Ameren Missouri Residential Portfolio Evaluation Summary: Program Year 2015

FINAL May 13, 2016

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Introduction

Ameren Missouri engaged Cadmus and Nexant (the Cadmus team) to perform annual process and impact evaluations of its seven residential energy efficiency programs for a three-year period, from 2013 through 2015. This annual summary report presents the key energy savings, demand reduction, and cost-effectiveness results for Program Year 2015 (PY15), the period from January 1, 2015, through December 31, 2015.

In addition to these key impact results, this summary report includes brief descriptions of each residential program, details regarding the cost-effectiveness analysis, and summaries of the Cadmus team's responses to the five process evaluation questions required by the Missouri Code of State Regulations (CSR).

Separate, program-specific PY15 evaluation reports offer significantly more detail regarding our impact methodologies and results, as well as key process evaluation findings, conclusions, and recommendations.

Energy Savings

Table 1 summarizes the *ex ante* gross, *ex post* gross, and *ex post* net energy savings (MWh/year) for each program and for the residential portfolio overall in PY15. The table also compares the Cadmus team's *ex post* net energy savings to the program-specific and residential portfolio net energy savings targets approved by Missouri Public Service Commission (MPSC).

As shown in the table, the residential portfolio achieved 83% of its energy savings target for PY15. This is the first year in the three-year cycle that the portfolio has not exceeded its annual energy savings target.

All programs performed very similarly in PY15 to PY14, in terms of percentage of target achieved, with the exception of the Lighting program. Historically, this program has generated savings so far in excess of its targets as to make up for any shortfall by other programs. However, the Lighting program operates in a challenging market, where the staged onset of the Energy Independence and Security Act (EISA) has reduced the opportunity for savings year over year. As a result, while this program exceeded its target by 61% in PY14, it achieved only 98% of its target in PY15, not enough to counter saving shortfalls in other programs.

Table 1. Summary of PY15 Residential Programs' Energy Savings (MWh/Year)

Program	MPSC-Approved Target[1]	*Ex Ante* Gross Savings (Prior to Evaluation)[2]	*Ex Post* Gross Savings Determined by EM&V[3]	Realization Rate	*Ex Post* Net Savings Determined by EM&V[4]	Net-to-Gross Ratio	Percent of Goal Achieved[5]
Efficient Products	25,087	10,049	7,908	79%	7,755	98%	31%
Home Energy Analysis	1,070	644	385	60%	332	86%	31%
HVAC	63,386	58,451	54,622	93%	60,677	111%	96%
Lighting	62,371	77,539	68,326	88%	60,830	89%	98%
Low Income	3,338	4,976	5,050	101%	4,838	96%	145%
ENERGY STAR New Homes	2,816	0	0	N/A	0	N/A	0%
Refrigerator Recycling	13,888	9,982	10,774	108%	8,237	76%	59%
Portfolio	**171,956**	**161,641**	**147,065**	**91%**	**142,669**	**97%**	**83%**

[1]Union Electric Company. Electric service applying to residential energy efficiency in Missouri service area. Effective June 30, 2013. Available at: http://www.ameren.com/-/media/missouri-site/Files/Rates/UECSheet191EEResidential.pdf

2 Calculated by applying tracked program activity to Technical Reference Manual (TRM) savings values.

3 Calculated by applying tracked program activity to the Cadmus team's evaluated savings values.

4 Calculated by multiplying the Cadmus team's evaluated gross savings by the evaluated net-to-gross (NTG) ratio.

5 Calculated by dividing MPSC Approved Target by *Ex Post* Net Savings Determined by EM&V.

Demand Reduction

Table 2 summarizes the *ex ante* gross, *ex post* gross, and *ex post* net demand reductions (kW) for each program and for the residential portfolio overall, and compares the Cadmus team's *ex post* net demand reductions to MPSC-approved targets.

While energy savings and demand reductions are not perfectly correlated (as the measure mix for some programs generates more peak savings), the portfolio achieved a similar percentage of its demand reduction target for PY15, 82% (compared to 83% of its energy savings target). As with energy savings, this is the first year the portfolio has fallen below its demand reduction target. While the HVAC program generates the majority of portfolio demand savings, the primary change in performance from PY14 was in the Lighting program.

The high number of upstream CFLs installed in nonresidential locations greatly increases the demand savings generated by the Lighting program relative to the target each year, as these bulbs are used more frequently during peak hours. While the Lighting program greatly exceeded its PY15 target, both the target itself and the margin of excess were smaller in PY15 than in previous year, for the reasons stated above. As a result, the program achieved 264% of its 1,875 kW target in PY15, relative to achieving 423%

of its 2,911 kW target in PY14. These reductions were not enough to overcome the shortage by other programs.

