Ameren Missouri Lighting Impact and Process Evaluation:

Program Year 2016

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AMENDED July 24, 2017

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Table of Contents

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Executive Summary

Ameren Missouri engaged Cadmus to perform annual process and impact evaluations of the Lighting program for a three-year period, from 2016 through 2018. This annual report covers the impact and process evaluation findings for Program Year 2016 (PY16), the period from March 1, 2016, through February 28, 2017—the first year of the three-year program cycle.

Program Description

The Lighting program's design seeks to increase sales of energy-efficient lighting products through a variety of retail channels. Ameren Missouri hired ICF International (ICF), as the Lighting program implementer, to provide a per-unit discount for eligible LEDs. In addition to reducing prices, ICF worked with participating retailers to place discounted lighting in prominent locations within stores and to locate Ameren Missouri signage and marketing materials nearby. The Lighting program operates through a point-of-sale markdown system at major chain retailers and through an online website. Table 1 shows measure categories eligible for program discounts as well as the participation in each measure category in PY16.

Table 1. PY16 Lighting Program Activity

Measure	PY16 Participation
General Purpose	
10W General Purpose	540,965
15W General Purpose	12,482
20W General Purpose	44,727
Decorative	
4W Candelabra	78,090
8W Globe	13,627
Special Function (EISA Exempt)	
12W Dimmable	6,198
Reflector	
10.5W Downlight	5,799
15W Flood (PAR 30)	215,125
Total	**917,013**

Key Impact Evaluation Findings

The following sections describe Cadmus's key findings for the PY16 evaluation period.

Program Data Adjustments

Cadmus identified tracking errors for fewer than 0.3% of program bulbs reported.

Gross Impacts

Table 2 summarizes PY16 participation, *ex post* gross per-unit savings, realization and installation rates, and *ex post* total gross savings. Realization rates ran between 90% and 100% for all measures.

Table 2. PY16 Gross Impact Results Summary

Measure	PY16 Total Participation	Per-Unit *Ex Post* Savings (kWh/yr)	Realization Rate[1]	Total *Ex Post* Gross Savings (MWh/yr)	Total *Ex Post* Gross Demand Reduction (kW/yr)[2]
General Purpose					
10W General Purpose	540,965	35.0	91.6%	18,926	2,847
15W General Purpose	12,826	46.0	92.1%	591	89
20W General Purpose	44,727	62.0	93.2%	2,773	417
Decorative					
4W Candelabra	78,090	39.1	93.0%	3,050	459
8W Globe	13,627	39.2	91.7%	535	80
Special Function (EISA Exempt)					
12W Special Function	6,198	72.6	93.4%	450	68
Reflector					
10.5W Downlight	5,799	39.2	96.0%	227	34
15W Flood (PAR 30)	214,781	55.3	92.1%	11,887	1,788
Total [3]	**917,013**			**38,439**	**5,782**

[1] Realization rates compare evaluated per-unit gross savings to the estimated per-unit gross savings in the Ameren Missouri 2017 TRM.

[2] The Non-Unanimous Stipulation and Agreement in File No. EO-2015-0055 states: "Only measures that are expected to deliver energy savings in 2023 and beyond are counted towards the demand goal in the EO included in Appendix A." Cadmus referenced the Ameren Missouri TRM for secondary data on measure EUL in order to assess whether or not measures are sufficiently long-lived to apply the stipulated energy to-demand ratio to determine 2023-persistent kW savings.

[3] Gross savings may not sum to total due to rounding.

Net Savings

As shown in Table 3, the Lighting program achieved net savings of 25,562 MWh in PY16, which results in an overall savings-weighted net-to-gross (NTG) ratio of 63.5% [excluding nonparticipant spillover (NPSO)].

Table 3. PY16 Net Impact Results Summary

Measure Group	Ex Post Gross Savings (MWh/yr)	Free Ridership	Like Spillover	Net Savings (MWh/yr)	Net Savings (kW/yr)[1]
10W General Purpose	18,926	41.0%	4.4%	12,002	1,806
15W General Purpose	591	41.0%	4.4%	375	56
20W General Purpose	2,774	41.0%	4.4%	1,759	265
4W Candelabra	3,050	58.0%	4.4%	1,416	213
8W Globe	535	58.0%	4.4%	248	37
12W Special Function	450	58.0%	4.4%	209	31
10.5W Downlight	227	35.0%	4.4%	158	24
15W Flood (PAR 30)	11,887	35.0%	4.4%	8,251	1,241
NPSO				**1,144**	**456**
Total [2]	**38,439**			**25,562**	**4,130**

[1] The Non-Unanimous Stipulation and Agreement in File No. EO-2015-0055 states: "Only measures that are expected to deliver energy savings in 2023 and beyond are counted towards the demand goal in the EO included in Appendix A." Cadmus referenced the Ameren Missouri TRM for secondary data on measure EUL in order to assess whether or not measures are sufficiently long-lived to apply the stipulated energy to-demand ratio to determine 2023-persistent kW savings.
[2] Savings may not sum to total due to rounding.

Progress Against Goals

As shown in Table 4, the PY16 program achieved 102.6% of its 24,923 MWh net energy savings target, as specified in the Ameren Missouri's residential tariff, and 111.3% of its net demand savings target of 3,711 kW.[1] Appendix A presents the coincidence factors used to calculate the program's demand savings.

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[1]   Union Electric Company. Electric service applying to residential energy efficiency in Missouri service area. Effective March 1, 2016. Available at: https://q9u5x5a2.ssl.hwcdn.net/-/Media/Missouri-Site/Files/rates/UECSheet211EEResResidentialEE.pdf?la=en

Table 4. PY16 Lighting Savings Comparisons

Metric	MPSC-Approved Target	Planning Gross Savings Utility Reported[1]	*Ex Post* Gross Savings Determined by EM&V[2]	*Ex Post* Net Savings Determined by EM&V[3]	Percent of Goal Achieved[4]
Energy (MWh)	24,923	27,810	38,439	25,562	103%
Demand (kW)[5]	3,711	4,151	5,782	4,130	111%

[1] Calculated by applying verified program activity to PY16 Lighting Program tracking data.

[2,] MWh calculated by applying verified program activity to the Cadmus team's evaluated savings values; kW calculated by applying coincident factors provided in Appendix A.

[3] Calculated by multiplying the team's evaluated gross savings and evaluated NTG ratio and adding total program NPSO.

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

[5] The Non-Unanimous Stipulation and Agreement in File No. EO-2015-0055 states: "Only measures that are expected to deliver energy savings in 2023 and beyond are counted towards the demand goal in the EO included in Appendix A." Cadmus referenced the Ameren Missouri TRM for secondary data on measure EUL in order to assess whether or not measures are sufficiently long-lived to apply the stipulated energy to-demand ratio to determine 2023-persistent kW savings.

CSR Impact Evaluation Requirements

According to the Missouri Code of State Regulations (CSR),[2] demand-side programs that operate as part of a utility's preferred resource plan are subject to ongoing process and impact evaluations that meet certain criteria. Specifically, the CSR requires that impact evaluations of demand-side programs satisfy the requirements listed in Table 5. The table also indicates data that Cadmus used to satisfy these impact CSR evaluation requirements for the Lighting program. (Table 6 provides a summary of the process CSR requirements.)

Table 5. Summary Responses to CSR Impact Evaluation Requirements

CSR Requirement	Method Used	Description of Program Method
Approach: The evaluation must use one or both of the following comparisons to determine the program impact:		
Comparisons of pre-adoption and post-adoption loads of program participants, corrected for the effects of weather and other intertemporal differences	x	The program compares the pre-adoption load based on assumed baseline technology with the post-adoption load based on program technology, and estimates hours of use (based on metered data adjusted for time of year) and waste-heat impact (based on equipment simulation).
Comparisons between loads for program participants and an appropriate control group over the same period		
Data: The evaluation must use one or more of the following types of data to assess program impact:		
Monthly billing data		

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[2]   State of Missouri. "Administrative Rules: Missouri Code of State Regulations." Revised January 2016. Available online: http://www.sos.mo.gov/adrules/csr/csr.asp

Hourly load data		
Load research data		
End-use load metered data	x	Metered lighting hours of use by room in a sample of homes in the program area during 2010.
Building and equipment simulation models	x	Simulation modeling to determine the waste-heat impact of efficient lighting.
Survey responses	x	Surveyed residential customers on purchasing practices and date of purchase of efficient technology to determine leakage and residential use rates; surveyed households to determine saturation of LEDs and installation rates (2015).
Audit and survey data on:		
Equipment type/size efficiency	x	Evaluation team conducted an audit of all lighting in sample of homes in program area (2015).
Household or business characteristics	x	Evaluation team collected household characteristics from homes participating in lighting audit: home type, own/rent home (2015)
Energy-related building characteristics		

Key Process Evaluation Findings

Cadmus conducted interviews with program stakeholders, reviewed program tracking data and marketing materials, and surveyed customers and program partners to inform the PY16 process evaluation. Key findings from this research follow.

Program Design

PY16 marked the first year that the program offered discounts solely for LEDs, the sales of which nearly doubled the program's PY15 LED sales due to multiple factors. According to the program implementer, retailers and manufacturers had already begun transitioning from CFLs to halogens and LEDs prior to PY16. As a result of increased demand, manufacturers offered more LED models at lower prices than in PY15. This allowed the program implementer to identify more models that it could cost-effectively discount.

Program Implementation

In PY16, the program implementer faced several operational challenges. These included transitioning to a new implementer and navigating the transition to the ENERGY STAR 2.0 Luminaire Specifications for certification. The program began about one month later than its anticipated date of March 1, 2017, and several retailers did not launch the program until after that date.

ICF already managed the portfolio-wide Vision database when starting as the Lighting Program implementer, which facilitated program tracking. Monitoring the program's progress during the year, however, proved difficult due to invoicing delays. The delays were te result of the need for ICF to adjust incentive levels in between invoicing periods, which then required that manufacturers make ad-hoc

adjustments to their automated invoices. Over 45% of program sales were not invoiced until the final quarter, although many of those sales occurred in previous quarters. Some sales—including all sales through the online store—were not invoiced in PY16 and will apply to PY17.

The program manager and implementer anticipated that transitioning to ENERGY STAR 2.0 specifications might cause significant market disruption in 2016. However, this concern did not materialize in any significant way. Though manufacturers changed their product lines more frequently throughout the year than they might have otherwise, the implementer generally could identify replacement models-- stocking sufficient, eligible models and nearly meeting program targets. In addition, when manufacturers introduced their new product lines in October, 2016, the majority were designed to meet ENERGY STAR 2.0 specifications.

Marketing and Outreach

In-store signage and promotional events were the primary marketing activities in PY16. From May through December 2016, ICF conducted 10 to 15 in-store promotions in high-volume retailer locations. Decreased sales targets, decreased incentives as percentage of the retail price, and a less intensive approach to managing retail partners resulted in less interest in supporting the program from partner retailers and manufacturers, according to the program manager. As a consequence, retail partners reportedly provided fewer opportunities for enhanced product placement than in previous program years.

Cadmus conducted a detailed review of in-store signage messaging, layout, visual appeal, and imagery and found that materials generally followed best practices. The team noted some opportunities for improvement.

Program Data

ICF collected program tracking data through a new database they developed early in the year. Cadmus reviewed the minimum and maximum lumens and wattage for all measure categories, as well as the measure descriptions, and found the data generally accurate. Cadmus identified errors for only 0.3% of reported bulbs.

CSR Process Evaluation Requirements

As previously discussed, the Missouri CSR requires that demand-side programs operating as 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 6. The table provides a summary response for each specified CSR process requirement. Cadmus previously offered a summary of the data used to meet with impact CSR requirements (Table 5).

Table 6. 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 market continues to transition rapidly. CFLs—an innovative new product but a few years ago—are being phased out. The swift pace of change creates an information barrier for consumers. Most consumers do not understand the differences between the incandescent bulbs that they were used to (and are no longer available as general-purpose bulbs) and the halogens and LEDs now widely available. Most LEDs remain far more expensive than other, less-efficient bulb types. LEDs remain cost-effective due to their much longer lifespans than normal bulbs, but consumers do not always know of this long life or do not value it.
2	Is the target market segment appropriately defined, or should it be further subdivided or merged with other market segments?	The program appropriately targets the entire residential lighting market, given the low saturation of LEDs in the territory.
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?	Yes. The program continues to offer a diverse array of bulb models that meet most household lighting needs.
4	Are the communication channels and delivery mechanisms appropriate for the target market segment?	Yes. The program operates in several large national retail chains that serve differing, broad, cross-sections of the population. The program also operates in smaller, local discount stores that serve customers that might not frequent large chains. The online store serves customers that do not live in easy driving range of a participating brick-and-mortar location. A review of program marketing materials found that Ameren Missouri follows marketing best practices.
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?	LED prices continue to present major barriers, as consumers do not understand LED bulbs' added value. Store intercept results found in-store promotions highly effective at driving sales and at producing more comments about understanding LED bulbs' energy savings benefits and long life. Ameren Missouri and its implementer should continue

CSR Requirement Number	CSR Requirement Description	Summary Response
		emphasizing in-store promotions, and should consider placing greater emphasis on the online store and increasing educational marketing online.

Key Conclusions and Recommendations

Overall, the program met or nearly met its targets for PY16, which is notable given the changes to the program. Cadmus offers the following conclusions and recommendations for continuing to improve the program, and manage to participation and savings targets in the future.

Conclusion 1. The implementer overall executed the first of implementation of the Lighting program smoothly, but invoicing speed and frequency is an area for improvement. Despite implementation challenges, the implementer nearly met its participation targets for PY16 (99.2% of bulb sales target). The implementer faced challenges as its first year in the role, and in maintaining program activity as manufacturers changed their product lines in advance of ENERGY STAR 2.0. However, invoicing delays due to changing manufacturer prices made it difficult to monitor the progress of the program during the year.

> **Recommendation 1.** Cadmus supports the program manager's intention to prioritize faster invoicing in the coming year and notes that the implementer has planned system improvement to streamline invoicing.

Conclusion 2. A focus on more expensive LEDs will make marketing more expensive on a $/bulb basis. Survey results confirmed that the most effective program promotion happens in-store (as 86% of shoppers were unaware of the program before arriving). The survey also found that in-store marketing, in particular the promotional events, can have a marked impact on shoppers. Promotional events were more frequently cited as a motivation even than the discount by shoppers where events were taking place. However, in-store marketing requires significant man hours to maintain signage, identify opportunities for enhanced product placement, and host promotional events. At the same time, price continues to be the most critical factor when events are not taking place (which represents the great majority of the time) and the LED bulbs discounted in PY16 are more expensive than the CFLs that made up the bulk of program sales in previous years.

> **Recommendation 2a.** We appreciate the need to adopt a more cost-conscious approach than in previous years, as the potential for savings from lighting diminishes. We suggest an emphasis on targeted engagement with retailers to prioritize the aspects of in-store marketing and placement that can have the most impact. The most important in-store marketing elements are most likely the shelf signage that calls attention to the discounted price and the promotional events that appear to have significant impact on consumer behavior.

Recommendation 2b. Ameren Missouri should explore conducting a randomized control trial of select promotional activities, in order to determine the level of impact from these activities. A randomized control trial requires that certain participating locations do not engage in the target activity, so that sales can be compared across test and control stores. For some aspects of the program, such as available models and discount levels, it is difficult to construct the control due to retailers preference to keep stores consistent. However, for promotional activities such as in-store events and product placement, there is the possibility to structure participation to allow for more rigorous analysis of overall impact.

Conclusion 3. Savings from nonresidential usage are near zero, and likely to remain that way. The store intercepts survey found that fewer purchasers bought bulbs intended for use in nonresidential applications than in previous years. What caused this shift remains unclear, but it may result from the fact that even with the program discount, the program LED bulbs are much more expensive than CFL or halogen alternatives. Consumers shopping for businesses may be more conscious of the upfront costs than those shopping for their homes. Since realization rates were generally within 10% of full realization, the TRM likely already accounts for the diminished role of nonresidential savings.

> **Recommendation 3.** Make the minor adjustments to savings forecasts needed to account for continued near-zero participation from nonresidential purchasers.

Conclusion 4. The increasing prevalence of lower priced, non-program LEDs will likely lead to lower observed changes in demand for program bulbs. Though the increasing prevalence of non-ENERGY STAR LED bulbs in the market benefits the program as far as putting downward pressure on prices of LEDs, which reduces the incentive amount necessary to make program bulbs price-competitive, non-ENERGY STAR bulbs also present a threat to program freeridership. Price elasticities tend to decrease over time as markets mature and consumers come to expect lower prices for consumer goods – there is less urgency to make a purchase when prices are low if prices are expected to remain low.

> Recommendation 4. Focusing on retail channels and bulbs that face less direct competition from non-ENERGY STAR LEDs may help reduce freeridership.

PY15 Recommendation Tracking

Cadmus followed up with Ameren Missouri's response to the PY15 evaluation's recommendations to track what has and has not been implemented. Table 7 presents these actions, as reported by Ameren Missouri.

Table 7. PY15 Evaluation Recommendation Tracking

PY15 Recommendation	Ameren Missouri Response
Future evaluations should not track the presence of incandescent bulbs in the marketplace and instead should adopt the corresponding halogen wattage as the baseline for EISA impacted bulbs.	The shelf stocking study prior MEEIA cycle showed the majority of stores with no incandescent bulbs but a larger presence of halogen bulbs. However we have noticed a few isolated retailers with large quantities of incandescent bulbs and we documented with photos and forwarded that information to Cadmus.
A future program should create more distinction between CFLs and LEDs. Inputs to gross and net savings calculations, such as hours of use, product wattage, free ridership, saturation, and other inputs, should be estimated separately for CFLs and LEDs. This was not possible in past studies because of the low number of LEDs in the marketplace, but LEDs are gaining market share fast enough that in the near future studies should be better able to distinguish between the two.	Current program is LED only and with the quantities incentivized there should be ample data to calculate separate hours of use, product wattage, free ridership, saturation, etc.
Future portfolio plans will need to take into account that the Lighting program is unlikely to drive the level of savings that it has in the past. This may impact the design of other programs that have been carried by the strong performance of the lighting program in generating cost-effective savings. In addition, it will be important to revisit the design of the Lighting program and adjust it to meet changing market conditions. A key revision might be to adopt bulb models that meet the new ENERGY STAR Lamps Specification 2.0, which will go into effect Jan. 2, 2017. These bulbs have the same savings benefits as other ENERGY STAR bulbs, so from an efficiency perspective, there is no reason to exclude these bulbs.	The current Lighting program incorporated ENERGY STAR ©Lamp Specification 2.0 in its MOU contracts when made available by manufacturers.
Future programs should continue to incorporate a diverse set of retail partners, and can expect smaller stores to make a significant contribution to program performance.	Ameren Missouri continued to incorporate a diverse set of retail partners which includes large retailers (i.e. Walmart, Lowes, Home Depot, etc.), an online store and non-traditional discount stores (i.e. Goodwill, Habitat Restores, St Vincent St. Paul, etc.)

Introduction

Ameren Missouri engaged Cadmus to perform annual process and impact evaluations of the Lighting program for a three-year period, from 2016 through 2018. This annual report covers the impact and process evaluation findings for Program Year 2016 (PY16), the period from March 1, 2016, through February 28, 2017 (i.e., the first year of the three-year program cycle).

Program Description

Since 2009, Ameren Missouri has offered a version of the Lighting program, though its structure has evolved over the years. The PY16 Lighting program's design seeks to increase sales of highly efficient LEDs through mainstream retail channels across Ameren Missouri's territory.

Ameren Missouri hired ICF as the Lighting program implementer, intended to recruit participating retailers to provide per-unit discounts for eligible LEDs sold through their stores. In PY16, ICF recruited major national retailers as well as smaller discount retailers and local franchise retailers, the majority of which participated in previous years. In addition to reducing prices, ICF worked with participating retailers to place discounted lighting in prominent locations within stores and to locate Ameren Missouri signage and marketing materials nearby.

ICF also offered discounted bulbs through an online store. As the vendor did not invoice these products in PY16, they will be counted in PY17. Unlike previous years, retailers did not offer coupon discounts, and the program did not distribute bulbs through a social marketing distribution channel. Table 8 shows the nine categories of bulbs eligible for program discounts in PY16.

Table 8. PY16 Lighting Measures

Eligible Measure Categories
10W General Purpose
15W General Purpose
20W General Purpose
4W Candelabra
8W Globe
12W Dimmable
10.5W Downlight
15W Flood (PAR 30)
18W Flood (PAR 38)

[a] Although the measure categories include specific wattages in the category name, wattage did not serve as a key criterion in each category's definition. For a more detailed discussion and definitions of each measure category, see Program Design.

Program Activity

In PY16, the Lighting program delivered a total of 917,013 products to Ameren Missouri participants, as shown in Table 9. General purpose bulbs make up over half of the total participation, followed by smaller reflector bulbs.

Table 9. PY16 Lighting Program Activity

Measure	PY16 Totals
General Purpose	
10W General Purpose	540,965
15W General Purpose	12,482
20W General Purpose	44,727
Decorative	
4W Candelabra	78,090
8W Globe	13,627
Special Function (EISA Exempt)	
12W Dimmable	6,198
Reflector	
10.5W Downlight	5,799
15W Flood (PAR 30)	215,125
Total	**917,013**

Evaluation Methodology

Cadmus identified the following impact and process evaluation objectives for the Lighting program in PY16.

Impact Evaluation Priorities

- Determining the appropriate baseline wattage for the bulb's first years and lifetimes
- Assessing leakage rates and splits between commercial and residential installations
- Estimating the program's NTG ratio including free ridership and spillover
- Estimating gross and net energy savings
- Assessing coincident peak net demand savings using pre-defined loadshapes and estimation methods

Process Evaluation Priorities

- Assessing the energy-efficient lighting market's transition in Missouri relative to changes elsewhere
- Characterizing market reactions to non-ENERGY STAR® LEDs and other market transitions
- Measuring partners' satisfaction with the program
- Assessing the effectiveness of educational information and marketing
- Assessing the program design and implementation along with opportunities for improvements Ensure the evaluation meets requirements set by 4 CSR 240-22.070(8)[3]

Table 10 lists evaluation activities conducted in PY16 to achieve these objectives, followed by brief summaries of each activity.

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[3]   http://s1.sos.mo.gov/cmsimages/adrules/csr/current/4csr/4c240-22.pdf

Table 10. PY16 Process and Impact Evaluation Activities and Rationale

Activity	Process	Impact	Rationale
Data Tracking Review	✓	✓	Ensure information was collected to inform the impact analysis. Provide ongoing support to ensure all necessary program data are tracked accurately; identify gaps for EM&V purposes.
Stakeholder Interviews	✓		Interview utility staff and implementer staff to provide insights into program design, delivery, satisfaction, free ridership, and spillover on marketing's effectiveness.
Store Intercept Surveys	✓	✓	Collect information to calculate leakage and nonresidential usage rates. Also collect information on customers' awareness of program discounts and the impacts of discounts on customer behaviors.
Retailer/Manufacturer Interviews	✓	✓	Collect information on the total 2016 efficient bulb sales and on the level of program impact on total sales to calculate PY16 spillover. Collect information on retailer experience in the program and market reactions to non-ENERGY STAR LEDs.
Engineering Analysis		✓	Determine the PY16 gross savings.
Demand Elasticity Modeling		✓	Assess impacts of price changes, marketing, and product placement on PY16 sales to estimate free ridership.
Benchmarking	✓		Compare program metrics to similar programs to identify potential for program improvements.
Track key progress indicators	✓	✓	Cadmus developed a number of key progress indicators to track each program year.
Cost-Effectiveness Review		✓	Ameren Missouri determined the Lighting program's cost-effectiveness.

Data Tracking Review

Cadmus reviewed the Ameren Missouri Vision database, and the Lighting and EMV/Lighting reports, both of which served as the working tracking database and provided final year-end data for completeness and accuracy. At the beginning of PY16, Cadmus provided Ameren Missouri with recommendations for improving the tracking data; these included adding the following components:

- Retailer name (as column rather than subheader row)
- Retailer store location address
- Manufacturer
- Final Price (paid by participant) and/or Original Retail Price

Ameren Missouri worked with its database contractor and program implementer to incorporate these fields into the database and to populate them throughout the year.

Cadmus requested other data and reports from Ameren Missouri staff on an *ad hoc* basis (e.g., a complete list of participating retail locations, with addresses and IDs, to inform the process evaluation;

data on the number and timing of special displays for products discounted through the program in participating stores, thus informing the demand elasticity model.

Stakeholder Interviews

In February 2017, Cadmus interviewed key Lighting program stakeholders. The interview design sought to capture information on the following subjects:

- Utility and implementer roles, and changes in assigned staff or staff roles
- Partner recruiting and the MOU process, including changes to the store mix
- Updates to the program's marketing, education strategy, and their outcomes
- Implementation obstacles and solutions over the year
- Intent and outcome of any midyear implementation changes
- Program strengths and weaknesses over the year

The team spoke with the Ameren Missouri Program Manager and a representative from ICF, as shown in Table 11. Appendix E provides the stakeholder interview guide.

