 shows how the string of responses from Table 68 is then translated into a free ridership score.

Table 69: 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 70.

Table 70: 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 71: 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 72: 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 Error! Reference source not found., 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 SHOULD NOT BE FORCING THE SUM TO MATCH –
CHECK THAT 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 SHOULD NOT 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 0**5]**

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