Table 2. Summary of PY15 Residential Program Demand Reductions (kW)

Program	MPSC-Approved Target[1]	*Ex Ante* Gross Savings (Prior to Evaluation)[2]	*Ex Post* Gross Savings Determined by EM&V[3]	Realization Rate	*Ex Post* Net Savings Determined by EM&V[4]	Net-to-Gross Ratio	Percent of Goal Achieved[5]
Efficient Products	3,838	1,586	1,162	77%	1,152	99%	30%
Home Energy Analysis	350	143	45	32%	39	86%	11%
HVAC	36,745	19,435	26,949	139%	28,951	107%	79%
Lighting	1,875	5,494	5,618	100%	4,944	88%	264%
Low Income	744	724	1,428	197%	1,368	96%	184%
New Homes	639	0	0	N/A	0	N/A	0%
Refrigerator Recycling	1,934	1,298	2,068	102%	1,583	77%	82%
Portfolio	**46,125**	**29,431**	**37,270**	**127%**	**38,036**	**102%**	**82%**

[1] Union Electric Company. Electric service applying to residential energy efficiency in Missouri service area. Effective June 30, 2013. Available at: http://www.ameren.com/-/media/missouri-site/Files/Rates/UECSheet191EEResidential.pdf

[2] Calculated by applying tracked program activity to Ameren's 2012 Technical Reference Manual (TRM) savings values (https://www.efis.psc.mo.gov/mpsc/commoncomponents/viewdocument.asp?DocId=935658483)

[3] Calculated by applying tracked program activity to the Cadmus team's evaluated savings values (accounting for line losses).

[4] Calculated by multiplying the Cadmus team's evaluated gross savings (accounting for line losses) by the evaluated NTG ratio.

[5] Calculated by dividing MPSC Approved Target by Ex Post Net Savings Determined by EM&V.

[6] May not sum exactly due to rounding.

Cost Effectiveness

To analyze the cost-effectiveness of the PY15 programs and residential portfolio, the Cadmus team worked with Morgan Marketing Partners (MMP), which used DSMore to assess cost-effectiveness through the following five tests (as defined by the California Standard Practice Manual):

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

All the cost-effectiveness results shown include the program's share of portfolio-level or indirect costs, determined using the present value of each program's UCT lifetime benefits (i.e., the present value in 2013 dollars of avoided generation costs, as well as deferral of capacity costs for capital and transmission and distribution). More details are provided in the Cost-Effectiveness Details section.

Collectively, the six residential programs resulted in UCT and TRC cost-effective ratios of 2.25 and 1.13, respectively, at a portfolio level (Table 3). In total, the residential portfolio generated just over $29.6 million dollars in annual net shared benefits (Table 4).[1]

Table 3. Summary of PY15 Residential Program Cost-Effectiveness

Program	UCT	TRC	RIM	SCT	PCT[1]
Efficient Products	1.58	1.05	0.39	1.25	3.36
Home Energy Analysis	0.74	0.55	0.32	0.70	1.91
HVAC	2.19	1.05	0.46	1.20	2.64
Lighting	3.49	1.27	0.42	1.66	3.02
Low Income	0.88	0.88	0.37	1.03	N/A
Refrigerator Recycling	1.60	1.60	0.40	1.80	N/A
Portfolio	**2.25**	**1.13**	**0.43**	**1.37**	**3.16**

[1] There is no cost to participants for the Low Income and Refrigerator Recycling programs, so the ratio of benefits to costs has a denominator of zero.

Table 4 presents detail by program of the benefits and costs used to determine the annual net shared benefits. These benefits and costs are equal to the UCT benefits and costs, and are reported in 2013 dollars. The annual net shared benefits are net of costs borne by the utility, but not costs borne by other parties. For example, the incentive cost would accrue to the utility, and is included. The remainder of

[1] Annual net shared benefits, as defined in 4 CSR 240-20.093(1), are the utility's avoided costs measured and documented through evaluation, measurement, and verification (EM&V) reports for approved demand-side programs less the sum of the programs' costs including design, administration, delivery, end-use measures, incentives, EM&V, utility market potential studies, and technical resource manual on an annual basis. Annual net shared benefits are equal to the lifetime benefits (based on evaluated net savings) less program costs.

the incremental measure cost, if it is not fully covered by the incentive, would be paid by the participant, and is not included.