Table 11. PY16 Completed Stakeholder Interviews

Stakeholder Group	Interviews Conducted
Ameren Missouri Program Management	1
ICF Program Management	1
Total	

Throughout PY16, the team regularly spoke with Ameren Missouri program staff to discuss program operations and to coordinate evaluation activities.

Marketing Review

Cadmus reviewed the program documentation shown in Table 12 to understand the residential lighting program's targeted audience, delivery methods, eligible measures, stated marketing strategies, and supporting tactics, along with the confirmed 2016 advertising schedule. To assess the program's marketing strategy, the review used industry insights and the team's expertise in best practices for marketing residential lighting programs.

Table 12. Summary of Program Documents and Materials Review

Research Method	Program Documents/Materials Reviewed
Strategy Assessment	• Program Implementation Guide: *Appendix H—MEEIA 2016-18 Program Template* • Marketing Calendar: *Marketing Flow Chart—9.1.16*
Materials Review	• Advertisements: *banner ads* • Collateral: *beam signs, blade signs, stickers, fact cards, and other different sized retail store signage* • Direct Mail: *inserts*

Store Intercept Surveys

From October 2017 through December 2017, Cadmus fielded intercept surveys with lighting shoppers in participating retail locations. The survey's design sought to capture information about program bulb leakage outside Ameren Missouri territory as well as the percentage of program bulbs likely to be installed in nonresidential applications. The survey also captured some basic information about shoppers' purchasing habits and awareness of Ameren discounts.

By conducting surveys in the highest-volume stores, the team sought to achieve a sample representing the maximum number of program sales possible. Table 13 shows the number of retailers where Cadmus conducted surveys, the percentage of PY16 participation represented by those retailer locations, and the total number of shoppers surveyed.

Table 13. Store Intercept Survey Sample

Unique Retail Locations	Percent of PY16 Sales in Survey Locations	Survey Sample
29	31%	458

The team conducted intercept surveys in four-hour periods in each participating location. The survey's timing differed across stores, including days and evenings, weekdays and weekends, during promotional events, and when no events took place. Survey takers used a tablet-based intake form to record answers addressing the following:

- Respondents' electric utilities and zip codes
- Number of lightbulbs—by technology and ENERGY STAR certification—in the respondents' cart/basket
- Where respondents expected to install the program bulbs (if any)
- The electric utility for bulbs installed in a business
- Awareness of program discounts prior to entering stores
- Intent to purchase program bulbs

Appendix E provides the survey instrument used.

Retailer-Manufacturer Interviews

Cadmus interviewed corporate representatives from participating national retailers and manufacturers, seeking to determine the total program and non-program sales of efficient bulbs, and the degree of influence that the program had on non-program sales (to evaluate program spillover for PY16). The interviews also collected data about retailers' and manufacturers' perceptions of the program, along with suggestions for improvements.

The team interviewed eight representatives of retailer-manufacturer partnerships participating in the PY16 program. Together, these retailer-manufacturer partnerships accounted for 84% of PY16 sales.

Appendix E provides the survey instrument used.

Engineering Analysis

To calculate program LED lighting savings, Cadmus used the algorithms below.

Equation 1

$$\Delta kWh_{RES} = \frac{\left[(Watt_{Base} - Watt_{EE}) * Hours_{RES} * WHF_{RES}\right] * \%RES * ISR * (1 - LKG)}{1,000}$$

Equation 2

$$\Delta kWh_{NRES} = \frac{\left[(Watt_{Base} - Watt_{EE}) * Hours_{NRES} * WHF_{NRES}\right] * (1 - \%RES) * ISR * (1 - LKG)}{1,000}$$

Where:

Watts$_{EE}$	=	The average program bulb wattage
Watts$_{Base}$	=	The lumen-equivalent wattage of replaced bulbs
Hours$_{RES/NRES}$	=	Average daily HOUs for residential or nonresidential applications
%Res	=	The percentage of program bulbs installed in residential applications
ISR	=	The installation rate (NRES is assumed to be the same as RES)
LKG	=	The leakage rate (bulbs sold to customers outside Ameren Missouri's service area)
WHF$_{RES/NRES}$	=	HVAC interaction factors (adjustments for HVAC interactive effects)

For PY16, Cadmus updated all inputs with primary data collected through this evaluation, or by weighting the previous year's input assumptions with PY16 program sales. The Gross Impact Evaluation Results Section further explains the methodology used and presents the results.

Key Progress Indicators

Cadmus plans to track the following key progress indicators for the Lighting program across the three-year program cycle: program year electric savings, number of program bulbs sold, free ridership, and net kWh savings per bulb.

Cost-Effectiveness Analysis

Using final PY16 Lighting Program participation and implementation data as well as the *ex post* gross and net savings estimates presented in this report, Ameren Missouri determined the program's cost-effectiveness using DSMore (a financial analysis tool designed to evaluate the costs, benefits, and risks of demand-side management [DSM] programs and services). As shown in the Cost-Effectiveness Results section, Ameren Missouri assessed cost-effectiveness using all five of the standard perspectives produced by DSMore:

- Total Resource Cost (TRC)
- Utility Cost Test (UCT)

- Societal Cost Test (SCT)
- Participant Cost Test (PART)
- Ratepayer Impact Test (RIM)

Process Evaluation Findings

This section provides Cadmus's process evaluation findings for Ameren Missouri's Lighting program, organized into three sections: Program Design, Program Operations, Marketing and Outreach.

Program Design

The Lighting program's design seeks to achieve energy savings in two ways—by increasing use of high-efficiency LED light bulbs over lower-efficiency baseline options, and by educating consumers about energy-efficient lighting options. In doing so, the program provides point of sale (POS) discounts through major retail chains for high-efficiency LED light bulbs; the program also provides promotional events and literature in demonstrating and educating customers about different lighting technologies.

ICF negotiated memorandums of understanding with 13 retail chains and franchise retailers in Ameren Missouri's territory, covering 177 storefront locations. Retailers fell into roughly four categories:

- Large hardware
- Large mass-merchandise
- Specialty electronics
- Discount stores

The PY16 program design utilized a streamlined version of the previous year's program, reflecting several changes to eligible measures and delivery channels. Most significantly, the program no longer offered discounts for CFLs in PY16. In addition, Ameren Missouri discontinued two minor distribution channels: the coupon channel for smaller retailers without the infrastructure to manage the POS system; and the social marketing distribution channel that distributed free bulbs to lower-income populations through area food banks.

Measures

In 2016, Ameren Missouri offered discounts on nine measure categories of LED bulbs, listed in Table 14. As in previous years, the program offered bulbs across a range of wattage options in four usage categories: general purpose, decorative, special function bulbs (such as 3-way bulbs) and reflectors. The measure category names shown in the table are partially based on legacy, and include other similar bulbs with slightly different wattages.

Table 14. Lighting Program PY16 Eligible Measure Categories

Measure Category	Bulb Type	Category Specification
10W General Purpose	General purpose	60-watt equivalent or less, determined by lumen output
15W General Purpose	General purpose	75-watt equivalent, determined by lumen output
20W General Purpose	General purpose	100-watt equivalent, determined by lumen output
4W Candelabra	Decorative	Small- and medium-base candle-shaped bulbs, all wattages
8W Globe	Decorative	Small- and medium-base globe-shaped bulbs, all wattages
12W Special Function	EISA exempt	Bulbs otherwise subject to EISA as general purpose bulbs, but exempt due to special features (e.g., three-way)
10.5W Downlight	Reflector	Bulb diameter of 20 eighths of an inch or less (2.5 inches or less)
15W Flood (PAR 30)	Reflector	Bulb diameter more than 20 eighths of an inch, at 1,789 lumens or below
18W Flood (PAR 38)	Reflector	Bulb diameter more than 20 eighths of an inch, above 1,789 lumens

Incentives

The Ameren Missouri 2016 – 2018 filing set $3.00 as the initial incentive, with a minimum price to consumer's of $0.50 per bulb. During the PY16 program year, Ameren Missouri decided to limit the incentives as needed to keep the price to the consumer above $2.00 per bulb. This reduced the program's cost and allowed ICF to stretch the program budget over the full year.

Table 15 shows average per-bulb rebates for each measure in 2016 (by quarter). The program implementer reported that prices continued to fall throughout 2016, though not as aggressively as in past years. Average incentives per bulb remained fairly consistent throughout the year, except for the two most popular bulb types—10W general purpose bulbs and 15W floods. Incentives for both bulbs decreased over the year.

Table 15. PY16 Lighting Program Incentives by Product and Quarter

Bulb Type	Measure	Average Per-Unit Incentive				
		Q1	Q2	Q3	Q4	Year
General Purpose	10W General Purpose	$2.62	$2.02	$2.41	$1.91	$2.03
	15W General Purpose	$3.00	$3.00	$3.46	$3.58	$3.37
	20W General Purpose	$3.00	$3.00	$3.23	$2.50	$2.63
Decorative	4W Candelabra	$3.93	$2.78	$2.94	$2.82	$2.87
	8W Globe	$4.00	$3.99	$3.73	$3.97	$3.90
Special Function (EISA Exempt)	12W Special Function	$4.00	$4.00	$4.14	$4.21	$4.14
Reflector	10.5W Downlight	$4.00	$4.00	$4.00	$4.06	$4.05
	15W Flood (PAR 30)	$4.00	$3.42	$2.92	$3.07	$3.06

Although the incentive per unit did not vary widely across bulbs, average dollars per net lifetime kWh ranged from $0.007 for 20W General Purpose bulbs to $0.022 for 4W Candelabra bulbs. Figure 1 shows average dollars per net kWh for each measure in PY16. The high cost per bulb for decorative bulbs

(globes and candelabras) largely resulted from high free ridership rates for these bulbs, as discussed in the Free Ridership Results section.

Figure 1. Incentive Dollars Per Unit Energy Saved ($/Lifetime Net kWh/Unit)[1]
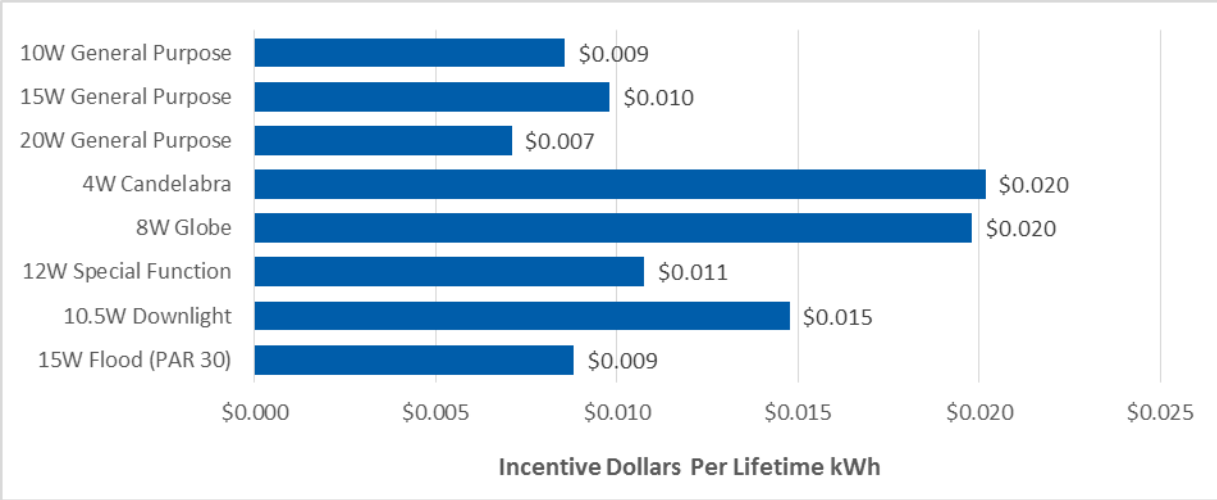
[1]This figure uses the present value of net kWh savings, not including NPSO, over the measure's estimated useful life (EUL). Each measure's EUL is derived from the average of residential and nonresidential EUL values in the Ameren iTRL, weighted by the percent of bulbs in residential applications, as determined in the PY16 evaluation.

Program Operations

This section discusses program stakeholders' responses during Cadmus's interviews regarding program management and delivery topics. Interviews primarily focused on the following topics:

- Utility and implementer roles, and changes in assigned staff or staff roles

- Partner recruiting and the MOU process, including changes to the store mix

- Updates to the program marketing and education strategy and its outcomes

- Implementation obstacles and solutions over the year

- Intent and outcome of any midyear implementation changes

- Program strengths and weaknesses over the year

PY16 Program Changes

In addition to changes in program design (described in the previous section), the program implementation changed in several ways during PY16:

- Transition to a new implementer and new program manager
- Elimination of minor delivery channels
- Transition to an all-LED program

Transition to all-LED Program

PY16 marked the first year in which the program offered only LED products. Although the program has offered LED discounts since 2012, LEDs made up only 29% of participation in PY15—the highest

percentage of LED sales of any year except PY16. According to the Ameren Missouri program manager, market factors primarily drove the switch from mixed products to all LEDs. In PY15, several manufacturers announced they would phase out their CFL product lines in favor of LEDs. Several retailers also said they planned to stock fewer (if any) CFLs.

Ameren Missouri planning staff expressed confidence in the program's ability to drive greater numbers of LEDs than in previous years. The program manager explained that the program would likely have achieved greater numbers of LED sales in PY15, except for a temporary halt to LED sales while Ameren Missouri filed for a reduced minimum incentive to accommodate the rapid decrease in LED prices. (See the PY15 Lighting Program Evaluation for more detail.) The reduced per-unit retail price for LEDs (which continues to decrease) allowed the program to offer LEDs in stores where they previously could not (e.g., discount stores). Reduced prices and expanded model options from manufacturers also allowed the program to offer more LED models than in PY15.

In its PY16–PY18 Energy Efficiency Plan[4], Ameren Missouri proposed diminishing annual savings targets for the Lighting program to account for declining per-unit savings and cost-effectiveness of lighting measures overall. As the Ameren Missouri program manager reported, however, LEDs were more cost-effective than CFLs, due to slightly lower wattages and longer lifetimes.[5] The PY16 energy savings target of 24,923 MWh roughly represents 40% of the PY15 target of 62,371 MWh. As a result, the program did not need to achieve the same overall participation level that it achieved in previous years.

Transition to New Implementer and Program Manager

Ameren Missouri assigned a new program manager over the Lighting Program just prior to the PY16 program year. Though new to the Lighting program, this person had experience working for Ameren Missouri. The new manager oversaw the transition to the new implementer and the first months of program operation, but retired about half-way through the year. At that point, the previous program manager returned to oversee the program. Cadmus interviewed the program manager in place at the end of the year for this evaluation. This person indicated that although there was relatively little disruption from the transition, since he was familiar with the program design, he could not provide detailed information on program operations in the first half of the year.

Ameren Missouri used a competitive bidding process to select an implementer for the new program cycle (PY16 to PY18). The transition to a new implementer resulted in several minor program design changes as well as a few obstacles common to major implementation changes. For example, stakeholder discussions took longer than anticipated which resulted in the launch date being delayed from March 1

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[4] *Ameren Missouri 2016-2018 Energy Efficiency Plan.* Missouri Public Service Commission file number EO-2015-0055, Appendix G. Available online: https://projects.cadmusgroup.com/sites/6320-P02/phase01/Shared%20Documents/Management/PY16%20Proposed%20Stipulated%20and%20Agreement%20Files/Appendix%20G%20-%20Measure_List_Incentives%20Range_Design.pdf?Web=1

[5] Ameren Missouri's TRM assumes 25 years for residential LED lighting.

to March 31, 2016, and some retailers and manufacturers did not launch the program until later in the year. The Ameren Missouri program manager, however, reported that implementation proceeded with relative smoothness overall, considering it was the new implementer's first year.

Partner Relationships

The Ameren Missouri program manager did note some differences between ICF's program implementation approach to the previous implementer's approach. According to the program manager, the greatest difference occurred in less emphasis on developing strong relationships with participating retailers and manufacturers. ICF, which did not have the established relationships with the supply-side partners that the previous implementer had built over time, applied a more cost-conscious approach, dedicating less staff time to retailer interactions and support in order to operate a more cost-effective program.

The program partnered with fewer retailers in PY16 (13 chains and 177 locations), compared to 17 chains, operating 471 markdown locations in PY15. According to the program manager, the reduced program budget drove the decline in retailer participation. However, the program manager noted that one new major national chain joined the program in October 2016.

The program manager also noted that ICF, through its partner CrossMark, employed fewer field representatives than in past programs and had no employees with established relationships with retailers. In 2015 there were 471 markdown locations serviced by 9 full time reps, compared to 8 parti time repts for 177 locations in 2016.

Despite these differences from previous years, ICF came very close to meeting Ameren Missouri's expected participation target for the year: achieving 99.2% of its 924,000 sales target in PY16. (Note that expected participation is a benchmark for performance, but is not a contractual metric.)

Data Management

ICF developed Ameren Missouri's portfolio-wide Vision database prior to becoming the Lighting program's implementer. ICF built on the existing Vision system to include program-specific data storage and tracking. The ICF team worked closely with Ameren Missouri staff and Cadmus to develop the lighting tracking database at the beginning of the program year. By July, ICF completed all requested major updates. Once updated, the tracking database, through an online portal, became available to all program staff and to the evaluation team in real time. At the end of the program year, the ICF manager reported making minor, ongoing adjustments to Vision to correct errors.

Although the tracking database had become updated and functional relatively early in the year, invoicing delays prevented populating the database in a sufficiently timely manner to make real-time access a useful feature for monitoring program progress. Over 45% of PY16 sales were invoiced in January or February 2017. Although the online store operated during the program year, online sales were not invoiced in 2016, and will be reported in PY17. The Ameren Missouri program manager considered the lack of existing relationships between the implementer and participating retailers and

manufacturers as the primary reason for start-up and invoicing delays. The program manager noted that faster invoicing has become a priority for PY17.

Elimination of Minor Distribution Channels

According to the Ameren Missouri program manager, Ameren Missouri designed its PY16-PY18 budgets to shift more portfolio resources to programs such as HVAC, which provide greater demand reduction than Lighting measures. As a result, less funding was available for Lighting. To conserve budget, Ameren Missouri eliminated the coupon and SMD channels, which in past years had contributed very little savings. The program manger noted that the program's online store and strong presence in discount retail locations satisfied the objectives of serving rural and lower income customers, making the coupon and SMD channels unnecessary.

Although Lighting was not expected to contribute the most savings of the residential programs in PY16, the program manager stated that the lighting program continues to serve an important role as the delivery channel that serves the broadest cross-section of Ameren Missouri customers.

Delivery Successes and Program Achievements

The program manager noted smooth implementation during the transition to new specifications for ENERGY STAR lighting certification as a notable success for 2016. In 2015, as manufacturers proved anxious to take advantage of consumers' appetite for LEDs, they began offering increased numbers of extremely low-cost LEDs. These did not, however, meet certain existing ENERGY STAR quality criteria, and therefore could not be ENERGY STAR certified. These low-cost bulbs put considerable price pressure on higher-quality bulbs, which cost more to manufacture.

Partially in response to this trend, ENERGY STAR published the ENERGY STAR Luminaires Specification Version 2.0 in early 2016, with an effective date of January 2, 2017. The new specifications relaxed some quality standards not related to energy efficiency. Among other changes, the new specifications allowed bulbs with much shorter lifetimes (i.e., 15,000 hours relative to the previous 25,000 minimum) and reduced minimum directionality for omnidirectional bulbs (260 degrees, relative to the previous minimum of 360 degrees). Throughout 2016, it remained unclear whether manufacturers would seek certification under the new specifications, or preferred to emphasize lower-cost LEDs without ENERGY STAR certification.

According to the ICF manager, consistent with these types of programs everywhere, the program required constant oversight during the year to manage frequent changes in available models, as manufacturers discontinued some product lines and launched others in advance of the new specifications. ICF faced some minor challenges in keeping retailers stocked with program-eligible bulbs. In addition, as prices continued to drop, ICF needed to closely monitor incentive levels to avoid depleting funding before the year's end. According to the ICF manager, however, manufacturers updated SKU lists (published in October 2016), largely offer 25,000-hour lifetimes and manufacturers sought ENERGY STAR certification for most models. As a result the program was able to maintain a wide selection of products and offer several ENERGY STAR 2.0 bulbs by the end of the year.

Retailer Experience

Cadmus interviewed eight corporate-level representatives from retailer-manufacturer partnerships that participated in the program. Among other topics, the interviews asked respondents to characterize their experiences with the program and to provide some observations about market trends, especially regarding sales on non-ENERGY STAR bulbs.

All eight representatives reported understanding the program well, as they did their roles in the program. All eight also confirmed that they had easy access to program representatives if needing to ask a question or express a concern.

No respondents reported obstacles to program participation, but all eight wanted the program to be "bigger" in some way. One respondent noted that while in the past, the program did not approve all SKUs she wanted to offer, in PY16, most SKUs were accepted. Three respondents requested increased budget to offer incentives on more products. Another requested the ability to combine program rebates with manufacturer rebates. (While combining the Ameren Missouri discount with manufacturer rebates is not prohibited, it can push the price to the consumer below the store's minimum level.)

Marketing and Outreach

The Lighting program marketing budget overall was smaller in PY16 than in PY15, but the marketing spend per-bulb increased. This was largely the result of a smaller program budget combined with a focus on more expensive LEDs, both of which resulted in reduced sales volume through the program. Table 16 shows PY15 and PY16 marketing budget and marketing spend per bulb.

Table 16. Marketing Spend per Bulb Sold

Program Year	Marketing Budget	Bulbs Sold	Marketing Spend /Bulb Sold
PY15	$71,804	2,032,936	$0.04
PY16	$45,000	917,013	$0.05

Cadmus reviewed Ameren Missouri's marketing strategy, the materials produced for the PY16 year based on the strategy, and the incorporated feedback from retailers and manufacturers on the effectiveness of Ameren Missouri's marketing for the Lighting program.

Strategy Assessment

Cadmus reviewed the program documentation shown in Table 17 to understand the residential lighting program's targeted audience, delivery methods, eligible measures, stated marketing strategies and supporting tactics, along with the confirmed 2016 advertising schedule. The review used industry insights and Cadmus' expertise in marketing residential lighting programs to assess the program's marketing strategy.

Ameren Missouri's Residential Lighting program targets all residential customers, encouraging purchases of ENERGY STAR-certified LED bulbs through strategic partnerships with local and national retailers.

Table 17 outlines Ameren Missouri's marketing strategies and related tactics used for engaging these audiences.

Table 17. Ameren Missouri Residential Lighting Program Strategies and Tactics

Audience	Residential Customers	Local and National Retailers
Strategy	Educate customers about the benefits of LED bulbs and the availability of Ameren Missouri incentives at retail partners	Educate sales staff about certified LEDs' benefits through on-site trainings at retail locations
Advertising	Print, radio, TV, mobile, billboards	NA
Ameren-Owned Communications	Bill stuffers, web placement	NA*
Collateral	Hang tags, stickers	Educational materials
Events	Pop-up retail, In-store events	Retail Trainings

*Though Cadmus did not review Ameren-owned communication materials that targeted retailers, according to the implementation plan, such materials exist.

Cadmus' review of the Lighting program's implementation guide indicated that Ameren Missouri's marketing and implementation staff developed an array of point-of-purchase collateral to inform customers of discounted pricing and energy savings options specific to the different stores within the service territory. Ameren Missouri's marketing strategy was designed to empower local and national retailers to educate their customers about LED bulb benefits—an approach that aligns with industry best practices. In addition to the store-oriented tactics, Ameren Missouri employed radio ad campaigns and online banner ads.

According to the marketing calendar, Ameren Missouri applied best practices in incorporating seasonality to increase the relevancy of its marketing and outreach. The launch of the digital advertising campaign for residential lighting coincided with the start of daylight savings time—a typically high-volume sales period for lighting. However, neither the strategy nor the advertisements themselves incorporated a change-of-messaging strategy to address consumers' seasonal purchasing motivations.

2016 Program Marketing Materials Review

Cadmus assessed 15 different marketing materials for the Lighting program provided by Ameren Missouri. These materials covered three of four typical categories of materials used in energy efficiency programs, as shown in Table 18.

Table 18. Ameren Energy Efficiency Program Materials Reviewed

Category	Materials Included	Number of Examples Provided for Lighting
Advertisement	Banner ads, TV commercial	1
Collateral	Beam signs, blade signs, fact card, general sign, stickers, brochures, door hangers, rebate forms, tear pad	13
Direct Mail	Bill insert, insert, post card	1
Direct Communication	Letter, email, enrollment form	-
Total		**15**

Cadmus analyzed the materials design and content Cadmus' list of best practices for effective and successful marketing tactics, provided in Table 19.

Table 19. Best Practice Elements for Marketing Materials

Element	Description
Consistent messaging and "look and feel"	Repetition in messaging and consistency in appearance helps to reinforce brand awareness, and makes it easier for viewers to understand and remember key program information.
Identifiable target audience	Target audiences are more motivated and engaged if messaging, content, and delivery clearly addresses a program's unique target audience, key barriers, or leveraging distinct motivators.
Clear and comprehensive program details and benefits	Successful communications materials convey benefits in simple terms and explain the value proposition, leading to customers' higher likelihood of understanding and participating in the program.
Direct call to action	A target will more likely follow through with a desired action if that desired action is clearly stated.
Appropriate messaging and creative, given the context	Creative layout, design, and messaging should match the marketing and media channel in which it will be placed.
Complementary creative imagery and messaging	An effective and impactful creative platform seamlessly and strategically blends key messaging with imagery and layouts to ensure all components work together to encourage the desired outcomes.
Visual appeal	Visually appealing materials leave positive impressions.
Easy participation steps	Effective marketing and communications materials outline a clear, simple, and—ideally—easy path for consumers to follow to participate in a program.
Memorable and recognizable messages	A memorable and recognizable message increases the likelihood of the target recalling the message, and, in turn, increases the likelihood of participation.
QA/QC errors	Materials with errors detract from an organization's credibility.

The team's analysis of key findings follows, drawn from reviewing residential lighting program marketing materials.

Advertising

Ameren provided one online banner advertisement, shown in Figure 2, which follows industry best practices in terms of its design. The layout is clean and appealing, the graphic of LED lightbulbs in the shopping cart will help catch a customer's attention, and the concise messaging clearly states that LEDs are discounted. The piece also uses a strong call-to-action, including a "Find a Retailer" button to guide next steps. The logo placement makes it is clear that this is offered by Ameren Missouri. If space allows, Cadmus recommends adding a statement about cost savings or another LED benefit to attract the customer's attention.

Collateral

The majority of residential lighting program marketing materials focus on retail signage, incorporating a mix of stickers, signs, and tip cards, developed and deployed to educate customers. All materials in this category (outside of the tip card) use one of two messages: (1) noting special pricing for products within the store (Figure 4); or

Figure 2. Banner Ad

(2) promoting a singular product or SKU with special pricing. These materials' designs remain consistent, which proves helpful as customers associate various signage forms with discounts received on LED bulbs from Ameren Missouri. For most of the materials, the black text under the "SPECIAL PRICING" headline serves as the only indication that the pricing applies to LEDs. This text can be lost when quickly glancing at the sign. Additionally, the in-store materials do not include a strong call to action, other than broadcasting discounts. A simple "buy now!" or similar call to action may help attract further attention. The team noted that some materials are bilingual—an important factor in reaching underserved - populations.

Figure 4. Lighting Special Pricing Sign

Direct Mail

Cadmus reviewed the direct mail insert shown in Figure 3, which strongly represents best practices for direct-mail customer outreach, given the clear nature of the design and copy. The insert's front includes a catchy title, using the word "switch" in two different ways, and connecting savings to the idea of buying LED light bulbs. Including "instant rebates" at the top shows customers need not wait for a mail-in rebate. On the front's lower half, the LED bulb copy adequately explains LED bulbs' benefits, both in terms of efficiency and how this translates to cost savings. On the back, text
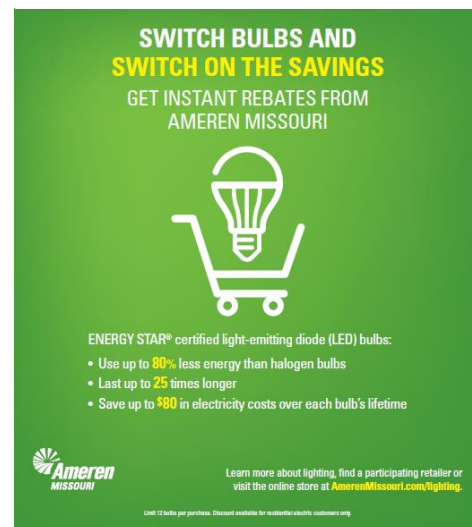
Figure 3. Lighting Insert (front)

thoroughly explains where customers can take advantage of available discounts, listing both in-store and online options. Including the sticker allows a customer to take the insert to the store, helping them avoid confusion when shopping. Consistent with the "smile" campaign, the insert's copy highlights key attributes associated with LED lighting (e.g., savings). Although technically correct, the insert's use of "halogen" could potentially confuse customers who may not associate the text with traditional, incandescent-style bulbs.

Marketing Support to Retailers

ICF and its partner CrossMark (the ICF team) engaged in similar in-store marketing, and retailer and customer outreach as the previous implementer. ICF and CrossMark conducted the following activities to support program partners in PY16:

- Placing in-store signage
- Conducting in-store promotional events
- Working with store maangers to obtain optimal placement for program products

ICF provided each retailer with a binder containing information on the program and program-eligible products and met with each store maanger. However, most day-to-day field activities were conducted by CrossMark. To operate the program as cost-effectively as possible, CrossMark representatives do shorter, less frequent field visits than the previous implementer. During visits, field representatives check that in-store signage has been correctly displayed, and that marked prices remain in accord with the MOU. Representatives also conducted promotional events, typically held at larger, national-brand retailers with higher volumes of program sales. According to the ICF manager, CrossMark averaged 30 events per quarter. The ICF program manager reported that CrossMark representatives also are trained to facilitate manufacturers' stocking whenever possible. For example, if a representative spots open or underutilized shelf space, they will coordinate with the store manager and the manufacturer to use that space for additional displays of program products.

The Ameren Missouri program manager said, overall, the program ran well, but "some areas could be improved." As an example, the program manager reported that on more than one site visit to participating retailers, he found the store had recently completed an aisle reset, and all program signage had been removed. In some instances, the program manager found that CrossMark did not replace signage for several days after a reset.

Marketing Effectiveness

Cadmus conducted store-intercept surveys of 458 shoppers in 29 of the program's 177 participating retail locations, in part to collect information about shopper purchasing habits and the effectiveness of Ameren Missouri's marketing campaigns.

Awareness and Motivation

Surveys asked respondents whether they were aware of the program before entering the store. As shown in Figure 5, 86% of respondents were not aware of the program upon entering the store. This is common in an upstream lighting program where the in-store signage and "sale prices" drive the

purchases. Just over a quarter of those who were not aware of the program prior to entering the store, or 22% of the total sample, ultimately purchased Ameren bulbs during their visits. This group was most likely to be impacted by either the discounted price or the in-store marketing.

Figure 5. Percentage Without Prior Awareness That Purchased Program Bulbs
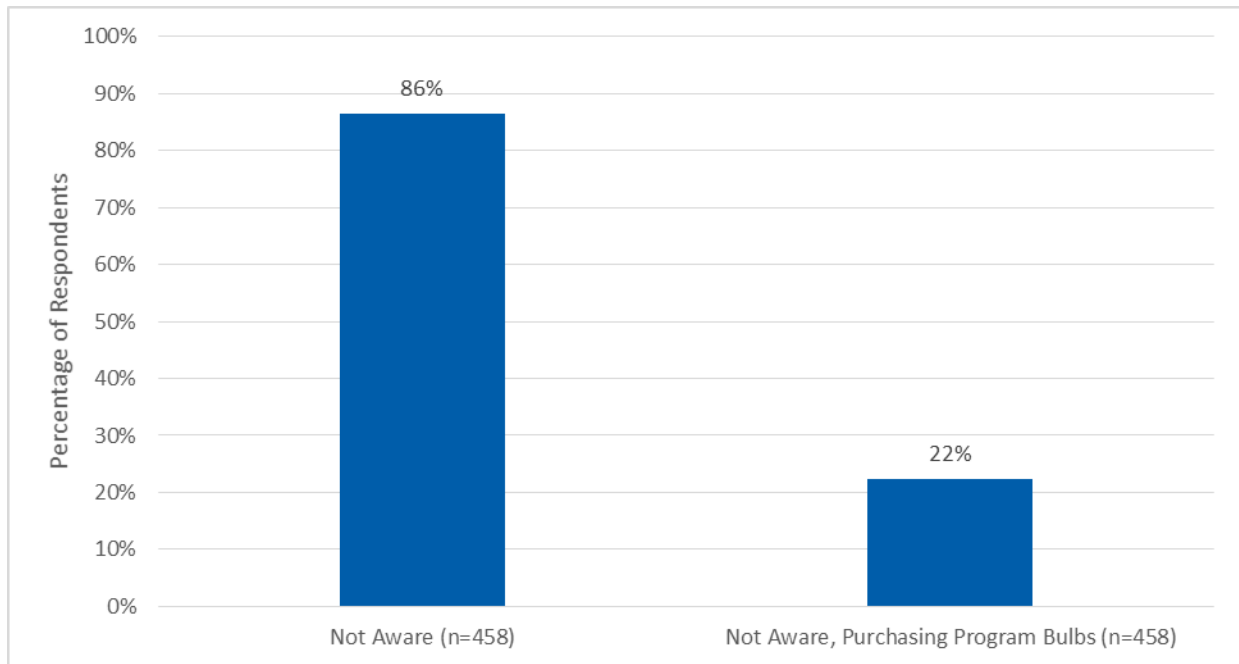
The survey asked respondents unaware of the program prior to entering the store, but purchasing a program bulb, what factors motivated their product choice. Respondents reported a variety of factors that influenced their decisions to participate, some of which were due to the program and some of which were not. At stores where a promotional event was taking place, the Ameren Missouri sales representative (actually a CrossMark employee) was the most commonly reported motivation (53%, n=72). When no event was taking place, the most common reason (37%, n=30) was the discounted price of the bulb.

Figure 6 provides the motivating factor for shoppers at store with an event, and those at stores without an event.

Figure 6. Motivation for Purchasing Program Bulbs

Figure 6. Motivation for Purchasing Program Bulbs

Chart data:

Motivation	Event (n=72)	Non Event (n=30)
Ameren Missouri/Store representative	53%	10%
Needed bulbs/Product location	15%	23%
Price with Discount	13%	37%
Prefer LED	8%	7%
Energy Savings	1%	10%
Replacing CFLs	1%	0
Other	8%	13%

X-axis: Percentage of Respondents (0% to 60%)
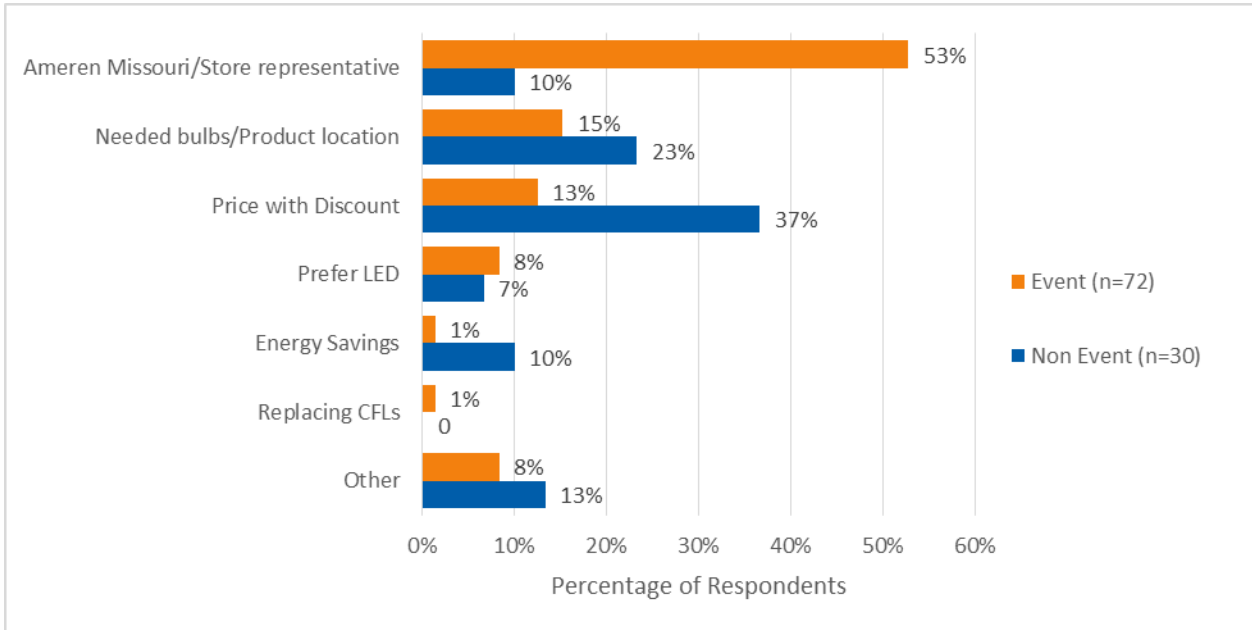
Non-ENERGY STAR Bulbs

In PY15, Lighting program stakeholders expressed concern that manufacturers were beginning to promote lower-cost LEDs that were not ENERGY STAR certified, placing increasing price pressure on ENERGY STAR bulbs. Cadmus used the intercept surveys to collect information on the market of non-ENERGY STAR bulbs relative to program bulbs. Figure 7 shows the types of bulbs purchased by respondents. The results show that, in participating retail locations, program-discounted LEDs are the most common high-efficiency bulb purchased, and ENERGY STAR LED bulbs (program and non-program) are 35% more commonly purchased than non-ENERGY STAR LEDs.

Figure 7. Bulbs Purchases by Type (n=1,820)
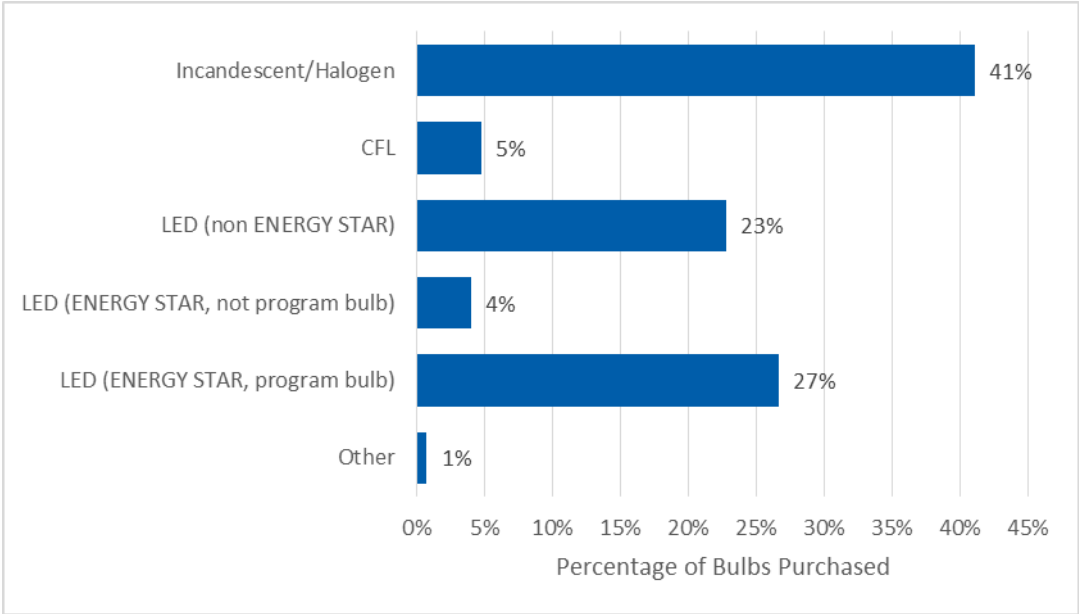
Cadmus used the retailer-manufacturer interviews to learn program partners' observations regarding non ENERGY STAR bulbs. Respondents indicated that the great majority of the bulbs they sold in their stores were ENERGY STAR certified. Estimates of the percentage of ENERGY STAR bulb sales ranged from 78% to 100%, with the average response at 85%. This estimate is higher than what Cadmus observed in store intercept surveys.

Respondents were somewhat split in their comments regarding how each chain's participating stores performed relative to nonparticipating stores. Four indicated program stores sold more ENERGY STAR bulbs than nonparticipating stores, while three reported ENERGY STAR bulbs sales remained the same across stores, regardless of program participation.

All eight respondents were familiar with the new lighting specifications that ENERGY STAR adopted in January 2017. Four respondents said the change resulted in price reductions for ENERGY STAR bulbs, allowing them to be more competitive than non-ENERGY STAR bulbs. One respondent thought the transition did not have an impact, stating that prices would likely drop anyway. Another said they had not noticed impacts, except it became more challenging to identify available SKUS for the program (as manufacturers were changing their product lines).

Gross Impact Evaluation Results

Cadmus used engineering analysis to calculate the gross savings per unit for each measure and the total gross savings for the Lighting program.

Tracking Data Review

Defining Measure Categories

In the PY16-PY18 Energy Efficiency Plan, Ameren Missouri established measure category names, but did not define each category. The measure names Ameren Missouri selected represent a combination of legacy measure categories (from previous years) and newly established measure names selected to represent LED products. In some cases, however, Cadmus found that the measure category names Ameren had selected for PY16-PY18 overlapped (e.g., "12W Dimmable LEDs" and "10W LEDs"). Some products were not represented by measure category names (e.g., EISA-exempt lamps with A-19 shapes). For other products, including many reflector bulbs, it remained unclear which measure category name might apply.

To accurately track and forecast savings during the year, and to ensure availability of evaluable measure categories, Cadmus worked with Ameren Missouri and ICF to define in detail specifications for measures to be included in each measure category. To avoid overlap, these specifications did not necessarily conform to original measure category name. For example, the team repurposed the "12W Dimmable" category, which could be understood to include general purpose LEDs, equivalent to 43W or 53W halogens, to represent the EISA-exempt A-19 bulbs, (e.g., three-way bulbs). For reflector bulbs, the team developed mapping to clearly document how reflectors should be categorized to facilitate accurate assessment of measure category characteristics. The measure category specifications are included in Appendix C.

Results of Data Review

Cadmus reviewed the tracking data submitted by the program implementer for reasonableness and completeness. Specifically, the team verified that measure details—including measure descriptions, reported lumens, and reported wattages—were consistent with the measure category. The team identified some errors in the final data. The bulb wattage was incorrect for one model of 10W LEDs, and lumens were incorrect for one model each of 4W candelabras, 15W Floods, and 18W floods. Cadmus recategorized the bulbs reported as 18W Floods to the 15W Flood category, which resulted in 0 bulbs reported in the 18W Flood category. Where necessary, the team corrected the tracking data to reflect values shown on the product package, based on an Internet search by manufacturers and model number. Overall, errors affected 3,020 bulbs (or 0.3% of the program total).

Measure-Specific Gross Savings

Cadmus estimated gross per-unit savings using the industry standard algorithm, along with inputs derived through protocols recommended in the Uniform Methods Project.[6] The team calculated the savings value for each measure category as the sum of the following two equations:

$$\Delta kWh_{RES} = \frac{(Watt_{Base} - Watt_{EE}) * \%RES * ISR * (1 - LKG) * (Hours_{RES} * Days * WHF_{RES})}{1,000}$$

$$\Delta kWh_{NRES} = \frac{(Watt_{Base} - Watt_{EE}) * (1 - \%RES) * ISR * (1 - LKG) * (Hours_{NRES} * Days * WHF_{NRES})}{1,000}$$

Where:

Watt$_{Base}$	=	Wattage of the baseline alternative bulb displaced by program bulb
Watt$_{EE}$	=	Wattage of program bulb
%Res	=	Percentage of program bulbs installed in residential applications as opposed to nonresidential applications
ISR	=	In-service rate
LKG	=	Leakage rate (program bulbs installed outside Ameren Missouri's service area)
Hours$_{RES}$	=	Average HOU per day for bulbs installed in residential applications
Hours$_{NRES}$	=	Average HOU per day for bulbs installed in nonresidential applications
Days	=	Days used per year
WHF$_{RES}$	=	HVAC interaction factor (adjustments for HVAC interactive effects) for bulbs installed in residential applications
WHF$_{NRES}$	=	HVAC interaction factor (adjustments for HVAC interactive effects) for bulbs installed in nonresidential applications
1,000	=	Conversion factor from Wh to kWh

Table 20 shows the source for each input value required for the PY16 evaluation.

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[6]   Dimetrosky, S., K. Parkinson, N. Lieb. *Uniform Methods Project, Chapter 21: Residential Lighting Evaluation Protocol.* National Renewable Energy Laboratory. February 2015. Available online: http://energy.gov/sites/prod/files/2015/02/f19/UMPChapter21-residential-lighting-evaluation-protocol.pdf

Table 20. Source for PY16 Lighting Energy Savings Input Values

Data Required	Data Source for PY16 Evaluation
Watts$_{EE}$	Sales-weighted average of program bulb wattages in each measure category, using complete PY16 sales data.
Watts$_B$	Sales-weighted average of baselines for each model in the measure category, using complete PY16 sales data. The baseline wattage was determined by lumen-per-watt output using the ENERGY STAR reference database or the manufacturer's stated equivalent baseline, as appropriate for each measure category.
%RES	PY16 store intercept study: survey of 458 shoppers in 29 participating retailer locations.
ISR	PY15 home inventory study from a sample of 100 homes, comparing stored bulbs to installed bulbs. Installation projected over four years, as recommended by the UMP.
LKG	PY16 store intercept study: survey of 458 shoppers in 29 participating retailer locations.
Hours$_{RES}$	PY10 HOU metering study, adjusted based on 2015 home inventory study: analysis of light meters installed in inventory homes in PY10, adjusted to reflect distribution of LEDs by room in PY15 home inventory.
Hours$_{NRES}$	Average value for indoor nonresidential spaces from the California Database for Energy Efficient Resources 2008.*
WHF$_{RES}$	Cadmus modeling analysis, PY13, updated to reflect the demographics and program-specific saturations of heating systems, cooling systems, and fuels used, as determined from HVAC participant surveys conducted in 2016–2017.
WHF$_{NRES}$	California Database for Energy Efficiency Resources, 2008: average HOU for screw-based bulbs, using nonresidential miscellaneous interior space values.

*Summit Blue Consulting. California Database for Energy Efficient Resources. 2008. Available online: http://www.deeresources.com/index.php/23-deer-versions

Watts$_{EE}$ and Watts$_B$

Cadmus determined the efficient wattage (Watts$_{EE}$) for each measure category by averaging the wattage of all bulbs sold in that measure category. For example, bulbs sold in the 15W Flood (PAR30) measure category ranged from 10W to 16W. Table 21 shows Watts$_{EE}$ for each measure category.

Table 21. PY16 Evaluated Efficient Wattages by Measure Category

Measure Category	Evaluated Value
10W General Purpose	9.2
15W General Purpose	10.8
20W General Purpose	15.0
4W Candelabra	4.5
8W Globe	5.9
12W Special Function	9.5
10.5W Downlight	7.0
15W Flood PAR 30	11.2

Cadmus determined the baseline wattage (Watts$_B$) for all reflectors and specialty bulbs using the algorithms for maximum allowable wattage included in the Energy Independence and Security Act (EISA)

regulations, then averaging all baseline wattages within the measure category. For standard bulbs (10W, 15W or 20W LEDs), the team determined an appropriate halogen-equivalent baseline as described in the Evaluation Methodology section.

Table 22. PY15 Evaluated Baseline Wattages by Measure Category

Baseline Category	Evaluated Value
WattsB (10W General Purpose)	41.3
WattsB (15W General Purpose)	53.0
WattsB (20W General Purpose)	72.0
WattsB (4W Candelabra)	40.4
WattsB (8W Globe)	42.0
WattsB (12W Special Function)	76.3
WattsB (10.5W Downlight)	43.1
WattsB (15W Flood (PAR 30))	62.1

HOU (Hours$_{Res}$ and Hours$_{Nres}$)

Cadmus updated the residential hours of use (HoursRes) for PY16 to more closely reflect the lower saturation of LEDs relative to CFLs. As LEDs remain more expensive than other, less-efficient bulbs, the team expects consumers will more likely install them in higher-usage areas. CFLs demonstrated a similar pattern after introduction, showing a higher HOU at earlier stages of market adoption (when the bulbs were more expensive relative to incandescent bulbs) and lower HOU values as the bulbs became more widely adopted and the price dropped. In Missouri, for example, high-efficiency bulbs in 2010 had an HOU of 2.91, and the bulbs had a saturation of 21%. In PY15, after three additional years of discounts through the Ameren Missouri Lighting program, CFL bulb saturations increased to about 30% and HOU declined to 2.2.

For PY16, Cadmus used the HOU for efficient bulbs from the 2010 metering study, weighted by the distribution of LEDs in Missouri households (found in the 2015 home inventory study). Table 23 shows HOU by room from 2010, with weighting based on the 2015 inventory.

Table 23. HOU by Room and Weight by LED Incidence by Room

Room	PY10 HOU	PY15 Weight
Basement	5.76	13.3%
Living Room/Family Room	4.37	12.2%
Kitchen	4.32	20.0%
Exterior	3.2	6.7%
Office	2.76	2.2%
Garage	2.06	5.6%
Bathroom	1.68	21.1%
Foyer	1.39	0.0%
Bedroom	1.32	8.9%
Hallway	1.32	1.1%
Dining	1.21	8.9%
Closet	0.8	0.0%
Utility	0.47	0.0%
Other	0.32	0.0%
Weighted Average		**3.15**

Basements, living rooms, and kitchens exhibited the highest HOU in 2010. As expected, the 2015 inventory showed that, after bathrooms, these were places people most likely placed LEDs.

For nonresidential HOU, Cadmus used the Illinois Technical Resource Manual estimates for HOU for screw-based bulbs in nonresidential spaces.[7]

Table 24 shows HOU values used in the PY15 savings algorithms for residential and nonresidential savings.

Table 24. PY16 HOU Values

Variable	2015
HOURes	3.15
HOUNRes	9.90

In-Service Rate

To determine the in-service rate (ISR), Cadmus used the protocol recommended in the Residential Lighting chapter of the UMP.[8] This method calculated the overall ISR as the present value of savings

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[7] Illinois TRM 5.0, vol. 2 commercial and Industrial Measures. Available online: http://ilsagfiles.org/SAG_files/Technical_Reference_Manual/Version_5/Final/IL-TRM_Effective_060116_v5.0_Vol_2_C_and_I_021116_Final.pdf

[8] Dimetrosky, S., K. Parkinson, N. Lieb. *Uniform Methods Project, Chapter 21: Residential Lighting Evaluation Protocol.* National Renewable Energy Laboratory. February 2015. Available online: http://energy.gov/sites/prod/files/2015/02/f19/UMPChapter21-residential-lighting-evaluation-protocol.pdf

from PY16 program bulbs, installed over a four-year period and based on a first-year installed rate. The first-year installed rate equaled the percentage of all high-efficiency bulbs counted in the inventory and installed in a socket at the time of the visit (versus those stored, disposed of, or given away).

For the PY16 analysis, Cadmus applied a 79% first-year installed rate, determined from the 2015 home inventory analysis. The UMP formula assumed cumulative installed rates increase gradually each year, until by Year 4 (if not sooner), 97% of all program bulbs have been installed. Given total program sales of 917,013 in PY16, this approach indicated 728,975 bulbs were installed in year 1 (PY16). In Year 2, the cumulative ISR increased to 87.9%, and an additional 77,096 of the bulbs purchased in PY16 would be installed. In Year 3, 52,651 bulbs would be installed, and finally, in Year 4, 30,781 bulbs would be installed; so that a cumulative 97% (889,503 bulbs) of 2016 program bulbs would be installed over four years.

Table 25. Rate of Future Installation of PY15 Bulbs

Installation Rate			Total Bulbs		
Total Bulbs Sold					**917,013**
PY15 Installation Rate (YR1)					**79.49%**
PY15 Installed					728,975
Year Projected	**UMP Cumulative Installed Percentage**	**Cumulative Install Rate**	**Cumulative Bulbs Installed**		**Installed in Year**
2016 (YR2)	$(1\text{-}ISR_{YR1}) * (.41) + ISRYR1$	87.9%	806,070		77,096
2017 (YR3)	$(1\text{-}ISR_{YR1}) * (.69) + ISRYR1$	93.6%	858,721		52,651
2018 (YR4)		97.0%	889,503		30,781

To account for the time delay of this installation rate, the team determined the net present value (NPV) of savings over the four-year installation period from PY16, discounted back to Year 1 at 6.95% (the utility discount rate).

As shown in Table 26, although 97% of the bulbs were predicted to be installed over time, the NPV of bulb savings was 95.1% of potential savings if all bulbs were installed in the first year. (The team used the number of bulbs as a proxy for achieved savings.)

Table 26. Comparison of Actual Installation Impacts to Assumed First-Year Installation

	Scenario 1, Installation Over Four Years					Scenario 2, Installation Assumed in Year One	Installation Rate
	Year 1	Year 2	Year 3	Year 4	Total		
NPV					815,571	857,422	**95.12%**
1	728,975				728,975	917,013	
2		77,096			77,096		
3			52,651		52,651		
4				30,781	30,781		

WHFRes and WHFNRes

Cadmus used the waste heat factors for residential (WHFRes) and non-residential applications (WHFNRes) applied in the PY15 evaluation. To estimate the WHFRes, Cadmus used a simulation model populated with a customer's typical home characteristics (identified from Ameren Missouri's 2012 potential study) to estimate how heating and cooling needs changed when converting incandescent lights to efficient LEDs. Specifically, we used BEopt™ Version 2.0 to model energy simulations needed for estimating WHF_e (energy) in residential homes. (See the PY13 Lighting program evaluation for more detail on the original residential WHF analysis.)[9]

The team used the nonresidential WHF for energy savings developed in collaboration with Ameren Missouri's nonresidential evaluation contractor in PY15. Table 27 shows PY16 values for residential and nonresidential WHF.

Table 27. WHF by Sector

Sector	WHF
Residential	0.99
Nonresidential	1.10

Leakage

In 2016, Cadmus conducted an in-store customer survey (known as an intercept survey) to determine the percentage of bulbs purchased through the Lighting program in large national brand retail stores and installed outside of Ameren Missouri's territory (i.e., leakage).

Cadmus counted the number of program-discounted bulbs purchased by other utility customers, or those intended for a nonresidential location outside of Ameren's territory, as a percentage of program bulbs purchased in that store. Cadmus weighted the results according to each store's contribution to the total final sales from stores in the sample, and then weighted the results back to the total population by adjusting for each retail channel's total contribution to PY16 sales from large national brand stores.

Table 28 shows the final weighting for results from each sample store.

Table 28. Intercept Survey Results Weighting by Sample Store

Sample Store	% of Sample Sales (Sums to 100%)	Channel Sales Weight (Based on Population PY16 Sales)	Final Weight
	(A)	(B)	(A X B)
Hardware/DIY			
Store 1	9.94%	0.54	0.054
Store 2	9.90%	0.54	0.054
Store 3	8.62%	0.54	0.047

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9   Cadmus and Nexant. *Ameren Missouri LightSavers Process and Impact Evaluation: Program Year 2013*. Presented to Ameren Corporation. June 2014.

Sample Store	% of Sample Sales (Sums to 100%)	Channel Sales Weight (Based on Population PY16 Sales)	Final Weight
	(A)	(B)	(A X B)
Store 4	7.63%	0.54	0.041
Store 5	7.26%	0.54	0.039
Store 6	7.14%	0.54	0.039
Store 7	6.73%	0.54	0.036
Store 8	5.92%	0.54	0.032
Store 9	5.16%	0.54	0.028
Store 10	2.05%	0.54	0.011
Store 11	2.01%	0.54	0.011
Store 12	1.90%	0.54	0.010
Store 13	1.57%	0.54	0.008
Store 14	1.51%	0.54	0.008
Store 15	1.34%	0.54	0.007
Store 16	1.31%	0.54	0.007
Store 17	1.28%	0.54	0.007
Store 18	1.22%	0.54	0.007
Store 19	1.18%	0.54	0.006
Store 20	0.92%	0.54	0.005
Mass Merchandise &Club			
Store 21	2.58%	8.03	0.208
Store 22	1.97%	8.03	0.158
Store 23	1.52%	8.03	0.122
Store 24	0.34%	8.03	0.027
Specialty Electronics			
Store 25	4.88%	0.74	0.036
Store 26	1.46%	0.74	0.011
Store 27	1.21%	0.74	0.009
Store 28	1.16%	0.74	0.009
Store 29	0.29%	0.74	0.002

Table 29 shows the survey results and weighting for each sampled store.

Table 29. Weighted Intercept Survey Results for Leakage

Sample Store	Total Ameren Bulbs	Total Leaked Bulbs	% Program Bulbs Installed In-Territory	Weight
Hardware/DIY				
Store 1	76	0	100%	0.054
Store 2	21	0	100%	0.054
Store 3	10	0	100%	0.047

Sample Store	Total Ameren Bulbs	Total Leaked Bulbs	% Program Bulbs Installed In-Territory	Weight
Store 4	7	3	57%	0.041
Store 5	52	0	100%	0.039
Store 6	19	0	100%	0.039
Store 7	23	0	100%	0.036
Store 8	19	0	100%	0.032
Store 9	4	0	100%	0.028
Store 10	0	0	0%	0.011
Store 11	93	0	100%	0.011
Store 12	31	11	65%	0.010
Store 13	30	1	97%	0.008
Store 14	14	6	57%	0.008
Store 15	5	0	100%	0.007
Store 16	8	0	100%	0.007
Store 17	12	0	100%	0.007
Store 18	0	0	0%	0.007
Store 19	1	0	100%	0.006
Store 20	6	0	100%	0.005
Mass Merchandise &Club				
Store 21	7	0	100%	0.208
Store 22	14	0	100%	0.158
Store 23	0	0	0%	0.122
Store 24	4	0	100%	0.027
Specialty Electronics				
Store 25	19	0	100%	0.036
Store 26	0	0	0%	0.011
Store 27	6	0	100%	0.009
Store 28	4	0	100%	0.009
Store 29	0	0	0%	0.002
TOTAL	**485**	**21**	**4%**	
Weighted Total	**16.78**	**0.30**	**1.76%**	

Finally, Cadmus calculated the sales-weighted average of the leakage percent in the large national brand stores and the leakage percentage from small local and franchise stores in the program (assumed to be 0%). As shown in Table 30, sales-weighted average program leakage was 1.65% in PY16.

Table 30. PY16 Program-Level Leakage

Store Type	Total Program Sales	Leakage %
Large Retailers	93.99%	1.76%
Small Retailers	6.01%	0.00%
Lighting Program		**1.65%**

Residential Percentage

Cadmus used the PY16 intercept survey results to update the percentage of Ameren Missouri Lighting program bulbs installed in residential applications (%Res) versus those installed in nonresidential applications. Through the survey, Cadmus collected data on the number of bulbs purchased by Ameren Missouri customers that these customers intended to install in a business or other nonresidential area. Cadmus reduced this count by the number of these bulbs that customers intended to install in a business or another location outside of Ameren Missouri's territory. Cadmus weighted the results by the percentage of PY16 sales contributed by the sample store, relative to sales from all sample stores, and by retail channel using the same weights presented inTable 28.

Table 31 shows the results by store, and the final weighted percentage of bulbs installed in residential applications (i.e., 99.15%).

Table 31. Weighted Intercept Survey Results for Percent Residential Use

Sample Store	Bulbs for Residential Use	Bulbs for Nonresidential Use	Percent Residential	Weight
Hardware/DIY				
Store 1	76	0	100.00%	0.054
Store 2	21	0	100.00%	0.054
Store 3	10	0	100.00%	0.047
Store 4	7	0	100.00%	0.041
Store 5	52	0	100.00%	0.039
Store 6	19	0	100.00%	0.039
Store 7	23	0	100.00%	0.036
Store 8	18	1	94.74%	0.032
Store 9	4	0	100.00%	0.028
Store 10	0	0	0.00%	0.011
Store 11	93	0	100.00%	0.011
Store 12	30	1	96.77%	0.010
Store 13	30	0	100.00%	0.008
Store 14	8	6	57.14%	0.008
Store 15	3	2	60.00%	0.007
Store 16	8	0	100.00%	0.007
Store 17	12	0	100.00%	0.007
Store 18	0	0	0.00%	0.007
Store 19	1	0	100.00%	0.006
Store 20	6	0	100.00%	0.005
Mass Merchandise &Club				
Store 21	7	0	100.00%	0.208
Store 22	14	0	100.00%	0.158
Store 23	0	0	0.00%	0.122
Store 24	4	0	100.00%	0.027
Specialty Electronics				
Store 25	18	1	94.74%	0.036
Store 26	0	0	0.00%	0.011
Store 27	6	0	100.00%	0.009
Store 28	4	0	100.00%	0.009
Store 29	0	0	0.00%	0.002
Total	**474.0**	**11.0**	**97.73%**	
Weighted Total	**16.6**	**0.1**	**99.15%**	

Summary

Table 32 lists *ex ante* and *ex post* gross per-unit energy savings and realization rates by measure for PY16. For all measures, realization rates were just below 100%. Differences between the Ameren Missouri TRM and the evaluated value were likely a result of the almost nonexistent non-residential usage of program bulbs.

Table 32. PY16 Gross Per Unit Energy Savings

Bulb Type and Wattage	Ex Ante Savings/ Unit (kWh)*	Ex Post Savings/ Unit (kWh)	Realization Rate
10W General Purpose	38.2	34.0	89.0%
15W General Purpose	50.0	44.6	89.5%
20W General Purpose	66.5	60.3	90.6%
4W Candelabra	42.0	38.0	90.4%
8W Globe	42.8	38.1	89.1%
12W Special Function	77.7	70.5	90.8%
10.5W Downlight	40.8	38.1	93.3%
15W Flood (PAR 30)	60.1	53.8	89.5%

*Source: Ameren Missouri 2017 TRM

Table 33 presents gross per unit demand savings for PY16. *Ex ante* savings were values reported by program tracking data.

Table 33. PY16 Gross Per Unit Demand Savings

Bulb Type and Wattage	Ex Ante Savings/Unit (kW)*	Ex Post Savings/Unit (kW)	Realization Rate
10W General Purpose	0.0060	0.0053	87.7%
15W General Purpose	0.0070	0.0069	98.9%
20W General Purpose	0.0126	0.0093	74.0%
4W Candelabra	0.0060	0.0059	97.9%
8W Globe	0.0060	0.0059	98.4%
12W Special Function	0.0120	0.0109	91.0%
10.5W Downlight	0.0060	0.0059	98.2%
15W Flood (PAR 30)	0.0090	0.0083	92.5%

*Source: Ameren Missouri 2017 TRM

Net Impact Evaluation Results

Cadmus determined total programs net impacts by calculating total gross savings by measure group and then by applying the following[10]:

- Participant Free ridership
- "Like" Spillover
- Nonparticipant Spillover (NPSO)

Cadmus determined participant free ridership and participant spillover ratios using participant surveys completed during PY16.

Free ridership equals the percentage of savings that would have occurred in a program's absence due to participants purchasing the same measures without the program's influence. Thus, free riders can be considered customers who would have purchased a measure independent of a program. As they account for some program costs but none of its benefits, they decrease a program's net savings.

Spillover equals savings that occur when customers undertake installation of energy efficiency measures or perform energy-efficient activities without receiving financial assistance. For participating customers, this is due to their experience participating in a given program, whereas non participating customers engage in energy-efficient activities due to awareness resulting from program marketing. Unlike free ridership, spillover savings do not generate program costs; rather, energy-saving benefits occur, which increase net savings.

To calculate the Lighting program's NTG, Cadmus used the following formula:

$$NTG = 1 - Freeridership + "Like" Spillover$$

Cadmus applied the resulting NTG ratio to the *ex post* gross savings for each program measure to calculate net savings for the program measures, then added the Lighting-generated NPSO savings to arrive at total net program savings. Because NPSO is of significant size and does not have the same load shape as the program, we did not include NPSO in the NTG ratio associated with the program, but rather added the net energy and demand impacts separately.

Table 34 shows PY16 program net impacts.

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[10] Cadmus relied upon the Uniform Methods Project definition of spillover than includes both participant and nonparticipant spillover that include subsets of both like and non-like spillover. This is located on page 3 of the linked document. https://energy.gov/sites/prod/files/2015/02/f19/UMPChapter23-estimating-net-savings_0.pdf

Table 34. PY16 Net Impact Results Summary*

Measure Category	Ex Post Gross Savings (kWh/yr)	Free Ridership	Like Spillover	NTG	Net Savings (kWh/yr)	Net Savings (kW/yr)
10W General Purpose	18,926,377	41%	4.4%	63.4%	12,002,554	1,806
15W General Purpose	590,560	41%	4.4%	63.4%	374,516	56
20W General Purpose	2,773,395	41%	4.4%	63.4%	1,758,806	265
4W Candelabra	3,049,935	58%	4.4%	46.4%	1,415,691	213
8W Globe	534,646	58%	4.4%	46.4%	248,167	37
12W Special Function	449,710	58%	4.4%	46.4%	208,742	31
10.5W Downlight	227,092	35%	4.4%	69.4%	157,640	24
15W Flood (PAR 30)	11,886,793	35%	4.4%	69.4%	8,251,464	1,241
Total	**38,438,509**	**40.9%**	**4.4%**	**63.5%**	**24,417,580**	**3,673**

* The Non-Unanimous Stipulation and Agreement in File No. EO-2015-0055 states: "Only measures that are expected to deliver energy savings in 2023 and beyond are counted towards the demand goal in the EO included in Appendix A." Cadmus referenced the Ameren Missouri TRM for secondary data on measure EUL in order to assess whether or not measures are sufficiently long-lived to apply the stipulated energy to-demand ratio to determine 2023-persistent kW savings.

Free Ridership Results

In PY16, Cadmus modeled bulb, pricing, and promotional data using an econometric model. The study modeled these data as a panel, with a cross-section of program bulb quantities modeled over time as a function of prices, promotional events, and retail channels. Model diagnostics and fit statistics are provided in Appendix B.

We used the demand elasticity model to predict sales that would have occurred without the program's price impact and promotional activity and sales that would have occurred with the program (and which should be close to actual sales with a representative model). Predicted sales are then multiplied by the evaluated kWh savings per-bulb for each bulb model. We then calculated free ridership using the following formula:

$$FR\ Ratio = \frac{(Predicted\ Savings\ with\ Program - Predicted\ Savings\ without\ Program)}{Predicted\ Savings\ with\ Program}$$

The demand elasticity model produced an estimated 40% free ridership for the program. Free ridership varies by bulb type, based on the estimated price elasticity and the average discount by bulb type.

Table 35 provides PY16 free ridership estimates by measure.

Table 35. Lighting Free Ridership Results

Program Measure	Total Weighted Free Ridership Estimate
A-Lamp	41%
Reflector/Flood	35%
Specialty	58%
Overall	**40%**

Price Variation and Representativeness

In prior years, when product offerings were fairly stable over the year, Cadmus estimated elasticities for each unique product with observed price variations. This year, because individual product offerings came and went throughout the program period, Cadmus averaged sales and prices across all program incented comparable products within each unique retailer's store location. The average price for each bulb type within each store reflected the monthly sales-weighted, per-bulb price across all comparable products. Monthly sales equaled the sum of all program incented sales within each store, across the same group of comparable products (e.g., monthly prices and sales for all 60-watt, incandescent-equivalent, general purpose LED bulbs at a single Home Depot store).

Combining sales and prices this way (rather than observing price and sales changes for each individual model number) allowed the analysis to capture substitutions between comparable products (e.g., a decrease in the average price per-bulb when adding a three-pack of an existing bulb to the program and a corresponding increase in total program sales).

Similarly, when an updated version of a bulb (with a different model number) replaced an original bulb model, the first model's sales drops as the retailer sells off back stock, while the second model's sales increases. Aggregating prices and sales captures the variations across both products rather than controlling for sales impacts of factors unrelated to price (i.e., products phased out and replaced).

Cadmus only included sales of products with price variations in the model, as products without price variations did not contribute information to the model. The greater the price variation levels across retailers and lamp styles, the more representative elasticity estimates became when applied to sales of products that did not exhibit price variations.

Table 36 breaks out sales by retail channel and bulb type as percent of total sales. The table also shows the proportion of each category's sales with observed price variations (and therefore included in the model). Overall, 93% of all bulbs sold were represented in the model.

Table 36. Representativeness of Sales Included in Model

Store Type	Bulb Type	Percent of Category in Model	Category Percent of Total Sales
Small Chain	A-Lamp	98%	3.1%
Small Chain	Flood	100%	0.9%
Small Chain	Specialty	100%	0.2%
Club	A-Lamp	49%	10.3%
Club	Flood	99%	5.9%
Club	Specialty	80%	4.4%
DIY	A-Lamp	100%	32.1%
DIY	Flood	99%	17.0%
DIY	Specialty	99%	3.9%
Mass Market	A-Lamp	100%	19.4%
Mass Market	Flood	92%	1.4%
Mass Market	Specialty	76%	1.5%
Total		**93%**	**100%**

A-lamps at DIY retailers, accounting for over 31% of program sales, was the category accounting for the largest share of program sales. Of those, 100% of sales observed price variations and were included in the model. The majority of sales within each category also was included in the model, with one notable exception: A-lamps at Club stores accounted for roughly 10% of total program sales, but only 49% of A-lamp club store sales were included in the model.

Promotional Displays

For PY16, ICF provided records of product displays. These data recorded whether a particular retailer location featured program products in merchandising displays (e.g., end-caps, wingstacks). Field representatives collected the data when visiting stores throughout the year to verify program signage remained in place and bulbs were marked at the agreed-upon price points.

Cadmus initially included the merchandising displays in the model, but, when testing model specifications, it became clear that merchandising displays correlated highly with price changes. The merchandising coefficients were not statistically significant (near zero), and alternated between positives (indicating merchandising led to an increase in sales) and negatives (indicating merchandising led to a decrease in sales). Cadmus ultimately excluded the merchandising indicator from the final model.

Additional information in subsequent program years would improve the likelihood that the model could identify separate impacts. Currently, the merchandising information lists the date of a store visit and whether any program lamps were featured in off-shelf placements. However, many retailers sell a large number of unique program lamps. Without knowing which specific products are featured, the model is trying to estimate the sales lift across all products when a single product on display. Tracking which specific product is displayed, or even knowing the brand, type, and pack size, would improve the signal-

to-noise ratio in the data and improve the likelihood that we could identify separate merchandising effects.

Model Equation

Cadmus tested a variety of specifications (356 in total) to ascertain price impacts—the main instrument affected by the program— to identify the model with the best parsimony and explanatory power using the following criteria:

- Model coefficient p-values (keeping values less than <0.1)[11]
- Explanatory variable cross-correlation (minimizing where possible)
- Model AIC (minimizing between models)[12]
- Minimizing bias
- Optimizing model fit

We estimated the basic equation for the model as follows (for cross section i, in period t):

Equation 7

$$\ln(Q_{it}) = \sum_{\pi}\left(\beta_{\pi}ID_{\pi,i}\right) + \sum_{\theta,\delta}\left(\beta_{\theta1,\delta1}\left[ln(P_{it}) * (Retail\ Channel_{\theta,i})\right]\right)$$
$$+ \sum_{\varphi}\left(\beta_{\varphi}Bulb\ Type_{\varphi,i}\right) + \sum_{\omega}\left(\alpha_{\omega} * Month_{\omega,t}\right) + \varepsilon_i + \gamma_t$$

Where:

ln	=	Natural log
Q	=	Quantity of bulb packs sold during the month
ID	=	Dummy variable equaling 1 for each unique retail location, bulb type, and baseline watt category; 0 otherwise
P	=	Per-bulb price in that month
Retail Channel	=	Retail channel (small chain, club store, DIY, or mass market)
Bulb Type	=	A set of dummy variables:

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[11] Where a qualitative variable indicated many states (e.g., as bulb type), Cadmus did not omit variables if one state did not prove significant. Rather, the team considered the joint significance of all states. The team used robust estimations of model standard errors to properly represent model accuracy and to guide the specification process. The error structure involved clustering around cross-sectional units and an AR(1) autoregressive term.

[12] Akaike's Information Criteria (AIC) was used to assess model fit, as the R-square statistic was undefined for nonlinear models. AIC also provided a desirable property in that it penalized overly complex models (akin to the adjusted R-square).

Equaling 1 if the bulb type is reflector; 0 otherwise

Equaling 1 if the bulb type is globe; 0 otherwise

Equaling 1 if the bulb type is 43w A-line; 0 otherwise

Equaling 1 if the bulb type is 50w reflector; 0 otherwise

Month = Dummy variable equaling 1 for each month of the program year; 0 otherwise

ε_i = Cross-sectional random-error term

γ_t = Time-series random-error term

The model assumed a negative binomial distribution, which accounted for a small number of products with a disproportionately high sales volumes. Overall, the model predicted sales well without persistent bias in a single direction. Figure 8 shows a comparison of predicted and actual sales by month. Overall, the model underpredicted sales by less than 1%.

Figure 8. Predicted vs Actual Sales by Month
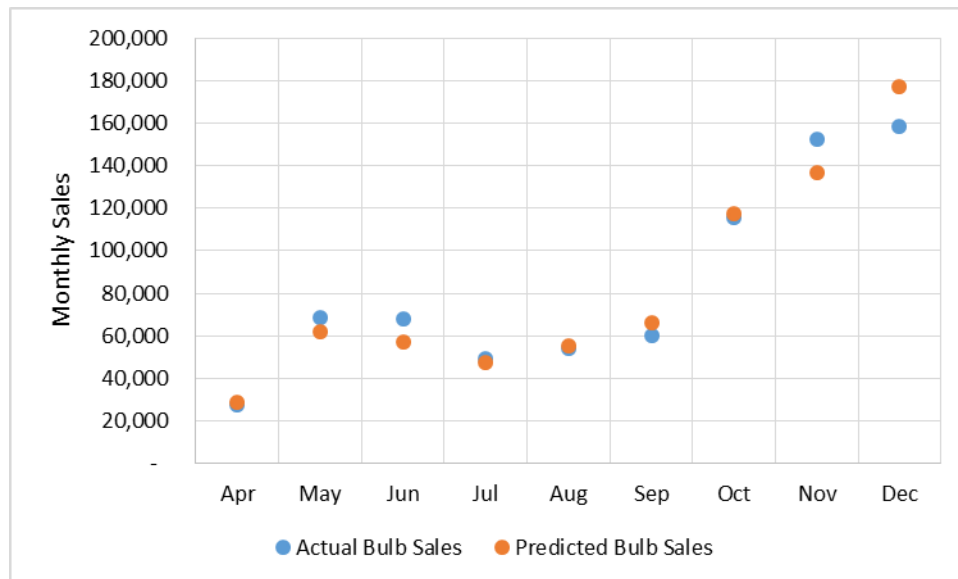
Elasticities

Price elasticity of demand measures equals the percentage change in the quantity demanded, given a percentage change in price. Because of the model's logarithmic functional form, price elasticity simply represented the coefficients for each price variable. In previous, similar analyses, Cadmus has seen elasticities range from -1 to -3, meaning a 10% drop in price leads to a 10% to 30% increase in the quantities sold. With the exception of specialty bulbs at small chain retailers the estimates for PY16 are largely within that range.

Table 37 shows price elasticity estimates by retail channel and bulb type.

Table 37. Price Elasticity Estimates by Retail Channel and Bulb Type

Retail Channel	Bulb Type	Elasticity
Small Chain	A-Lamp	-0.45
Small Chain	Flood	-1.39
Small Chain	Specialty	0.40
Club	A-Lamp	-1.07
Club	Flood	-2.19
Club	Specialty	-0.81
DIY	A-Lamp	-1.65
DIY	Flood	-2.26
DIY	Specialty	-0.99
Mass Market	A-Lamp	-2.12
Mass Market	Flood	-3.00
Mass Market	Specialty	-1.34

Demand for flood and reflector lamps proved the most elastic and responsive to price changes. A-lamps proved most elastic at Mass Market stores and Online. Demand for specialty bulbs remained the least elastic—not an uncommon finding in elasticity studies. Consumers tend to only buy ceiling fan bulbs or decorative bulbs for a vanity when needed, whereas reflector bulbs and A-line bulbs can be used in a variety of sockets; so consumers may stock up when prices are low.

The model found that specialty bulbs at small chain retailers actually had a positive price elasticity, indicating a positive relationship between price and sales. It is unlikely this accurately describes the relationship and more likely results from the small sample size for this bulb type and noise in the data. These bulbs accounted for only 0.2% of total program sales, and the model specification that produced the positive estimate predicted sales most accurately for other bulb types.

Program Price Impacts

Table 38 shows sales-weighted, average sale prices, original prices, and markdowns within the program, broken out by retail channels and bulb types. The table also shows markdowns as a share of original prices, which ranged from 28% to 58%.

Table 38. Mean Prices and Markdown by Retail Channel and Bulb Type

Store Type	Bulb Type	Mean Regular Price/Bulb	Mean Incentive/ Bulb	Mean Final Price/ Bulb	% Markdown
Small Chain	A-Lamp	$5.76	$2.65	$3.11	46%
Small Chain	Flood	$8.20	$3.95	$4.25	48%
Small Chain	Specialty	$8.06	$4.00	$4.06	50%
Club	A-Lamp	$5.33	$2.55	$2.78	48%
Club	Flood	$6.37	$2.44	$3.92	38%
Club	Specialty	$4.26	$1.19	$2.98	28%
DIY	A-Lamp	$5.90	$2.36	$3.52	40%
DIY	Flood	$8.28	$3.11	$5.13	38%
DIY	Specialty	$6.07	$3.51	$2.51	58%
Mass Market	A-Lamp	$4.15	$1.77	$2.39	43%
Mass Market	Flood	$9.40	$4.44	$4.96	47%
Mass Market	Specialty	$8.20	$4.34	$3.86	53%

Markdown levels for LEDs remained relatively stable between PY15 and PY16, ranging from 43% to 58% in PY15.

Overall, the net of free ridership was lower in PY16 at 60% than in PY15 at 65% for LEDs. Free ridership likely increased for two reasons:

1. First, price elasticities at club stores were lower in PY16, 1.07 compared with 2.14 in PY14 (PY15 results relied on PY14 estimates). This means that the increase in sales for a percent decrease in price is half the size in PY16. This could be due to consumer expectations changing as they become accustomed to lower prices.

2. Since only 49% of club store A-line bulbs incurred price variations, the model may be less predictive for this individual bulb category. Similarly, in PY14 (estimates applied to both PY14 and PY15) the model did not compute separate elasticities for globe, candelabra, and reflector/flood bulb, all categorized as specialty at that time. In the present analysis, reflector/flood bulbs are separated from specialty decorative globe and candelabra bulbs. The elasticities for reflector/flood bulbs were comparable to the specialty elasticity estimates in PY14. However, demand for the specialty decorative bulbs is less elastic than reflectors and the estimated elasticities were lower in PY16 than the specialty elasticities from PY14.

Precision

Once the final model specification had been developed, Cadmus calculated "block bootstrap" standard errors to determine the sensitivity of the net-to-gross ratios. To develop bootstrap standard errors, Cadmus drew 1,000 new samples (with replacements drawn at the cross-section level, i.e., retail channel/bulb type) from the original data, estimating coefficients with each sample and calculating a

new net-to-gross ratio. Using this method, the 5th and 95th percentiles in these net-to-gross ratios represented the lower and upper bounds of the 90th confidence interval, as shown in Table 39.

Table 39. Freeridership Estimate Confidence Intervals

Mean Freeridership	Lower Confidence Interval (90%)	Upper Confidence Interval (90%)	Absolute Precision (90%)
40%	37%	45%	± 4%

Like Spillover Results

"Like" spillover occurred when Ameren Missouri customers purchased and installed high-efficiency bulbs without a program discount, but due to the program's influence. Direct program influence may occur because of promotional and educational activities. The program also indirectly influenced manufacturer and retailer stocking and pricing practices; so consumers had a greater variety of high-efficiency models as well as continued downward pressure on prices for all high-efficiency bulbs.

To evaluate like spillover for PY16, Cadmus interviewed eight corporate representatives of participating retailer and manufacturers. In most cases, the representative interviewed managed the program MOU, which represented a partnership between a specific retailer and a specific manufacturer to participate in the Ameren Missouri Lighting Program.

Cadmus relied on these industry experts to provide their insight into broader trends in the Ameren Missouri territory and national lighting market. Cadmus used the interviews to capture each respondent's quantitative estimate of the program's influence on nonprogram bulb sales, based on their expertise and on information about Ameren's market interventions that Cadmus provided. We compared these results to the total 2016 sales of non-program energy-efficiency bulbs estimated from intercept survey results.

Assessing Program Influence

The interview guide used a four-step process to capture each respondent's estimate of program influence in a structured way:

1. The interviewer reviewed a list of five key factors that influence annual sales of efficient products, and asked respondents to review and add to the list as needed.

2. The respondent indicated the relative influence of each of the key factors, including any factors the respondent identified; so the total influence across all key factors was 100%.

3. The respondent reviewed a workbook that Cadmus compiled, showing program activity relevant to specific retailers or manufacturers for each program year since 2012. For example, the workbooks showed the number of bulbs sold, the number of models eligible for program discounts, the number of in-store events, and other activities, for each program year.

4. After reviewing the program activity data, the respondent indicated (as a percentage) their perceptions of program activity's influence level on each key factor influencing annual sales.

For the first step, Cadmus proposed using five elements as factors generally influencing sales, and asked respondents to suggest additional factors they considered important.

Table 40 shows the five factors and Cadmus' definition for each, as presented to the respondents. None of the respondents suggested any additional factors.

Table 40. Factors Affecting Annual Sales

Pricing	*By pricing, I mean your company's decision about what retail price to set for each product, taking into consideration information such as the price for other similar products, the store's minimum price point, your company's revenue expectations, and your expectations of consumer demand.*
Product Stocking	*Product stocking refers to the logistics and operational capacity needed to keep the product in stock and on the shelf.*
Product Placement and In-store Marketing	*Product placement and in-store marketing refers to the product's profile within the store—where it is placed on the shelf and what signs are present promoting the product.*
Customer Education	*Customer education refers to any efforts, whether local or national, or in-person or via some other channel, to specifically educate consumers about the differences between common bulb technologies and styles.*
Retailer Education	*Retailer education refers to any efforts to educate store clerks and other store employees about different lighting products, to ensure store employees are able to assist customers with their lighting purchases.*

Upon establishing the list, Cadmus asked respondents to estimate the percentage influence of each identified factor; so the influence summed to 100%. Table 41 shows the results from seven interviews (the eighth respondent did not provide quantitative answers).

Table 41. Respondent Estimates of Factor Influence on Annual Sales of High-Efficiency Bulbs

Respondent	Pricing	Product Stocking	Placement/In-store Marketing	Customer Education	Retailer Education	Total
Interview 1	65%	15%	8%	8%	5%	**100%**
Interview 2	50%	10%	5%	25%	10%	**100%**
Interview 3	40%	10%	20%	10%	20%	**100%**
Interview 4	80%	10%	10%	0%	0%	**100%**
Interview 5	70%	10%	10%	5%	5%	**100%**
Interview 6	25%	15%	40%	15%	5%	**100%**
Interview 7	30%	30%	30%	5%	5%	**100%**

After the respondents quantified each factor's general influence on sales, Cadmus asked the respondents to estimate the program's influence on each factor. To ensure each respondent provided a knowledgeable estimate, Cadmus presented them with data on program activity specifically affecting their stores or products from 2012 through 2015. Where possible, Cadmus narrowed the data to represent activity from the representative's own stores or with their own product. Where retailer/manufacturer-specific data were unavailable, Cadmus presented program-level activity in the territory. Table 42 shows the template used to present program activity, with sample data.

Table 42. Example of Retailer/Manufacturer-Specific Information on Program Activity

Program Activity	Program Year			
	2012	**2013**	**2014**	**2015**
Average Incentive per [Manufacturer] Bulb:				
Standard CFLs	n/a	$1.10	$1.08	$0.75
Specialty CFLs	$1.50	$1.93	$1.91	n/a
Standard LEDs	$14.00	$9.38	$4.52	$4.12
Specialty LEDs		n/a	$4.80	$3.49
Number of Program-Incented [Manufacturer] Models	9	6	12	13
% of Efficient Models in [Retailer] Stores/ % of Efficient Models in Nonparty. Retailers				82% / 25%
# of In-Store Events (Territory-wide, not Retailer Specific)	*50*	*222*	*233*	*200*
[Retailer] Active Locations	5	6	6	5

Table 43 shows program influence estimates by factor from each interview. For example, the respondent from Interview One considered the program responsible for about 50% of the pricing impact on annual sales.

Table 43. Respondent Estimates of Program Influence on Key Sales Factors

Respondent	Pricing	Product Stocking	Placement/In-store Marketing	Customer Education	Retailer Education
Interview 1	50%	10%	15%	50%	15%
Interview 2	60%	10%	5%	10%	5%
Interview 3	75%	0%	50%	10%	30%
Interview 4	80%	20%	0%	0%	0%
Interview 5	75%	15%	15%	10%	5%
Interview 6	75%	5%	10%	5%	5%
Interview 7	30%	30%	30%	5%	5%
Average (Unweighted)	**64%**	**13%**	**18%**	**13%**	**9%**

Cadmus multiplied each respondent's factor influence estimate (Table 41) by their estimate of the program's influence on that factor (Table 43), thus calculating a program influence score for each factor (factor score). The team summed each respondent's five factor scores to determine the respondent's overall estimate of program influence on annual sales of energy-efficient bulbs in Ameren Missouri territory, shown in Table 44. The table also shows PY16 program sales for each retailer-manufacturer, indicating the relative importance of each respondent's estimate. Cadmus averaged each retailer's estimate of program influence, weighted by the retailer's program sales, to calculate the average program influence on energy-efficient sales in Ameren Missouri territory.

Table 44. Estimate of Program Influence on Sales of High-Efficiency Bulbs in Ameren Territory

Respondent	Respondent Estimates of Program Influence	Retailer-Manufacturer 2016 Program Sales
Interview 1	40%	370,390
Interview 2	34%	35,183
Interview 3	47%	5,305
Interview 4	66%	148,057
Interview 5	56%	11,488
Interview 6	25%	50,021
Interview 7	28%	33,265
Sales-weighted average	**44%**	

Determining Non-Program Sales

To determine the number of non-program energy-efficient bulb (EE bulb) sales in 2016, Cadmus used the results from the store intercept survey. Cadmus calculated the percentage of all EE bulbs purchased that were not program-discounted as 32% (Table 45).

Table 45. 2016 Intercept Counts of Bulb Sales by Type

Bulb Type	Number of Bulbs	Percent of Total
Incandescent	591	32%
Halogen	157	9%
CFL	86	**5%**
LED (non ENERGY STAR)	415	**23%**
LED (ENERGY STAR, non program bulb)	73	**4%**
LED (ENERGY STAR, program bulb)	485	27%
Other	13	1%
Total	**1,820**	**100%**
Non-program EE Bulbs		*32%*

To determine the *total number* of non-program EE bulb sales in Ameren Missouri territory in PY16, Cadmus applied the percentage of EE bulb sales that were not program bulbs (32%) to the number of program bulb sales that occurred in retail outlets that also sold non-program EE bulbs. (Since discount outlets typically do not sell lighting products not discounted by the program, they cannot generate any like spillover, and we removed them from the base for determining non-program EE bulb sales.) We then summed program sales and non-program EE bulbs sales to get the total number of EE bulb sales in Ameren Missouri territory in PY16. Table 46, Lines 1-6, shows the total EE bulb sales, as well as detail on the calculation.

Cadmus considers this the best available estimate of the total sales of energy-efficient bulbs in the territory in PY16. However, the calculation uses sales in participating stores as the base for determining total EE sales, and therefore does not account for any sales of EE bulbs in non-participating locations, which may be impacted by the diversity of models and lower prices available at nearby participating stores as a result of the program. By excluding these sales, we may be underestimating program spillover.

Calculating Spillover

To determine the rate of spillover sales, we used the retailer-manufacturer interview results. The retailer-manufacturer representatives estimated, on average, that the program was responsible for 44% of their total annual EE bulb sales (Table 44). We applied 44% to our estimate of total EE bulb sales to determine the number of bulb sales attributable to the program. We then divided this number by the PY16 total program sales to determine the overall net-to-gross ratio for the program. We compare this estimate of overall NTG to our freeridership estimate determined through the demand elasticity model (see Free Ridership Results for detail). The difference between the overall NTG, and the percent net of freeridership is the like spillover for PY16.

Table 46, Lines 7 through 12, shows the steps Cadmus followed to calculate the like spillover, using the inputs described above.

Table 46. Like Spillover Calculations

Line	Input	Value	Source and Calculations
Total EE Sales			
1	Program sales	917,013	Tracking data
2	Program sales in discount stores	52,354	Tracking data
3	Program sales in regular lighting retail channels	864,659	Tracking data
4	Non-program sales as % of total EE bulb sales	32%	2016 Intercept Survey
5	Program sales in regular lighting retail channels as % of total EE bulb sales	68%	*1-Line 4*
6	Total EE sales	1,323,911	*Line 1 + (Line 3 ÷ Line 5 × Line 4)*
Spillover			
7	Program attribution	44%	Retailer Interviews
8	Program attributable bulbs	582,521	*Line 6 × Line 7*
9	Overall NTG	63.5%	*Line 8 ÷ Line 1*
10	Freeridership	40.9%	PY16 demand elasticity model
11	1-Freeridership	59.1%	*1 - Line 10*
12	**Like Spillover**	**4.4%**	*Line 9 – Line 11*

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 and general marketing can affect customers' perceptions of their energy usage, and, in some cases, motivates customers to take efficiency actions outside of a utility's program. The energy savings caused by, but not rebated through, a utility's demand-side management activity are spillover savings. The spillover savings accrued by customers who did not participate in Ameren Missouri's programs are nonparticipant spillover, or NPSO.

During PY16, Ameren Missouri spent over $1.1 million dollars to market individual residential efficiency programs (excluding the Low-Income and Home Energy Report programs).[13] To understand whether Ameren Missouri's program-specific marketing efforts generated energy efficiency improvements outside of Ameren Missouri's incentive programs, Cadmus implemented a phone survey of residential customers who did not participate in Ameren Missouri's incentive programs in PY16. As this survey has been implemented annually since PY13, the PY16 version represents the latest effort in monitoring nonparticipant activity.

Methodology

Survey Sampling and Disposition

From Ameren Missouri's entire residential customer base, Cadmus selected customers who did not participate in any Ameren Missouri programs in PY16; these 674,577 customers served as the sample frame for the nonparticipant survey.[14] From this sample frame, the team randomly selected 20,000 customers for the survey sample. The team called customers from this sample until reaching a quota of 200 completed nonparticipant surveys.[15]

The team cross-checked each respondent's account ID and phone numbers against the final participant program tracking databases to ensure that respondents were not confused by the questions and, in fact, participated in the program. Analysis found that two survey respondents participated in the Multifamily Efficient Kits program, but they did not report spillover measures. The NPSO analysis focused on 198 verified nonparticipants to avoid potential double-counting of program-specific spillover.

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[13]   The Home Energy Report program is evaluated using billing analysis, which accounts for both program savings and spillover savings. Thus, it is excluded from this NPSO analysis.

[14]   Invalid or duplicate phone numbers were removed from the sample frame. Home Energy Report participants were also removed from the sample frame.

[15]   A small number of survey respondents (n=17) self-reported that they participated in an Ameren Missouri residential program in PY16, so they are not part of the 200 nonparticipant completes.

Like and Non-Like Spillover Measures

The survey asked respondents whether they installed any of 11 energy efficiency measures offered by Ameren Missouri programs (i.e., "like" spillover), with the notable exception of products in the Lighting, and HVAC programs. The like NPSO analysis excluded products in the Lighting and HVAC programs to avoid double-counting spillover savings already captured through those programs' like spillover analyses (see Like Spillover Results).

In addition, the survey asked respondents whether they installed energy efficiency measures or performed energy-saving actions outside of Ameren Missouri's PY16 program offerings (i.e., "non-like" spillover). The rationale for including non-like spillover was that Ameren's program marketing and outreach would raise general awareness of energy efficiency and could result in Ameren Missouri customers taking additional steps to save energy on their own.

For example, some respondents reported installing non-like measures previously offered through Ameren Missouri programs and might have been influenced by Ameren Missouri's prior program marketing and outreach. In addition, Ameren Missouri customers might have adopted other non-like measures due to Ameren Missouri's program marketing and outreach changing their general attitudes towards energy efficiency.

NPSO Selection Criteria

To confirm a relationship between Ameren Missouri's energy efficiency programs and measures adopted by nonparticipants, Cadmus created a set of selection criteria and operationalized these into survey questions. To be included in the NPSO analysis, nonparticipating respondents had to meet all of the following criteria:

a) Familiarity with at least one Ameren Missouri program, rebate, or discount[16]

b) At least one element of Ameren's program marketing and outreach motivated them to adopt the measure

c) They had a valid reason for considering the adopted measure energy efficient

d) For a like measure, they had not received a rebate from Ameren, and had not already tried to receive a rebate from Ameren, and they stated a valid reason for not applying for an Ameren Missouri measure rebate

e) They had a valid reason for deciding to install the measure

f) The adopted measure generated electric savings, not gas savings

For criterion b), the team asked respondents to rate several Ameren Missouri program marketing and outreach elements' (shown in Table 47) importance in motivating them to adopt the spillover measure

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[16] Responding "Yes" to C2 "Have you ever seen or heard of the Ameren Missouri energy efficiency programs?" or C10 "Are you aware that Ameren Missouri offers rebates and discounts for energy-saving equipment in your home?"

as "very important," "important," "not important," or "not important at all". For like measures, the measure in question met criterion b) if the respondent found at least one element "very important" or "important" in deciding to adopt the measure. For non-like measures, respondents had to find at least one element "very important".

Table 47. Ameren Missouri Marketing and Outreach Elements for Criterion B

Statement
Information about energy savings from Ameren's marketing or bill-inserts
Information from colleagues or friends who installed energy-efficient equipment and received a rebate from Ameren Missouri
If applicable, past participation in an Ameren Missouri rebate program
If applicable, information from the energy assessment conducted at your home through Ameren

Criterion c) helped ensure that spillover measures actually generated energy savings. For applicable measures, the team asked respondents how they knew that their product was energy efficient. Responses passing criterion c) included "it's ENERGY STAR rated" or "the retailer/dealer/contractor told me it was."

If respondents reported adopting a like measure, the team asked whether they received a rebate from Ameren Missouri (to double-check whether respondents truly did not participate in the program). The team then asked why they or their contractor did not apply for a rebate through Ameren Missouri. If respondents reported that they applied for a rebate but did not receive it (as their product did not qualify), their adopted measure did not pass criterion d). Hence, the team excluded the measure in NPSO.

The team also asked respondents why they decided to adopt the measure. If the response directly contradicted criterion b), c), or d), the measure did not pass criterion e). For example, one respondent reported installing an "Efficient room air conditioner" because "it was free and I didn't have any choice." This response contradicted criterion b)—that Ameren Missouri's marketing and outreach influenced the measure adoption.

As the PY16 evaluation only concerned electric savings generated by Ameren's programs, the team asked respondents for the fuel types for their water heaters, heating systems, and cooling systems. Reported like and non-like measures satisfied criterion f) if the measures had a corresponding electric water heater, electric heat, or electric cooling.

Results

Of 198 verified nonparticipant respondents, 27 respondents adopted measures that were not incentivized and passed all six NPSO criteria (see Appendix E. Stakeholder Interview Guide, Store Intercept Survey Guide, Retailer-Manufacturer Interview Guide). None of these 27 respondents received an incentive from Ameren Missouri for any measure. They were only influenced by Ameren Missouri program marketing and outreach, and adopted NPSO measures on their own.

From these 27 respondents, six respondents reported adopting a total of seven non-incentivized like measures; and 23 respondents adopted a total of 32 non-incentivized non-like measures.

Like NPSO

Table 48 shows like measures and gross evaluated kWh savings attributed to Ameren Missouri, achieving average savings of 176 kWh (i.e., Variable A in Table 49).

Table 48. Like NPSO Response Summary

Individual Reported Like Measures	Importance of Ameren Missouri Influence on Adoption	Measure Savings (kWh)*	Allocated Savings	Total kWh Savings	Avg kWh Per Spillover Measure
Efficient kitchen faucet aerators	Somewhat	250*	50%	125	
Efficient kitchen faucet aerators	Very	250*	100%	250	
Efficient kitchen faucet aerators	Very	250*	100%	250	
Efficient room air conditioner	Somewhat	45**	50%	22	A
Efficient room air conditioner	Somewhat	45**	50%	22	
Efficient showerheads	Very	331*	100%	331	
Learning or "smart" thermostat	Somewhat	462**	50%	231	
Total (n=7)				**1,231**	**176**

*Based on savings calculated for the PY16 EE Kits program.

**Based on savings calculated for the PY16 Efficient Products program.

To determine total like NPSO generated by Ameren Missouri marketing in PY16, Cadmus extrapolated like NPSO savings per like measure (shown in Table 48) to Ameren Missouri's entire PY16 residential nonparticipant population. Table 49 presents the like NPSO analysis, resulting in like NPSO total evaluated savings of 5,050 MWh at the portfolio level.

Table 49. Like NPSO Analysis

Variable	Metric	Value	Source
A	Average kWh Savings per Like Measure	176	Survey Data; PY16 Impact Evaluation
B	Number of Like Measures	7	Survey Data
C	Number of Nonparticipant Respondents	198	Survey Disposition
D	Total Residential Population Minus PY16 Participants	812,009	Customer Database
E	Total Like NPSO MWh Savings Applied to Population	5,050	$(((B \div C) \times A) \times D)/1000$

Like NPSO savings in PY16 (5,050 MWh) were smaller than savings reported in PY15 (12,247 MWh) due to three factors:

a) The total *ex post* residential portfolio savings in PY16 (95,249 MWh) decreased from PY15's 142,016 MWh

b) The like NPSO savings as a percent of total portfolio savings in PY16 (5.3%) decreased from 8.6% in PY15

c) Several measures were no longer like measures as in PY15 (e.g., insulation, refrigerator/freezer recycling, programmable thermostats, windows)

Whereas PY15's survey reported like measures from a variety of Ameren Missouri programs, PY16's reported like measures are mostly efficient kitchen faucet aerators from the EE Kits program and efficient room air conditioners in the Efficient Products program.

Non-like NPSO

Cadmus followed a similar methodology as for like spillover in computing non-like spillover with two exceptions. Table 50 shows non-like measures and gross evaluated kWh savings attributed to Ameren, achieving average savings of 110 kWh (Variable A). The first exception: in contrast with the like NPSO, we only counted non-like NPSO when the respondent rated Ameren Missouri's influence on the measure adoption as "very important". Due to uncertainty around how Ameren Missouri's marketing influences non-like measure adoption, we were more conservative in counting savings. For the second exception, we estimated savings from individual measures more conservatively:

- Because ENERGY STAR market shares are generally high for efficient clothes washers, freezers, and refrigerators, the team allocated only 50% of the measure savings. Although respondents rated the program as "very important" in their decision to purchase, it is likely that at least some respondents would have bought an ENERGYSTAR product regardless of Ameren's influence.

- For the measure defined as "removing a refrigerator or freezer", it is possible that respondents sold it or gave it to someone else rather than recycling, in which case the savings generated from the removing would be over-estimated. Again, even though the respondent rated Ameren Missouri's marketing as very important, and had mentioned it as an energy saving activity, we allocated 50% of the savings to spillover.

- We excluded efficient dishwashers from the spillover analysis because virtually all dishwashers on the market are already ENERGYSTAR-certified.

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Table 50. Non-like NPSO Response Summary

Individual Reported Non-like Measures	Quantity	Measure Savings (kWh)	Allocated Savings	Total kWh Savings	Avg kWh Per Spillover Measure
Insulation	3	192*	100%	577	
Efficient clothes washer (gas water heating)	2	34**	50%	34	
Efficient clothes washer (electric water heating)	1	120***	50%	60	
Efficient freezer	4	61†	50%	122	
Efficient refrigerator	2	37††	50%	37	
Efficient water heater (other than heat pump water heater)	2	157†††	100%	314	A
Efficient Windows	2	187^	100%	374	
Programmable (but not "smart") thermostat	1	83^^	100%	83	
Programmed thermostat to reduce usage	8	83^^	100%	664	
Removed a refrigerator or freezer	3	494^^^	50%	741	
Scheduled an air conditioner tune-up	4	126^^	100%	504	
Total (n=32)				**3,510**	**110**

*Average ceiling insulation savings per home, calculated for the PY15 Home Energy Analysis.
**Deemed savings for gas water heating and unknown dryer fuel, from the Illinois TRM Version 5.0 Volume 3.
***Deemed savings for electric water heating and unknown dryer fuel, from the Illinois TRM Version 5.0 Volume 3.
†Deemed savings for ENERGY STAR Freezer from Ameren Missouri 2012 Energy Efficiency Filing Appendix A TRM.
††Deemed savings for ENERGY STAR Refrigerator from the Illinois TRM Version 5.0 Volume 3.
†††Deemed savings from Ameren Missouri 2012 Energy Efficiency Filing Appendix A TRM.
^Based on savings calculated for the PY15 Home Energy Analysis.
^^Based on savings calculated for the PY15 Heating and Cooling program.
^^^Based on savings calculated for the Appliance Recycling program (refrigerator/freezer recycling savings minus refrigerator/freezer replacement savings).

Using the same extrapolation method as that used for the like NPSO analysis, Cadmus determined total non-like NPSO generated by Ameren Missouri's PY16 marketing in MWh savings. Table 51 presents the non-like NPSO analysis, resulting in non-like NPSO evaluated savings of 14,396 MWh at the portfolio level.

Table 51. Non-like NPSO Analysis

Variable	Metric	Value	Source
A	Average kWh Savings per Non-like Measure	110	Survey Data; PY15 Impact Evaluation; Ameren Missouri TRM; Illinois TRM
B	Number of Non-like Measures	32	Survey Data
C	Number of Nonparticipant Respondents	198	Survey Disposition
D	Total Residential Population Minus PY16 Participants	812,009	Customer Database
E	Total Non-like NPSO MWh Savings Applied to Population	14,396	$(((B \div C) \times A) \times D)/1000$

Spillover Allocation to Individual Programs

Combining the above analyses, Cadmus observed 19,446 MWh of combined like and non-like NPSO. The team considered the following three approaches for allocating total observed NPSO to individual programs:

1. **Even Allocation**: The most straightforward approach allocated NPSO evenly across the residential programs (i.e., made a 20.4% adjustment to each program's NTG). This equaled applying NPSO at the portfolio-level, and, therefore, assumed all programs contributed equally to generating NPSO.

2. **"Like" Programs:** Another approach allocated NSPO savings to specific programs, based on the measure installed by the nonparticipant. This approach only applied to like NPSO. For example, one nonparticipant reported installing a start thermostat, motivated by Ameren Missouri's marketing. Using this approach, the team would assign NPSO savings associated with the installation to the Efficient Products Program.

   While this approach established a clear connection between a reported spillover measure and Ameren Missouri's program (which promoted that measure), the research found this direct measure-program relationship did not prove as straightforward as it appeared. Specifically, while all seven respondents reporting like NPSO were aware of Ameren Missouri programs, only one respondent was familiar with the specific program corresponding to the measure they installed.[17] This indicated that Ameren Missouri generated NPSO through the cumulative effects of various program-specific marketing efforts, and mapping spillover measures solely to the program offering the specific measure could undervalue the overall impact of cumulative and sustained energy efficiency messaging.

3. **Marketing Budget and Program Size.** The final allocation approach that the team considered—and eventually chose to use—assigned overall NSPO as a function of each program's marketing and program budget (shown in Table 52). This approach remained consistent with the theory that NPSO resulted from cumulative effects of program-specific marketing and program activity

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[17] C11 "What rebates or discounts have you heard about?"

over a particular period—not necessarily by a single, program-specific marketing effort. In addition, while NPSO most commonly was associated with mass media marketing campaigns, the scale of program activity counted as 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.) The team found this approach accurately reflected and attributed NSPO to programs, ensuring those total costs (including marketing) and total benefits (net savings including NPSO) were properly accounted for when assessing overall program cost-effectiveness.

Table 52. Combined Savings and Marketing Allocation

Program	Program *Ex Post* Gross Savings (MWh)	Percentage of Portfolio Savings	Program Marketing	Percentage of Total Marketing	Combined Savings & Marketing	Percentage of Combined Savings & Marketing
Lighting	**38,349**	**40.4%**	**$45,000**	**5.6%**	**2.3%**	**5.9%**
Efficient Products	2,940	3.1%	$97,882	12.2%	0.4%	1.0%
HVAC	44,661	46.9%	$608,571	75.6%	35.4%	92.4%
Smart Thermostats	3,732	3.9%	$52,530	6.5%	0.3%	0.7%
EE Kits	5,478	5.8%	$1,479	0.2%	0.0%	0.0%
Total	**95,249**	**100%**	**$805,462**	**100%**	**38.3%**	**100%**

Using the Market Budget and Program Size allocation method, Cadmus distributed the portfolio-level result of 19,446 MWh NPSO to each of Ameren Missouri's residential programs. As shown in Table 53, the approach reflected each program's impact on the nonparticipant population, proxied by the combined effect of marketing expenditures and program savings. The Lighting program achieved 5.9% of the total NPSO, at 1,144 MWh.

Table 53. NPSO by Program

Program	Program Gross Savings (MWh)	Total NPSO (MWH)	Percent of Combined Savings/ Marketing	Program-Specific NPSO (MWh)
Lighting	**38,349**		**5.9%**	**1,144**
Efficient Products	2,940		1.0%	190
HVAC	44,661	**19,446**	92.4%	17,977
Smart Thermostats	3,732		0.7%	130
EE Kits	5,478		0.0%	5
Total	**95,249**		**100%**	**19,446**

Benchmarking

Cadmus compared values across several programs similar to Ameren Missouri's Lighting program, examining several key program design and performance metrics. For PY16, the team benchmarked several metrics related to free ridership:

- Free ridership Rate by bulb type

- Average incentive levels

- Incentives as a share of retail price

The team also benchmarked ISRs and bulb saturation.

Table 54 compares free ridership estimates specific to LED sales for several programs in 2015 and 2016, all of which applied a demand elasticity model. Ameren Missouri's LED free ridership rate in 2015 (28%) is the lowest rate across all studies, while the Ameren Missouri 2016 rate is very close to the two other 2016 evaluations, at 41%.

Table 54. Elasticity Model Free Ridership Estimates for LEDs

Evaluation	Free Ridership
Ameren Missouri (2016)	**41%**
Ameren Missouri – LEDs only (2015)	**28%**
Focus on Energy Wisconsin (2015)	29%
Midwest Utility (2016)	38%
Northeast Utility (2016)	39%
PPL Electric (2015)	39%
Entergy Arkansas (2015)	52%

Table 55 shows the average incentive amount per LED, broken out by bulb type (where available). Average incentives ranged from $2.26 per bulb to as much as $6.62 per bulb. Ameren Missouri's average incentive for standard LEDs is the lowest value seen across several Midwest and east coast programs. However, although Ameren Missouri's average incentives for specialty and reflector LEDs decreased substantially in 2016 relative to the previous year, they remain higher than the majority of programs.

Table 55. Average Incentive Levels Per Bulb

State or Utility	Retail Channel	Standard LEDs	Specialty LEDs	Reflector LEDs
Ameren Missouri (2016)	**All**	**$2.26**	**$4.13**	**$3.86**
Ameren Missouri (2015)	**All**	**N/A**	**$5.00**	**$5.28**
IPL (2015)	All	$2.31	$2.20	$2.48
NIPSCO (2015)	All	$3.59	$3.83	$3.83
SWEPCO (2015)	DIY	$2.91	$3.00	$4.29
	Mass Market	$2.92	$3.00	$3.00
Vectren Indiana (2015)	All	$3.50	$3.50	$3.50
Entergy (2015)	DIY	$3.62	$3.16	$5.33
	Discount	$4.68	$3.71	$6.23
	Mass Market	$3.84	$3.46	$4.98
PPL Electric (2015)	All	$4.81	$6.62	$6.62
Average		**$3.43**	**$3.56**	**$4.15**

As free ridership closely correlates to incentive percentages of retail prices, net of freeridership tends to increase as incentives increase as a percentage of retail price. Table 56 compares the incentives as a share of retail prices for different utilities, bulb types, and retail channels. Although the relationship is not perfectly linear, utilities with incentives that are a low percentage of the retail price tend to have lower net of freeridership rates. Ameren Missouri's 2016 average incentive as a percentage of retail price and net-of-freeridership percentage were within range of most other programs.

Table 56. LightSavers Benchmarking Results: Incentives as Share of Retail Price

State or Utility	Bulb Type	Incentive as a Share of Retail Price (Avg)	Net of Free Ridership
Ameren Missouri 2016	**LED**	**41%**	**59%**
SWEPCO 2015	LED	27%	27%
Entergy Arkansas 2015	LED	42%	52%
Entergy Arkansas 2015	Standard CFL	57%	80%
SWEPCO 2015	CFL	58%	55%
PPL 2015	LED	N/A	61%

Cadmus also benchmarked first-year ISRs for different utilities, as shown in Table 57. The table shows that when differentiated, LEDs tend to have a higher first year ISR than CFLs. This is likely because they are a newer product and more expensive – so customers are less likely to purchase without installing. Ameren Missouri's 2015 first-year ISR is the lowest of the programs included in the table. Ameren Missouri's ISR was determined through site visits to Ameren Missouri customer homes. Other studies did not indicate how they determined their first-year ISR.

Table 57. LightSavers Benchmarking Results: First-Year ISRs

Study ID	Year	Bulb Type	ISR
Ameren MO	**2015**	**All**	**79%**
IPL	2015	CFLs (Standard and Specialty)	76%
IPL	2015	LEDs (Standard and Specialty)	86%
IMP	2015	CFLs	91%
IMP	2015	LEDs	100%
NIPSCO	2015	CFLs (Standard and Specialty)	86%
NIPSCO	2015	LEDs (Standard and Specialty)	86%
Focus on Energy	2015	CFL	86%
Focus on Energy	2015	LED	99%
PNM	2015	CFLs	96%
PNM	2015	LEDs	100%
Vectren Indiana	2015	Standard CFL	89%
Vectren Indiana	2015	Specialty CFL	89%
Vectren Indiana	2015	Standard LED	100%
Vectren Indiana	2015	Specialty LED	100%

Finally, Cadmus benchmarked the saturation of different bulb types, as shown in Table 58. LED saturation in Ameren Missouri territory in 2015 is lower than other programs, however in 2015 Ameren's program was limited and purchasing habits are changing rapidly.

Table 58. Saturation by Bulb Type

Study ID	Year	CFL	LED	Halogen	Incandescent	Lin. Fluorescent
Ameren Missouri	**2015**	**29%**	**2%**	**5%**	**64%**	**0%**
IPL	2015	34%	11%	11%	44%	N/A
NIPSCO	2015	33%	14%	9%	45%	N/A
Focus on Energy	2015	31%	5%	6%	46%	9%
Ameren Missouri	2013	22%	1%	10%	56%	N/A
Focus on Energy (single family)	2013	31%	2%	0%	53%	N/A
Focus on Energy (multi-family)	2013	34%	1%	2%	50%	N/A

Cost-Effectiveness

Ameren Missouri assessed cost-effectiveness using the following five tests, as defined by the California Standard Practice Manual:[18]

- 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 Lighting program, and correlates prices and savings to 33 years of historic weather data. Using long-term weather ensures that the model captures low-probability, high-consequence weather events, and appropriately values these. As a result, the model produces an accurate evaluation of the demand-side efficiency measure relative to other alternative supply options.

Key assumptions include the following:

- Discount Rate = 6.46%
- Line Losses = 5.72% for Residential measures and 4.84% for Business measures
- Summer Peak would occur during the 16th hour of a July weekday, on average
- Avoided Electric T&D = $23.03/kW in 2016 and growing at a rate of 2% annually for the next 24 years
- Escalation rates for different costs occur at the component level, with separate escalation rates for fuel, capacity, generation, T&D, and customer rates carried out over 25 years

Ameren Missouri used evaluation results as model inputs (e.g., PY16-specific Lighting program participation counts, per-unit gross savings, NTG, NPSO).

Particularly, measure load shapes drove model assumptions, as indicated when the model should apply savings during the day. This ensured that the load shape for an end use matched the system peak impacts of that end use, and provided the correct summer coincident savings. Ameren Missouri used measure lifetime assumptions and incremental costs based on the program database, the Ameren Missouri TRM, or the original Batch Tool.

A key step in the analysis process required PY16 Ameren Missouri program-spending data: actual spending, broken down into contractor administration, incentives, and marketing costs.

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

Ameren Missouri applied contractor administration, marketing, and other costs —including R&D, EM&V, Educational Outreach, Portfolio Administration, Potential Study, and Data Tracking— at the program level, while incentives were applied at the measure level.

Table 59 summarizes cost-effectiveness findings by test. Any benefit-cost score of 1.0 or higher passed the test as cost-effective. As shown, the Lighting program passed all tests. The participant cost test is N/A because due to reduced maintenance, incremental costs of the measure are negative, even though first costs are higher.

Table 59. Cost-Effectiveness Results (PY16)

Program	UCT	TRC	RIM	Societal	PART
Lighting	5.91	5.91	0.49	8.83	N/A

Appendix A. End-Use Load Shapes and Coincidence Factors

Appendix E

End-Use Category Energy Load Shapes
% Energy by Month

Month	Residential End-Use Category Load Shape								
	Building Shell	Cooling	Freezer	HVAC	Lighting	Miscellaneous	Pool Spa	Refrigeration	Water Heating
January	11.1297%	0.1200%	7.9579%	11.1297%	10.1182%	8.4893%	8.6451%	7.7053%	10.3527%
February	9.3077%	0.1100%	7.2518%	9.3077%	8.8441%	7.7366%	7.1145%	7.2169%	9.0720%
March	7.0042%	0.3130%	8.1080%	7.0042%	9.2879%	8.4863%	8.6052%	8.0272%	9.5543%
April	3.7116%	1.5047%	7.9918%	3.7116%	8.4645%	8.2144%	8.0702%	7.8752%	8.4799%
May	4.0888%	6.5410%	8.4083%	4.0888%	7.9393%	8.4847%	8.6052%	8.5646%	8.3600%
June	10.3973%	21.0823%	8.5730%	10.3973%	6.8508%	8.2122%	8.0702%	8.9112%	7.7065%
July	14.0100%	28.4780%	9.6095%	14.0100%	6.7864%	8.4883%	8.6451%	9.4239%	6.7712%
August	13.3207%	27.0766%	9.6095%	13.3207%	7.0565%	8.4840%	8.5653%	9.4212%	6.3688%
September	6.6759%	12.6605%	8.4277%	6.6759%	7.3792%	8.2136%	8.3032%	8.4971%	6.9373%
October	3.7011%	1.8472%	8.2582%	3.7011%	8.4539%	8.4869%	8.6052%	8.5653%	7.9644%
November	5.9593%	0.1444%	7.8465%	5.9593%	8.9880%	8.2122%	8.1088%	7.8717%	8.4752%
December	10.6937%	0.1222%	7.9579%	10.6937%	9.8312%	8.4915%	8.6619%	7.9204%	9.9577%

End-Use Category Energy to Coincident Peak Demand Factors

	Building Shell	Cooling	Freezer	HVAC	Lighting	Miscellaneous	Pool Spa	Refrigeration	Water Heating
	0.0004660805	0.0009474181	0.0001685722	0.0004660805	0.0001492529	0.0001148238	0.0002354459	0.0001285253	0.0000887318

Source: Ameren Missouri 2016-2018 Energy Efficiency Plan. MPSC file number EO-2015-0055 Appendix E

Appendix B. Elasticity Model Outputs

Cadmus ran 356 model scenarios to identify the model with the best parsimony and explanatory power using the following criteria:

- Model coefficient p-values (keeping values less than <0.1)
- Explanatory variable cross-correlation (minimizing where possible)
- Model QIC (minimizing between models)
- Minimizing multicollinearity
- Optimizing model fit

The following tables provide output statistics and information generated by the final model.

Table 60. Model Information

Model Information	
Data Set	WORK.FINALMODELDATA
Distribution	Negative Binomial
Link Function	Log
Dependent Variable	MonthlyPackSales
Number of Observations Read	17249
Number of Observations Used	15991
Number of Invalid Responses	99
Missing Values	1159

Table 61. Model Classification Variable Levels

Class Level Information		
Class	**Levels**	**Values**
id	1,108	Stores
Channel	3	CLUB DIY MASS
style	3	LED BULB SPEC BULB STAN BULB
CFL	2	0 1

Table 62. Parameter Estimates with Empirical Standard Errors

Parm	Level 1	Estimate	Stderr	LowerCL	UpperCL	Z	ProbZ
Intercept		0	0	0	0		
logPrice*Channel	Chain	0.282	0.218	-0.146	0.709	1.291	0.197
logPrice*Channel	Club	-0.814	0.258	-1.320	-0.308	-3.152	0.002
logPrice*Channel	DIY	-1.034	0.103	-1.236	-0.831	-9.988	0.000
logPrice*Channel	Mass	-1.429	0.177	-1.776	-1.081	-8.064	0.000
logPrice*Reflector		0.048	0.259	-0.460	0.556	0.185	0.853
logPrice*Globe		0.522	0.152	0.225	0.819	3.441	0.001
logPrice*ALine43		-0.799	0.155	-1.103	-0.495	-5.150	0.000
logPrice*Reflector50		-1.743	0.307	-2.346	-1.141	-5.670	0.000

Table 63. QIC Fit Criteria

Criterion	Value
QIC	-7294089
QICu	-7291890

Appendix C. Measure Category Specifications

Table 64. Standard—General Purpose, A-Line, Omni-Directional

Bulb Type	Lumen Bin	Baseline	Ameren Measure Category
Standard	310-449	25	10W_LED
Standard	450-799	29	10W_LED
Standard	800-1,099	43	10W_LED
Standard	1,100-1,599	53	15W_LED
Standard	1,600-1,999	72	20W LED
Standard	2,000-2,600	72	20W LED

Table 65. Specialty Lumens Bins

Bulb Type	Lumen Bin	Baseline	Ameren Measure Category
Globes			
Globe	350-499	40	8W_LED_Globe_Light
Globe	500-574	43	8W_LED_Globe_Light*
Globe	575-649	53	8W_LED_Globe_Light
Globe	650-1,099	72	8W_LED_Globe_Light
Decorative			
Decorative	150-299	25	4W_LED_Candelabra
Decorative	300-499	40	4W_LED_Candelabra

Table 66. EISA-Exempt Lumens Bins (i.e., three-way, post lamps)

Bulb Type	Lumen bin	Baseline	Ameren Measure Category
EISA-Exempt	450-799	40	12W_LED_Dimmable
EISA-Exempt	800-1,099	60	12W_LED_Dimmable
EISA-Exempt	1,100-1,599	75	12W_LED_Dimmable

Table 67. Reflectors with Diameter >2.5 inches (>20 eighths of an inch)

Bulb Type	Bin	Baseline	Ameren Measure Category
D > 20	740-849	45	15W_LED_Flood_Light_PAR30
D > 20	850-1,179	50	15W_LED_Flood_Light_PAR30
D > 20	1,180-1,419	65	15W_LED_Flood_Light_PAR30
D > 20	1,420-1,789	75	15W_LED_Flood_Light_PAR30
D > 20	1,790-2,049	90	18W_LED_Flood_Light_PAR38
D > 20	2,050-2,579	100	18W_LED_Flood_Light_PAR38
Exclusion 2: BR30, BR40,and ER40 Lamps			
BR30, BR40, ER40	650-1,179	65	15W_LED_Flood_Light_PAR30
Exclusion 3: ER30 Lamps			
ER30	740-849	45	15W_LED_Flood_Light_PAR30
ER30	850-1,179	50	15W_LED_Flood_Light_PAR30

Table 68. Reflectors with Diameter >2.25 and <= 2.5 inches
(>18 eighths of an inch and <= 20 eighths of an inch)

Bulb Type	Bin	Baseline	Ameren Measure Category
20 ≥ D > 18	300-539	30	10.5W_LED_Downlight
20 ≥ D > 18	540-629	40	10.5W_LED_Downlight
20 ≥ D > 18	630-719	45	10.5W_LED_Downlight
20 ≥ D > 18	720-999	50	10.5W_LED_Downlight
20 ≥ D > 18	1,000-1199	65	10.5W_LED_Downlight
Exclusion 1: R20 Lamps			
R20	450-719	45	10.5W_LED_Downlight
R20	720-999	50	10.5W_LED_Downlight
R20	1,000-1,199	65	10.5W_LED_Downlight

Appendix D. Bibliography

Ameren Missouri 2016-2018 Energy Efficiency Plan. *Missouri Public Service Commission file number EO-2015-0055, Appendix G.* Available online: https://projects.cadmusgroup.com/sites/6320-P02/phase01/Shared%20Documents/Management/PY16%20Proposed%20Stipulated%20and%20Agreement%20Files/Appendix%20G%20-%20Measure_List_Incentives%20Range_Design.pdf?Web=1

Dimetrosky, S., K. Parkinson, N. Lieb. *Uniform Methods Project, Chapter 21: Residential Lighting Evaluation Protocol.* National Renewable Energy Laboratory. February 2015. Available online: http://energy.gov/sites/prod/files/2015/02/f19/UMPChapter21-residential-lighting-evaluation-protocol.pdf

Cadmus and Nexant. *Ameren Missouri LightSavers Process and Impact Evaluation: Program Year 2013*. Presented to Ameren Corporation. June 2014.

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

Appendix E. Stakeholder Interview Guide, Store Intercept Survey Guide, Retailer-Manufacturer Interview Guide, Nonparticipant Spillover Survey Data

Ameren Missouri Lighting Program
Stakeholder Interview Guide (PY16)

Respondent name: _____

Respondent phone: _____

Interview date:_____   Interviewer initials: _____

This interview is to assess how well the program processes and implementation are working to achieve the goals of the program. The guide is particularly focused on any changes in how the program is performing relative to PY15.

A.   Roles and Responsibilities
I will start with roles and responsibilities.

1)   **[Ameren]** Have there been any changes to the Ameren Missouri staff dedicated to the Lighting Program this year?

2)   **[ICF]** Please describe ICF's role and responsibilities in the Lighting Program, and the organization and responsibilities of the ICF team that works on the program.

3)   **[Both]** Describe communication between Ameren and ICF. What types of formal or informal communication do you use?

4)   **[Both]** Have there been any issues with communication or reporting over the year? How were these resolved?

B.   Program Goals
Now let's move on to the program goals.

5)   In your view, what is the overall objective of the Lighting Program? What do you see as the critical factors for achieving that objective? How is the program designed to influence those factors?

6)   Can you describe what you perceive as the impact of the program on the overall energy efficient lighting market so far, over the past eight years of implementation? What evidence do you have to support your views?

7)   Do you think the program influences sales at nonparticipating stores? How so? What evidence would you cite to support your views?

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8) Can you confirm that the program's participation goal for PY16 is 924,000 LEDs, and the energy savings goal is 25,016 MWh?

	Participation		MWh	
	PY15 (Actual)	PY16 (Target)	PY15 (Actual)	PY16 (Target)
Program	2,032,936	924,000	60,830	25,016

9) In previous years, the program had goals such as increased awareness (total number of promotional events) and inclusion of rural areas/smaller retailers (coupons). Does the program have any process or non-impact goals for PY16?

    a. If so:

        i. What are the non-impact goals?

        ii. How are these non-impact goals determined?

        iii. How is the program doing relative to these non-impact goals?

    b. If not:

        i. Why are these types of goals no longer a program focus?

C. Program Design and Implementation

My next questions address the program design.

10) In PY16, Ameren Missouri eliminated CFLs from the program. What do you think was the intention driving this change?

11) Were there any other significant changes in eligible measures in PY16?

12) In the past, the program included a coupon channel that allowed for participation by smaller retailers in more rural areas. Why was this channel discontinued?

13) The overall participation goal for PY16 is about half the goal in PY15, but the target number of LEDs sales is substantially higher. How has the program design or implementation changed to encourage more LED sales in PY16?

14) What is the process to identify discounted models and set incentives?

15) Early results show the program is unlikely to meet annual savings targets, primarily due to lower than expected sales. What factors do you think are causing the low sales? (Probe: specific measures? specific retailers? Non ENERGY STAR LED sales?)

16) How has Ameren or ICF, Inc. responded to address low sales over the year?

D. Data Tracking and Quality Control

Thank you. My next subject is data tracking.

17) Please describe how sales are tracked in the program.

18) What is the process to enter data into the Vision database?

19) What quality control is performed on the data? How does Ameren verify the level of sales, or the specifications of the products that are discounted through the program?

20) Did Ameren implement any other quality control in PY16? (Probe: Did Ameren staff perform any ride-alongs, store visits, or other checks?)

21) Did the quality control activities uncover any issues? How were these issues addressed?

22) Do you feel there was enough quality control?

E. Retailers

Now I'd like to discuss your relationships with partner retailers.

23) How does the program recruit participating retailers? Was the response from manufacturers and retailer as expected for this year?

24) Please describe the process to negotiate the MOUs.

25) Has there been any change in the retailer mix from PY15 for PY16? What lead to the change?

26) How do you manage communication with participating retailers?

27) How were retailers in PY15 notified that CFLs would be eliminated in PY16, and how did they respond to that news?

28) What chains were expected to drive the most sales in 2016? How has each participating retailer or manufacturer performed, relative to expectations?

29) **[AMEREN ONLY]** Did you have any direct contact with participating retailers?

30) **[Both]** What feedback have you received from participating retailers this year?

F. Marketing

Now let's discuss marketing for the program, both in-store and other channels.

31) Who is in charge of designing in-store materials? Do they vary by manufacturer or store? How are they placed in store?

32) How are products stocked on the shelf? What is the role of the field representatives and what is the role of the manufacturer or retailer?

33) In past years, product placement has been an important part of driving sales. Does this continue to be true? What is the approach for product placement this year?

34) Can you describe the in-store events? [Probe: what materials are used, what is the approach to customers, how are they scheduled?]

35) What other marketing does the program use, outside of stores? Who designs materials, and who implements the marketing campaigns?

36) What channels does the program use?

37) How are materials designed? What are the key messages in this marketing?

38) Are marketing efforts tracked in any way? Do you have any sense of which channels or messages are most effective?

39) Does marketing promote ENERGY STAR materials, or address non ENERGY STAR products in any way?

40) What do you think have been the most influential program or market factors to attract program participation, either from retailers or from customers, this year? Is this different from the previous year (especially if marketing tactics have changed)?

G. Summary

Thank you. Now I have just a few general questions to wrap up.

41) What would you say is working particularly well so far in PY16? Why is that?

42) Conversely, what is not working as well as anticipated? Why is that?

43) Have any changes been planned for PY17, in terms of eligible measures, the retailer mix, or the approach to set incentive levels? (Probe: change to product mix in mid-PY17?)

44) Do you expect to the program to meet the PY17 savings goals?

45) Is there anything else you'd like us to know about your experience administrating/implementing the program so far this year?

CADMUS

Ameren Missouri Lighting Program – PY16
Store Intercept Survey Instrument

Cadmus will conduct the store intercept survey with shoppers in retail locations that participate in the Ameren Missouri Lighting Program. The survey will collect information that will inform the following:

- Rate of Ameren bulbs going to non-Ameren locations (leakage)
- Nonresidential installation rate
- Presence of non-EnergySTAR LEDs in the market

This survey instrument will be programmed into an electronic tablet for data collection.

Target Quota = 600 completes, across 30 stores

A. Survey Instrument

Hello! I notice you're purchasing light bulbs today. I am working with Ameren to help them improve their energy-efficiency programs and I'm hoping you have 2 minutes to talk with me about your purchase. To thank you, we would like to give you a $10 gift card.

1. May I have your electric utility, and your zip code for our records?
   a. Electric Utility:
      i. ___ Ameren
         1. ___ Missouri
         2. ___ Illinois
      ii. ___ Kansas City Power and Light (KCP&L)
      iii. ___ Union Electric
      iv. ___ Cooperative or Other
   b. Zip Code: _____

2. May I take a look at the types of lightbulbs you are purchasing?
   a. Incandescent _____ (#)
   b. Halogen _____ (#)
   c. CFL _____ (#)
   d. LED (Not ENERGYSTAR) _____ (#)
   e. LED (ENERGYSTAR, not Ameren bulb) _____ (#)
   f. **LED (ENERGY STAR, Ameren bulb) _____ (#)**
   g. Other _____ (#)

3. [Ask only if customer is purchasing at least one Ameren LED] [Identify Ameren-discounted bulbs to customer] Do you expect to install these discounted lighting products that you're purchasing

today in a home, a place of business, or both? Your best guess is fine. [Note for interviewer – if being installed in a rental property, or house for sale, this should be recorded as "in a home".]

    a.   _____ # in a home

    b.   _____ # in a business

        i.   [Ask only if installing any bulbs in a business] What is the electric utility for your business? _____

    c.   _____ # in other. Define "Other":_____

    d.   _____ # not sure

        Total: _____ [Total should auto-calculate, and should equal 2f.]

4. Before entering the store today, were you aware Ameren was offering discounts for energy efficient lighting products?

    a. Yes

        i. Did you come to the store today specifically intending to purchase bulbs discounted by Ameren Missouri?

            1. Yes

            2. No

            3. No response

    b. No

        i. [Ask only if buying Ameren LEDs] What prompted you to purchase these Ameren-discounted LEDs today? [OPEN-END] _____

    c. Not sure

5. Providing your name will help us account for the gift cards. May I have your name? _____

This sheet is for the <u>interviewer</u> to use.

(blue cell)	Blue cells are text that the interviewer will read out loud
(orange cell)	Orange cells are to be completed by Interviewer

Interviewer reads blue cells. Interviewer records data in orange cells.

		Response
	Retailer/Manufacturer	
	Contact Name	
	Date of Interview	
Sales		
	[Asked via email prior to interview.] Thank you for agreeing to speak with us about your experience with Ameren Missouri's Lighting Program. In advance of the interview, please estimate your **total sales of LED and CFL lightbulbs for 2016** . We are specifically looking for sales of <u>program and nonprogram</u> bulbs in the **[RETAILER]** stores located <u>in Ameren Missouri's program area</u> . If you do not know which stores are in Ameren's program area, please estimate total LED and CFL sales in Missouri.	
	[Asked via email prior to interview.] [Big box retailer] Please estimate what percentage of all of your LED sales in 2016 were incented through the Ameren Missouri Lighting Program. [Habitat/Goodwill/St. Vincent] Can you confirm your store would not sell LEDs without the Ameren Missouri program, and all sales are incented by the program?	
	Thank you for agreeing to speak with us today. We are conducting interviews with national retailers and manufacturers that participate in the Ameren Missouri Lighting program, to help Ameren Missouri identify ways to improve the program, and to understand how the program impacts the market for high efficiency bulbs. Your feedback is extremely important and appreciated by Ameren Missouri, and will enable them to provide better service to your company, as their program partner.	
Process and Satisfaction		
	To begin, please briefly describe your role in the Ameren Missouri lighting markdown program, and how long you personally have been involved with the program.	
	Do you feel you have a good understanding of how the program works, and what your role is in in the program?	
	Do you feel you have easy access to a program contact whenever you have questions regarding the program?	
	Have you experienced any obstacles with regard to participating in the program in the 2016-2017 program period?	
	How satisfied were you with the incentive levels offered in 2016-2017? Would you say very satisfied, somewhat satisfied, not too satisfied, or not at all satisfied?	
	How satisfied were you with the process to sign the MOU in for 2016-2017? [If needed: Would you say very satisfied, somewhat satisfied, not too satisfied, or not at all satisfied?]	
	How satisfied have you been with the program overall? [If needed: Would you say very satisfied, somewhat satisfied, not too satisfied, or not at all satisfied?]	
	Is there anything you would recommend to improve the program?	
Non-ENERGY STAR LEDs		
	Thank you. My next questions will address the market for LED bulbs that are ENERGY STAR certified compared to those that are not. Are you familiar with these products?	
	In 2016, what percentage of your LED sales were certified ENERGY STAR models? If you can, please consider only the Ameren Missouri territory, or Missouri market.	
	Was the percentage of ENERGY STAR LED sales the same in stores outside the Ameren Missouri territory (in other words, non-particiating store locations?)	
	If not, what was the percentage of ENERGY STAR LED sales in stores OUTSIDE the Ameren Missouri territory?	
	What percentage of the models of LED bulbs that you stock are ENERGY STAR certified?	
	Are you aware that new ENERGY STAR standards for certification went into effect on Jan. 2 [If yes] What impact do you think these standards have had on pricing of certified and noncertified LED bulbs?	

Estimate of Program Influence on Sales [Big box stores only]		

Factors	*factors that may influence the total volume of CFL and LED bulb sales in a given year.* These include pricing, product stocking, product placement and in-store marketing, and customer and retailer education. By <u>pricing</u>, I mean your company's decision about what retail price to set for each product, taking into consideration information such as the price for other similar products, the store's minimum price point, your company's revenue expectations, and your expectations of consumer demand. <u>Product stocking</u> refers to the logistics and operational capacity needed to keep the product in stock and on the shelf. <u>Product placement and in-store marketing</u> refers to the product's profile within the store - where it is place do nthe shelf and what signs are present promoting the product. <u>Customer education</u> refers to any efforts, whether local or national, or in-person or via some other channel, to specifically educate consumers about the differences between common bulb technologies and styles. <u>Retailer education</u> refers to any efforts to educate store clerks and other store employees about different lighting products, to ensure store employees are able to assist customers with their lighting purchases. Are there other key factors we should add to this list? [If yes, please overwrite the orange cell in column B, where it says "Other".]
Task 1	For Task 1, we would like you to estimate the influence of each of the market factors we discussed on your **total annual sales of CFL and LED bulbs (both program and non-program), in the Ameren Missouri program area**. Your estimate should be in the form of a percent, from 0% to 100%. For example, in row 25, complete the sentence "Product pricing is responsible for about X% of total annual sales of CFL and LED bulbs." This is intended as a conceptual exercise to quantify your <u>opinion</u> of how influential each factor is on annual sales - it is not expected to be an objective measure. Please make sure the numbers in Task 1 sum to 100%, including the influence you attribute to any other factor you identified, as well as undefined factors.
Overview	The next step will be to complete Task 2 on your worksheet. However, before you begin , I'd like to review some of the program activities that are designed to influence each of the market factors . We present this data in the second table in your worksheet, but I would like to quickly review it together.
Pricing	First, consider pricing. Ameren Missouri's lighting program offers incentives on select high-efficiency bulbs. Incentives vary by model, but we show the average incentive by bulb type for each year of program activity.
Product Stocking	In an effort to influence product stocking, the program negot iates a memorandum of understanding with your company, in which Ameren agrees to offer incentives and you agree to stock a certain number of eligible models. Through out the year, the program field representives work with the manufacturer to ensure those models are stocked on the shelves. The table shows the number of models that Program field representatives stocked each year, visiting stores on an average of every *XX week.*
Placement & Mktg	The program attempts to optimize p lacement of incentivized bulbs within each store. Here we show the number of special displays - such as an endcap display, pallet display, wingstack or other non-standard display in *[RETAILER]* stores, where we had data available.
Customer Education	The program *seeks to* provide educational outreach for customers. Program representatives host in-store promotional events, during which the representative demonstrates different lighting products, distributes informational literature, and talks to customers about energy efficient lighting. The table shows the number of promotional events Ameren conducted in *[RETAILER]* stores each year.
Retailer Educ.	Finally, in addition to the promotional events, the program seeks to provide training to store employees on the products avilable through the program. The table shows the number of participating *[RETAILER]* stores each year since 2009, in which field represntatives provided retailer education.
Task 2	Do you have any questions about the information we just reviewed? Then lets move on to Task 2. For Task 2, please estimate the program influence on each of the market factors we discussed. Your estimate should be in the form of a percent. For example, in row 25, complete the sentence "The Ameren Missouri program incentives are XX% of how my company determines pricing level for program models." Again, this is intended to be a conceptual exercise. The numbers in Task 2 do not need to sum to 100%, but no individual entry should exceed 100%. If you feel the program has an influence on any other factors you identified, please indicate that influence in the worksheet. Please also briefly describe how the program influences that factor.
Closing	That concludes our interview. Please save the worksheet with your inputs, and email it back to me. Thank you for participating today. Your feedback is critical to helping Ameren Missouri optimze the Lighting Program's influence on the market for high-efficiency lighting.

This sheet is for the interview subject. They will ONLY receive this sheet.

[RETAILER/MANUFACTURER] Feedback Worksheet
Please complete all orange cells.

Market Factors	Task 1: Factor Influence on Annual Sales (%)	Task 2: Ameren Missouri Influence on Factor (%)
	*For each factor, complete the sentence: "[Factor] is responsible for about **X%** of annual sales volume."*	*For each factor, complete the sentence: "The Ameren Missouri Program has a XX% influence on [FACTOR]"*
Pricing		
Product Stocking		
Product Placement and In-store Marketing		
Customer Education		
Retailer Education		
Please note any other key factors affecting annual high-efficiency lighting sales in this cell		*Please explain any program influence on this factor in this cell*
Unspecified	100%	0%
Total	100%	

Summary of Ameren Missouri Program Activity for [RETAILER/MANUFACTURER]

	Program Activity	Program Year							
		First year	PY2	PY3	PY4	PY5	PY14	PY15	
		2009	2010	2011	2012	2013	2014	2015	2016
	Program Sales and Average Incentive per bulb:	*To be completed by Cadmus prior to sending worksheet…*							
Pricing	Standard CFLs								
	Specialty CFLs								
	Standard LEDs								
	Specialty LEDs								
	Number of program-incented models								
Product Stocking	% of efficient models in [RETAILER] store/ % of efficient models offered in other stores								
Product Placement and In-store Marketing	# of special displays for program bulbs								
Customer Education	# of in-store events								
Retailer Education	Active Locations								

Nonparticipant Survey Responses

ID	Measure ID	Measure	Like or Non-like	Web or Phone Survey	C2. Have you seen or heard of the Ameren Missouri energy efficiency programs?	C10. Are you aware that Ameren Missouri offers rebates and discounts for energy-saving equipment in your home?	Criterion A met? (Yes to C2 or C10)	QG12_A. Information about energy savings from Ameren's marketing, or bill-insert	QG12_C. Information from colleagues or friends who installed energy efficient equipment and received a rebate from Ameren	QG12_D. Past participation in an Ameren rebate program	QG12_E. Information from the energy assessment conducted at your home through Ameren	Criterion B met for 50% savings? (Max rating was 3)	Criterion B met for 100% savings? (Max rating was 4)	QG4. How do you know the measure is energy efficient?	Criterion C met? (qualitative assessment)	QG9. Why you didn't apply for rebate?	Criterion D met? (qualitative assessment)	QG6/QG7. Why did you adopt this measure?	Criterion E met? (qualitative assessment)	Cooling System	Heating System	Water Heating Fuel	Criterion F met? (depends on the measure)	Meeting all criteria
CAD000163256	G203	Efficient room air conditioner	Like	Phone	No	Yes	TRUE	4	Refused	Refused	Refused	FALSE	TRUE	The retailer/dealer/contractor told me it was	TRUE	beacuase I don't know how efficient it is	TRUE	because it was free and I didn't have any choice	FALSE	Central air conditioner	Gas furnace/boiler	Gas	TRUE	FALSE
CAD002669018	G208	Efficient kitchen faucet aerators	Like	Phone	Yes	Yes	TRUE	4	2	0	0	FALSE	TRUE	Galloons per minute used	TRUE	Not worth hassle.	TRUE	Part of the replacement of the faucet.	TRUE	Central air conditioner	Electric baseboard heat	Electric	TRUE	TRUE
CAD002723284	G208	Efficient kitchen faucet aerators	Like	Phone	Yes	Yes	TRUE	1	4	0	0	FALSE	TRUE	It's ENERGY STAR-certified	TRUE	Did not feel it was necessary	TRUE	Save Water	TRUE	Central air conditioner	Gas furnace/boiler	Electric	TRUE	TRUE
CAD002723284	G220	Learning or "smart" thermostat	Like	Phone	Yes	Yes	TRUE	3	1	0	0	TRUE	FALSE	NA		Same Reason; Did not feel it was necessary	TRUE	87 yr old mother who screws it up all of the time.	TRUE	Central air conditioner	Gas furnace/boiler	Electric	TRUE	TRUE
CAD002698885	G203	Efficient room air conditioner	Like	Phone	Yes	Yes	TRUE	3	3	0	0	TRUE	FALSE	It's ENERGY STAR-certified	TRUE	I wasn't sure my equipment qualified	TRUE	the one we had was too small	TRUE	Window or wall air conditioner	Gas furnace/boiler	Electric	TRUE	TRUE
CAD002175073	G207	Efficient showerheads	Like	Phone	Yes	No	TRUE	4	4	0	0	FALSE	TRUE	BOX SAID SO	TRUE	DIDN'T KNOW THE PROGRAM WAS AVAILABLE.	TRUE	IT WAS THE ONE I LIKED	TRUE	Central air conditioner	Gas furnace/boiler	Electric	TRUE	TRUE
CAD002788370	G207	Efficient showerheads	Like	Phone	Yes	Yes	TRUE	1	1	0	0	FALSE	FALSE	It does good and lowers the bill	TRUE	Just forgot about it	TRUE	To save energy	TRUE	Window or wall air conditioner	Gas furnace/boiler	Electric	TRUE	FALSE
CAD000196966	G203	Efficient room air conditioner	Like	Phone	Yes	Yes	TRUE	3	1	0	1	TRUE	FALSE	Just from what the paper work says.	TRUE	I didn't buy it through a contractor, I picked it up myself.	TRUE	Because it is the hottest room in the house and we wanted that it would cool the room off sooner.	TRUE	Central air conditioner	Electric furnace	Electric	TRUE	TRUE
CAD002203571	G208	Efficient kitchen faucet aerators	Like	Phone	Yes	Yes	TRUE	2	3	0	2	TRUE	FALSE	Word of mouth.	TRUE	Time consumption.	TRUE	Conserve energy.	TRUE	None	Electric furnace	Electric	TRUE	TRUE
CAD002413700	G225	Efficient clothes washer	Non-like	Phone	No	Yes	TRUE	2	2	2	2		FALSE	It's ENERGY STAR-certified	TRUE			NA		Central air conditioner	Gas furnace/boiler	Gas	TRUE	FALSE
CAD002413700	G303	Programmed thermostat to reduce usage (either at night or during the day when people are not home)	Non-like	Phone	No	Yes	TRUE	2	2	2	2		FALSE	NA				It was more precise.	TRUE	Central air conditioner	Gas furnace/boiler	Gas	FALSE	FALSE
CAD002421391	G229	Efficient Windows	Non-like	Phone	Yes	Yes	TRUE	4	3	1	1		TRUE	The retailer/dealer/contractor told me it was	TRUE			NA		Central air conditioner	Gas furnace/boiler	Gas	TRUE	TRUE
CAD002530620	G224	Efficient freezer	Non-like	Phone	No	Yes	TRUE	4	4	4	0		TRUE	It's ENERGY STAR-certified	TRUE			NA		Air-source heat pump	Electric furnace	Electric	TRUE	TRUE

Measure Information					Criterion A: Familiarity with at least one Ameren Missouri program, rebate, or discount			Criterion B: At least one element of Ameren's program marketing and outreach motivated them to adopt the measure						Criterion C: They had a valid reason for considering the adopted measure energy efficient		Criterion D: For a like measure, they had not received a rebate from Ameren, and had not already tried to receive a rebate from Ameren, and they stated a valid reason for not applying for an Ameren rebate		Criterion E: They had a valid reason for deciding to install the measure		Criterion F: The adopted measure generated electric savings, not gas savings				Meeting all criteria
ID	Measure ID	Measure	Like or Non-like	Web or Phone Survey	C2. Have you seen or heard of the Ameren Missouri energy efficiency programs?	C10. Are you aware that Ameren Missouri offers rebates and discounts for energy-saving equipment in your home?	Criterion A met? (Yes to C2 or C10)	QG12_A. Information about energy savings from Ameren's marketing, or bill-insert	QG12_C. Information from colleagues or friends who installed energy efficient equipment and received a rebate from Ameren	QG12_D. Past participation in an Ameren rebate program	QG12_E. Information from the energy assessment conducted at your home through Ameren	Criterion B met for 50% savings? (Max rating was 3)	Criterion B met for 100% savings? (Max rating was 4)	QG4. How do you know the measure is energy efficient?	Criterion C met? (qualitative assessment)	QG9. Why you didn't apply for rebate?	Criterion D met? (qualitative assessment)	QG6/QG7. Why did you adopt this measure?	Criterion E met? (qualitative assessment)	Cooling System	Heating System	Water Heating Fuel	Criterion F met? (depends on the measure)	Meeting all criteria
CAD002530620	G301	Removed a refrigerator or freezer	Non-like	Phone	No	Yes	TRUE	4	4	4	0		TRUE	NA				It was using up space and it was old.	TRUE	Air-source heat pump	Electric furnace	Electric	TRUE	TRUE
CAD002339649	G303	Programmed thermostat to reduce usage (either at night or during the day when people are not home)	Non-like	Phone	No	Yes	TRUE	4	4	0	0		TRUE	NA				was already installed when I moved in.	TRUE	Central air conditioner	[DO NOT READ] DON'T KNOWElectric	Electric	TRUE	TRUE
CAD002339649	G302	Scheduled an air conditioner tune-up	Non-like	Phone	No	Yes	TRUE	3	4	0	0		TRUE	NA				because my air conditioner would be running but not blowing out anything.	TRUE	Central air conditioner	[DO NOT READ] DON'T KNOWElectric	Electric	TRUE	TRUE
CAD002779787	G301	Removed a refrigerator or freezer	Non-like	Phone	Yes	Yes	TRUE	3	Don't know	0	0		FALSE	NA				no longer needed it	TRUE	Central air conditioner	Electric furnace	Electric	TRUE	FALSE
CAD002779787	G303	Programmed thermostat to reduce usage (either at night or during the day when people are not home)	Non-like	Phone	Yes	Yes	TRUE	2	Don't know	0	0		FALSE	NA				usefull	TRUE	Central air conditioner	Electric furnace	Electric	TRUE	FALSE
CAD002551087	G303	Programmed thermostat to reduce usage (either at night or during the day when people are not home)	Non-like	Phone	No	Yes	TRUE	1	1	0	0		FALSE	NA				NO SENSE TO PAY FOR ENERGY WHEN NOBODY AT HOME TO USE IT.	TRUE	Central air conditioner	Gas furnace/boiler	Gas	FALSE	FALSE
CAD002551087	G225	Efficient clothes washer	Non-like	Phone	No	Yes	TRUE	3	2	0	0		FALSE	It's ENERGY STAR-certified	TRUE			NA		Central air conditioner	Gas furnace/boiler	Gas	TRUE	FALSE
CAD002419453	G302	Scheduled an air conditioner tune-up	Non-like	Phone	No	Yes	TRUE	Refused	Refused	0	0		FALSE	NA				To maintain it through the hot season.	TRUE	Central air conditioner	Gas furnace/boiler	Gas	TRUE	FALSE
CAD002419453	G225	Efficient clothes washer	Non-like	Phone	No	Yes	TRUE	3	4	0	0		TRUE	It's ENERGY STAR-certified	TRUE			NA		Central air conditioner	Gas furnace/boiler	Gas	TRUE	TRUE
CAD002419453	G303	Programmed thermostat to reduce usage (either at night or during the day when people are not home)	Non-like	Phone	No	Yes	TRUE	Refused	Refused	0	0		FALSE	NA				Save money.	TRUE	Central air conditioner	Gas furnace/boiler	Gas	FALSE	FALSE
CAD002281843	G303	Programmed thermostat to reduce usage (either at night or during the day when people are not home)	Non-like	Phone	Yes	No	TRUE	4	2	0	0		TRUE	NA				So I could reduce my bill	TRUE	Central air conditioner	Electric furnace	Electric	TRUE	TRUE

ID	Measure ID	Measure	Like or Non-like	Web or Phone Survey	C2. Have you seen or heard of the Ameren Missouri energy efficiency programs?	C10. Are you aware that Ameren Missouri offers rebates and discounts for energy-saving equipment in your home?	Criterion A met? (Yes to C2 or C10)	QG12_A. Information about energy savings from Ameren's marketing, or bill-insert	QG12_C. Information from colleagues or friends who installed energy efficient equipment and received a rebate from Ameren	QG12_D. Past participation in an Ameren rebate program	QG12_E. Information from the energy assessment conducted at your home through Ameren	Criterion B met for 50% savings? (Max rating was 3)	Criterion B met for 100% savings? (Max rating was 4)	QG4. How do you know the measure is energy efficient?	Criterion C met? (qualitative assessment)	QG9. Why you didn't apply for rebate?	Criterion D met? (qualitative assessment)	QG6/QG7. Why did you adopt this measure?	Criterion E met? (qualitative assessment)	Cooling System	Heating System	Water Heating Fuel	Criterion F met? (depends on the measure)	Meeting all criteria
CAD002750636	G302	Scheduled an air conditioner tune-up	Non-like	Phone	Yes	Yes	TRUE	2	3	0	0		FALSE	NA				the ac broke	TRUE	Central air conditioner	Gas furnace/boiler	[DO NOT READ] DON'T KNOW	TRUE	FALSE
CAD002439061	G302	Scheduled an air conditioner tune-up	Non-like	Phone	Yes	No	TRUE	Don't know	Don't know	0	Don't know		FALSE	NA				He checks in the summer time	TRUE	None	None	Electric	TRUE	FALSE
CAD002439061	G303	Programmed thermostat to reduce usage (either at night or during the day when people are not home)	Non-like	Phone	Yes	No	TRUE	Don't know	Refused	0	3		FALSE	NA				No need to run it at night	TRUE	None	None	Electric	TRUE	FALSE
CAD002723284	G302	Scheduled an air conditioner tune-up	Non-like	Phone	Yes	Yes	TRUE	4	1	0	0		TRUE	NA				So it works more efficiently.	TRUE	Central air conditioner	Gas furnace/boiler	Electric	TRUE	TRUE
CAD002276715	G303	Programmed thermostat to reduce usage (either at night or during the day when people are not home)	Non-like	Phone	[DO NOT READ] DON'T KNOW	Yes	TRUE	3	4	0	0		TRUE	NA				Just too save more energy because we usually keep it at 60-63 during winter and 70-75 during the summer.	TRUE	Central air conditioner	Electric furnace	Gas	TRUE	TRUE
CAD002175073	G224	Efficient freezer	Non-like	Phone	Yes	No	TRUE	4	4	0	0		TRUE	It's ENERGY STAR-certified	TRUE			NA		Central air conditioner	Gas furnace/boiler	Electric	TRUE	TRUE
CAD002762688	G303	Programmed thermostat to reduce usage (either at night or during the day when people are not home)	Non-like	Phone	Yes	No	TRUE	2	2	0	0		FALSE	NA				[DO NOT READ] DON'T KNOW		Central air conditioner	Gas furnace/boiler	Gas	FALSE	FALSE
CAD002547137	G228	Efficient water heater (other than heat pump water heater)	Non-like	Phone	No	Yes	TRUE	1	1	0	0		FALSE	It's ENERGY STAR-certified	TRUE			NA		Central air conditioner	Electric furnace	Electric	TRUE	FALSE
CAD000091720	G302	Scheduled an air conditioner tune-up	Non-like	Phone	Yes	Yes	TRUE	3	2	0	2		FALSE	NA				just good practice, just operating efficiency	TRUE	Central air conditioner	Gas furnace/boiler	Gas	TRUE	FALSE
CAD002778413	G302	Scheduled an air conditioner tune-up	Non-like	Phone	Yes	No	TRUE	3	3	0	0		FALSE	NA				make sure it had plenty of freon in it , cleaned and serviced	TRUE	Central air conditioner	Electric furnace	Electric	TRUE	FALSE
CAD002778413	G303	Programmed thermostat to reduce usage (either at night or during the day when people are not home)	Non-like	Phone	Yes	No	TRUE	3	3	0	0		FALSE	NA				they just checked it while at my home , I didn't request it	TRUE	Central air conditioner	Electric furnace	Electric	TRUE	FALSE
CAD000166644	G225	Efficient clothes washer	Non-like	Phone	Yes	Yes	TRUE	3	3	0	0		FALSE	It's ENERGY STAR-certified	TRUE			NA		Central air conditioner	Ground-source or geothermal heat pump	Electric	TRUE	FALSE

Measure Information					Criterion A: Familiarity with at least one Ameren Missouri program, rebate, or discount			Criterion B: At least one element of Ameren's program marketing and outreach motivated them to adopt the measure						Criterion C: They had a valid reason for considering the adopted measure energy efficient		Criterion D: For a like measure, they had not received a rebate from Ameren, and had not already tried to receive a rebate from Ameren, and they stated a valid reason for not applying for an Ameren rebate		Criterion E: They had a valid reason for deciding to install the measure		Criterion F: The adopted measure generated electric savings, not gas savings				Meeting all criteria
ID	Measure ID	Measure	Like or Non-like	Web or Phone Survey	C2. Have you seen or heard of the Ameren Missouri energy efficiency programs?	C10. Are you aware that Ameren Missouri offers rebates and discounts for energy-saving equipment in your home?	Criterion A met? (Yes to C2 or C10)	QG12_A. Information about energy savings from Ameren's marketing, or bill-insert	QG12_C. Information from colleagues or friends who installed energy efficient equipment and received a rebate from Ameren	QG12_D. Past participation in an Ameren rebate program	QG12_E. Information from the energy assessment conducted at your home through Ameren	Criterion B met for 50% savings? (Max rating was 3)	Criterion B met for 100% savings? (Max rating was 4)	QG4. How do you know the measure is energy efficient?	Criterion C met? (qualitative assessment)	QG9. Why you didn't apply for rebate?	Criterion D met? (qualitative assessment)	QG6/QG7. Why did you adopt this measure?	Criterion E met? (qualitative assessment)	Cooling System	Heating System	Water Heating Fuel	Criterion F met? (depends on the measure)	Meeting all criteria
CAD002193741	G301	Removed a refrigerator or freezer	Non-like	Phone	Yes	No	TRUE	4	4	0	1		TRUE	NA				cause the refrigerator went bad	FALSE	Central air conditioner	Electric furnace	Electric	TRUE	FALSE
CAD002344338	G302	Scheduled an air conditioner tune-up	Non-like	Phone	Yes	Yes	TRUE	3	1	0	1		FALSE	NA				I have someone come each spring	TRUE	[DO NOT READ] DON'T KNOW	Gas furnace/boiler	Gas	TRUE	FALSE
CAD002289348	G303	Programmed thermostat to reduce usage (either at night or during the day when people are not home)	Non-like	Phone	Yes	No	TRUE	4	4	0	0		TRUE	NA				we were gonna be gone for a coupkleof days	TRUE	Central air conditioner	Electric furnace	Electric	TRUE	TRUE
CAD002688692	G303	Programmed thermostat to reduce usage (either at night or during the day when people are not home)	Non-like	Phone	Yes	Yes	TRUE	Don't know	3	0	0		FALSE	NA				help save money	TRUE	Central air conditioner	Gas furnace/boiler	Gas	FALSE	FALSE
CAD000490371	G303	Programmed thermostat to reduce usage (either at night or during the day when people are not home)	Non-like	Phone	[DO NOT READ] DON'T KNOW	Yes	TRUE	3	3	0	0		FALSE	NA				we live in saint Louis and the weather fluctuates a lot and we don't need to use it	TRUE	Central air conditioner	[DO NOT READ] DON'T KNOWGas	Gas	TRUE	FALSE
CAD000490371	G229	Efficient Windows	Non-like	Phone	[DO NOT READ] DON'T KNOW	Yes	TRUE	4	4	0	0		TRUE	The retailer/dealer/contractor told me it was	TRUE			NA		Central air conditioner	[DO NOT READ] DON'T KNOWGas	Gas	TRUE	TRUE
CAD000490371	G302	Scheduled an air conditioner tune-up	Non-like	Phone	[DO NOT READ] DON'T KNOW	Yes	TRUE	4	4	0	0		TRUE					just do it every year	TRUE	Central air conditioner	[DO NOT READ] DON'T KNOWGas	Gas	TRUE	TRUE
CAD002443279	G225	Efficient clothes washer	Non-like	Phone	No	Yes	TRUE	Don't know	2	0	4		TRUE	It's ENERGY STAR-certified	TRUE			NA		Central air conditioner	Electric furnace	Electric	TRUE	TRUE
CAD002443279	G302	Scheduled an air conditioner tune-up	Non-like	Phone	No	Yes	TRUE	2	1	0	3		FALSE	NA				Because we needed a new air conditioner so we bought a new one.	TRUE	Central air conditioner	Electric furnace	Electric	TRUE	FALSE
CAD003392328	G226	Efficient dishwasher (exclude from NPSO because virtually all dishwashers on the market are ENERGYSTAR)	Non-like	Phone	No	Yes	TRUE	1	4	0	0		TRUE	It's ENERGY STAR-certified	TRUE			NA		Air-source heat pump	Gas furnace/boilerAir-source heat pump	Electric	TRUE	FALSE
CAD003392328	G301	Removed a refrigerator or freezer	Non-like	Phone	No	Yes	TRUE	4	4	0	0		TRUE	NA				it was old	TRUE	Air-source heat pump	Gas furnace/boilerAir-source heat pump	Electric	TRUE	TRUE

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CAD003392328	G228	Efficient water heater (other than heat pump water heater)	Non-like	Phone	No	Yes	TRUE	4	4	0	0		TRUE	It's ENERGY STAR-certified	TRUE			NA		Air-source heat pump	Gas furnace/boilerAir-source heat pump	Electric	TRUE	TRUE
CAD000148252	G301	Removed a refrigerator or freezer	Non-like	Phone	No	Yes	TRUE	4	4	0	0		TRUE	NA				[DO NOT READ] DON'T KNOW		Central air conditioner	Electric furnace	Electric	TRUE	TRUE
CAD002577182	G302	Scheduled an air conditioner tune-up	Non-like	Phone	Yes	No	TRUE	1	1	0	3	FALSE		NA				to get the coil cleaned, there's always a lot of dirt that gets in there	TRUE	Central air conditioner	Gas furnace/boiler	Gas	TRUE	FALSE
CAD000413427	G302	Scheduled an air conditioner tune-up	Non-like	Phone	No	Yes	TRUE	3	1	0	1	FALSE		NA				to make it morwe eefficient	TRUE	Central air conditioner	Electric furnace	Electric	TRUE	FALSE
CAD000413427	G225	Efficient clothes washer	Non-like	Phone	No	Yes	TRUE	2	1	0	Refused	FALSE		what itr sauid	TRUE			NA		Central air conditioner	Electric furnace	Electric	TRUE	FALSE
CAD000413427	G303	Programmed thermostat to reduce usage (either at night or during the day when people are not home)	Non-like	Phone	No	Yes	TRUE	Refused	4	0	Don't know	TRUE		NA				saves money	TRUE	Central air conditioner	Electric furnace	Electric	TRUE	TRUE
CAD002794146	G303	Programmed thermostat to reduce usage (either at night or during the day when people are not home)	Non-like	Phone	Yes	No	TRUE	2	1	0	0	FALSE		NA				for when im not home I adjust it to a lower temp	TRUE	Central air conditioner	Gas furnace/boiler	Gas	FALSE	FALSE
CAD002794146	G225	Efficient clothes washer	Non-like	Phone	Yes	No	TRUE	1	1	0	0	FALSE		The retailer/dealer/contractor told me it was	TRUE			NA		Central air conditioner	Gas furnace/boiler	Gas	TRUE	FALSE
CAD000381277	G225	Efficient clothes washer	Non-like	Phone	No	Yes	TRUE	4	4	0	4	TRUE		Marked on the sticker.	TRUE			NA		Central air conditioner	Gas furnace/boiler	Gas	TRUE	TRUE
CAD002788370	G228	Efficient water heater (other than heat pump water heater)	Non-like	Phone	Yes	Yes	TRUE	4	4	0	0		TRUE	It lowers the bill	TRUE			NA		Window or wall air conditioner	Gas furnace/boiler	Electric	TRUE	TRUE
CAD002788370	G224	Efficient freezer	Non-like	Phone	Yes	Yes	TRUE	4	3	0	0		TRUE	It lowers the bill	TRUE			NA		Window or wall air conditioner	Gas furnace/boiler	Electric	TRUE	TRUE
CAD002557560	G303	Programmed thermostat to reduce usage (either at night or during the day when people are not home)	Non-like	Phone	Yes	No	TRUE	4	4	0	4	TRUE		NA				just trying not to use as much energy, turn it down when i go to bed and dont let it go past 60	TRUE	Central air conditioner	Gas furnace/boiler	Gas	TRUE	TRUE
CAD002277386	G229	Efficient Windows	Non-like	Phone	Yes	No	TRUE	3	3	0	0	FALSE		It's ENERGY STAR-certified	TRUE			NA		Central air conditioner	Gas furnace/boiler	Gas	TRUE	FALSE

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ID	Measure ID	Measure	Like or Non-like	Web or Phone Survey	C2. Have you seen or heard of the Ameren Missouri energy efficiency programs?	C10. Are you aware that Ameren Missouri offers rebates and discounts for energy-saving equipment in your home?	Criterion A met? (Yes to C2 or C10)	QG12_A. Information about energy savings from Ameren's marketing, or bill-insert	QG12_C. Information from colleagues or friends who installed energy efficient equipment and received a rebate from Ameren	QG12_D. Past participation in an Ameren rebate program	QG12_E. Information from the energy assessment conducted at your home through Ameren	Criterion B met for 50% savings? (Max rating was 3)	Criterion B met for 100% savings? (Max rating was 4)	QG4. How do you know the measure is energy efficient?	Criterion C met? (qualitative assessment)	QG9. Why you didn't apply for rebate?	Criterion D met? (qualitative assessment)	QG6/QG7. Why did you adopt this measure?	Criterion E met? (qualitative assessment)	Cooling System	Heating System	Water Heating Fuel	Criterion F met? (depends on the measure)	Meeting all criteria
CAD002531208	G302	Scheduled an air conditioner tune-up	Non-like	Phone	Yes	Yes	TRUE	3	1	0	1		FALSE	NA				well its saves money in the long run and if theres problems they find them.	TRUE	Central air conditioner	Gas furnace/boiler	Gas	TRUE	FALSE
CAD002531208	G303	Programmed thermostat to reduce usage (either at night or during the day when people are not home)	Non-like	Phone	Yes	Yes	TRUE	3	Don't know	0	2		FALSE	NA				to save money	TRUE	Central air conditioner	Gas furnace/boiler	Gas	FALSE	FALSE
CAD000233264	G303	Programmed thermostat to reduce usage (either at night or during the day when people are not home)	Non-like	Phone	No	Yes	TRUE	Don't know	3	0	3		FALSE	NA				Because my wife likes it colder at night.	TRUE	Central air conditioner	Gas furnace/boiler	[DO NOT READ] DON'T KNOW	FALSE	FALSE
CAD002674741	G301	Removed a refrigerator or freezer	Non-like	Phone	Yes	No	TRUE	3	1	0	1		FALSE	NA				I have gotten a new one	TRUE	Central air conditioner	[DO NOT READ] DON'T KNOW Electric	Electric	TRUE	FALSE
CAD000304876	G301	Removed a refrigerator or freezer	Non-like	Phone	Yes	Yes	TRUE	3	3	0	2		FALSE	NA				Because we needed a new fridge, and when I chose it, I needed it to be energy efficient.	TRUE	Central air conditioner	Gas furnace/boiler	Gas	TRUE	FALSE
CAD000304876	G225	Efficient clothes washer	Non-like	Phone	Yes	Yes	TRUE	3	3	0	2		FALSE	It has a sign that says high effiecny, it was highly detailed.	TRUE			NA		Central air conditioner	Gas furnace/boiler	Gas	TRUE	FALSE
CAD000304876	G302	Scheduled an air conditioner tune-up	Non-like	Phone	Yes	Yes	TRUE	3	2	0	2		FALSE	NA				It was for the air quality.	TRUE	Central air conditioner	Gas furnace/boiler	Gas	TRUE	FALSE
CAD000047136	G224	Efficient freezer	Non-like	Phone	Yes	Yes	TRUE	4	4	0	4		TRUE	The retailer/dealer/contractor told me it was	TRUE			NA		Central air conditioner	Ductless or mini-split heat pump	Electric	TRUE	TRUE
CAD000315574	G302	Scheduled an air conditioner tune-up	Non-like	Phone	No	Yes	TRUE	3	3	0	3		FALSE	NA				It was part of the purchase agreement, that they service it once every year	TRUE	Central air conditioner	Gas furnace/boiler	Gas	TRUE	FALSE
CAD000315574	G228	Efficient water heater (other than heat pump water heater)	Non-like	Phone	No	Yes	TRUE	3	3	0	2		FALSE	It's ENERGY STAR-certified	TRUE			NA		Central air conditioner	Gas furnace/boiler	Gas	FALSE	FALSE

Measure Information					Criterion A: Familiarity with at least one Ameren Missouri program, rebate, or discount			Criterion B: At least one element of Ameren's program marketing and outreach motivated them to adopt the measure						Criterion C: They had a valid reason for considering the adopted measure energy efficient		Criterion D: For a like measure, they had not received a rebate from Ameren, and had not already tried to receive a rebate from Ameren, and they stated a valid reason for not applying for an Ameren rebate		Criterion E: They had a valid reason for deciding to install the measure		Criterion F: The adopted measure generated electric savings, not gas savings				Meeting all criteria
ID	Measure ID	Measure	Like or Non-like	Web or Phone Survey	C2. Have you seen or heard of the Ameren Missouri energy efficiency programs?	C10. Are you aware that Ameren Missouri offers rebates and discounts for energy-saving equipment in your home?	Criterion A met? (Yes to C2 or C10)	QG12_A. Information about energy savings from Ameren's marketing, or bill-insert	QG12_C. Information from colleagues or friends who installed energy efficient equipment and received a rebate from Ameren	QG12_D. Past participation in an Ameren rebate program	QG12_E. Information from the energy assessment conducted at your home through Ameren	Criterion B met for 50% savings? (Max rating was 3)	Criterion B met for 100% savings? (Max rating was 4)	QG4. How do you know the measure is energy efficient?	Criterion C met? (qualitative assessment)	QG9. Why you didn't apply for rebate?	Criterion D met? (qualitative assessment)	QG6/QG7. Why did you adopt this measure?	Criterion E met? (qualitative assessment)	Cooling System	Heating System	Water Heating Fuel	Criterion F met? (depends on the measure)	Meeting all criteria
CAD000302905	G303	Programmed thermostat to reduce usage (either at night or during the day when people are not home)	Non-like	Phone	No	Yes	TRUE	2	1	0	1		FALSE		NA			there was so sense in havoing it run all day	TRUE	Central air conditioner	Gas furnace/boiler	Electric	FALSE	FALSE
CAD000302905	G302	Scheduled an air conditioner tune-up	Non-like	Phone	No	Yes	TRUE	3	1	0	4		TRUE		NA			casue I have a reguslar tune up every summer for the heat. time track	TRUE	Central air conditioner	Gas furnace/boiler	Electric	TRUE	TRUE
CAD000302905	G304	Other action	Non-like	Phone	No	Yes	TRUE	1	1	0	1		FALSE		NA			it was vented properly and the whole thing blew it. destroyed it.	TRUE	Central air conditioner	Gas furnace/boiler	Electric	TRUE	FALSE
CAD002203571	G225	Efficient clothes washer	Non-like	Phone	Yes	Yes	TRUE	2	3	0	2		FALSE	Word of mouth	TRUE			NA		None	Electric furnace	Electric	TRUE	FALSE
CAD000243723	G225	Efficient clothes washer	Non-like	Phone	Yes	Yes	TRUE	3	2	0	0		FALSE	I read the information	TRUE			NA		Central air conditioner	Gas furnace/boiler	Gas	TRUE	FALSE
CAD000243723	G302	Scheduled an air conditioner tune-up	Non-like	Phone	Yes	Yes	TRUE	Don't know	Don't know	0	0		FALSE		NA			Because you should do that every season, its better for the air conditioner to catch things in the beginning rather than it go haywire in the middle of the season.	TRUE	Central air conditioner	Gas furnace/boiler	Gas	TRUE	FALSE
CAD000432783	G230	Additional insulation	Non-like	Phone	No	Yes	TRUE	1	Don't know	0	0		FALSE		NA			NA		Central air conditioner	Gas furnace/boiler	Gas	TRUE	FALSE
CAD000369716	G228	Efficient water heater (other than heat pump water heater)	Non-like	Phone	Yes	Yes	TRUE	3	2	0	0		FALSE	It's ENERGY STAR-certified	TRUE			NA		Central air conditioner	Gas furnace/boiler	Gas	FALSE	FALSE
CAD000369716	G301	Removed a refrigerator or freezer	Non-like	Phone	Yes	Yes	TRUE	2	2	0	0		FALSE		NA			it was burning up.	FALSE	Central air conditioner	Gas furnace/boiler	Gas	TRUE	FALSE
CAD002337612	G229	Efficient Windows	Non-like	Phone	[DO NOT READ] DON'T KNOW	Yes	TRUE	3	2	1	0		FALSE	The retailer/dealer/contractor told me it was	TRUE			NA		Central air conditioner	Gas furnace/boiler	Gas	TRUE	FALSE

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CAD002622738	G303	Programmed thermostat to reduce usage (either at night or during the day when people are not home)	Non-like	Phone	Yes	Yes	TRUE	4	4	0	0		TRUE	NA				Well we don't need it hot in the house and night and when we are not at home it doesn't need to run at all.	TRUE	[DO NOT READ] DON'T KNOW	[DO NOT READ] DON'T KNOWElectric	Electric	TRUE	TRUE
CAD002419821	G303	Programmed thermostat to reduce usage (either at night or during the day when people are not home)	Non-like	Phone	Yes	Yes	TRUE	Refused	4	0	0		TRUE	NA				Its just a matter of economy I have always done it.	TRUE	Window or wall air conditioner	Gas furnace/boiler	Gas	TRUE	TRUE
CAD002646472	G302	Scheduled an air conditioner tune-up	Non-like	Phone	Yes	Yes	TRUE	3	Refused	0	0	FALSE		NA				just part of an agreement we have with the air conditioner people	TRUE	Central air conditioner	Electric furnace	Gas	TRUE	FALSE
CAD002646472	G301	Removed a refrigerator or freezer	Non-like	Phone	Yes	Yes	TRUE	Refused	Refused	0	0	FALSE		NA				It was broken	FALSE	Central air conditioner	Electric furnace	Gas	TRUE	FALSE
CAD002565360	G230	Additional insulation	Non-like	Phone	No	Yes	TRUE	1	4	1	0		TRUE	NA				NA		Central air conditioner	Electric baseboard heat	Electric	TRUE	TRUE
CAD002277386	G230	Additional insulation	Non-like	Phone	Yes	No	TRUE	2	3	0	0		FALSE	NA				NA		Central air conditioner	Gas furnace/boiler	Gas	TRUE	FALSE
CAD000047136	G230	Additional insulation	Non-like	Phone	Yes	Yes	TRUE	4	4	0	4		TRUE	NA				NA		Central air conditioner	Ductless or mini-split heat pump	Electric	TRUE	TRUE
CAD002698885	G210	Insulation	Non-like	Phone	Yes	Yes	TRUE	3	3	0	0		FALSE	The retailer/dealer/contractor told me it was	TRUE			to replace the old stuff	TRUE	Window or wall air conditioner	Gas furnace/boiler	Electric	TRUE	FALSE
CAD002565360	G210	Insulation	Non-like	Phone	No	Yes	TRUE	1	4	1	0		TRUE	because the more insulation you have the warmer it is, otherwise its going out the walls	TRUE			[DO NOT READ] DON'T KNOW		Central air conditioner	Electric baseboard heat	Electric	TRUE	TRUE
CAD000381277	G221	Programmable (but not "smart") thermostat	Non-like	Phone	No	Yes	TRUE	4	4	0	4		TRUE	NA				[DO NOT READ] DON'T KNOW		Central air conditioner	Gas furnace/boiler	Gas	TRUE	TRUE
CAD002413700	G221	Programmable (but not "smart") thermostat	Non-like	Phone	No	Yes	TRUE	3	3	3	1		FALSE	NA				Its the one that came with the home and the cost.	TRUE	Central air conditioner	Gas furnace/boiler	Gas	TRUE	FALSE
CAD002175073	G202	Efficient refrigerator	Non-like	Phone	Yes	No	TRUE	3	4	0	0		TRUE	The retailer/dealer/contractor told me it was	TRUE			IT WAS THE ONE I LIKED	TRUE	Central air conditioner	Gas furnace/boiler	Electric	TRUE	TRUE

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CAD002193741	G202	Efficient refrigerator	Non-like	Phone	Yes	No	TRUE	4	3	0	Don't know		TRUE	It's ENERGY STAR-certified	TRUE			Just cause we needed one	TRUE	Central air conditioner	Electric furnace	Electric	TRUE	TRUE