Table 4. Summary of PY15 Annual Net Shared Benefits (2013 Dollars)

Program	UCT Net Lifetime Benefits[1]	Program Costs[2]	Annual Net Shared Benefits[3]
Efficient Products	$2,870,124	$1,818,795	$1,051,330
Home Energy Analysis	$147,791	$199,294	($51,503)
HVAC	$24,431,963	$11,139,399	$13,292,564
Lighting	$20,457,518	$5,863,386	$14,594,132
Low Income	$2,439,379	$2,777,124	($337,746)
ENERGY STAR New Homes	$0	$0	$0
Appliance Recycling	$2,929,764	$1,830,835	$1,098,929
Portfolio[4]	**$53,276,539**	**$23,628,833**	**$29,647,707**

[1] UCT Net Lifetime Benefits are the value in 2013 dollars of the utility avoided costs over the measure lifetime, based on the evaluated net savings applied at the measure level.

[2] The portion of portfolio costs that were distributed across programs are included in the program costs presented in this table. See Table 11 for details.

[3] Annual net shared benefits, as defined in 4 CSR 240-20.094(1)(C) and when using avoided costs or avoided utility costs defined in 4 CSR 240-20.094(1)(D), are the same as UCT Net Lifetime Benefits Minus Costs.

[4]May not sum exactly due to rounding.

Table 5 presents details by program of costs and benefits pertaining to the TRC test results. The TRC includes all costs that are paid by either the utility or the participant. For example, in this case, both the incentive cost and the incremental measure cost would be included. Costs for the TRC are higher than those for the UCT because more costs are included. Benefits, however, stay the same.

Table 5. Summary of TRC Benefits and Costs (2013 Dollars)

Program	TRC Net Lifetime Benefits[1]	Costs[2]	TRC Net Lifetime Benefits Less Costs[3]
Efficient Products	$2,870,124	$2,724,678	$145,446
Home Energy Analysis	$147,791	$266,412	($118,621)
HVAC	$24,431,963	$23,237,763	$1,194,200
Lighting	$20,457,518	$16,122,396	$4,335,122
Low Income	$2,439,379	$2,777,124	($337,746)
ENERGY STAR New Homes	$0	$0	$0
Appliance Recycling	$2,929,764	$1,830,835	$1,098,929
Portfolio[3]	**$53,276,539**	**$46,959,209**	**$6,317,330**

[1] To determine net benefits, the Cadmus team applied the NTG ratio for each program to the measure savings values.

[2] The portion of portfolio costs that were distributed across programs are included in the program costs presented in this table. See Table 11 for details.

[3] May not sum exactly due to rounding.

The UCT and TRC are the most common cost-effectiveness test, and receive the most analysis in this report. However, we also report on the RIM, SCT, and PCT. Costs included in each of the tests reviewed in this report are shown in Table 6.

Table 6. Costs Associated with Each Cost-effectiveness Test

Test	Costs Included
UCT	All costs paid by the utility directly.
TRC	All costs paid by the utility or the participant.
RIM	All costs paid by the utility or the participant, and the revenue loss associated with reduced sales.
SCT	All costs paid by the utility or the participant.
PCT	All costs paid by the participant.

Adjustments to PY14 Results

In PY14, the Cadmus team reported that we would adjust the PY15 lighting net savings to account for any over or under estimate of PY14 net savings based on planned additional PY15 primary research to estimate lighting spillover and market effects. As described in the PY15 Lighting Evaluation Report, we estimated that PY14 lighting net savings were over-estimated by 23,046 MWh.

Table 7 and Table 8 show the adjustment to the PY15 portfolio energy savings and annual net shared benefits to correct the PY14 overage. We estimated the change in annual net shared benefits based on the most recent results that update the PY14 analysis with revised avoided costs from the Ameren Missouri 2014 Integrated Resource Plan.[2]

Table 7. Adjustment to PY15 Portfolio Energy Savings

Program	MPSC-Approved Target	Ex Post Net Savings Determined by EM&V	Percent of Goal Achieved
PY15 Portfolio	171,956	142,669	82%
Net Savings Adjustment		-23,046	
Adjusted PY15 Portfolio Savings		**119,623**	**70%**

[2] Cadmus. Ameren Missouri Residential Portfolio Evaluation Summary: Program Year 2014. Amended May 13, 2016.

Table 8. Adjustment to PY15 Portfolio Annual Net Shared Benefits

Program	UCT Net Lifetime Benefits	Program Costs	Annual Net Shared Benefits
PY15 Portfolio Annual Net Shared Benefits	$53,276,539	$23,628,833	$29,647,707
Annual Net Shared Benefits Adjustment	-$6,976,985	$0	-$6,976,985
Adjusted PY15 Portfolio Annual Net Shared Benefits	$46,299,555	$23,628,833	$22,670,722

Program Descriptions

From PY13 to PY14, Ameren Missouri changed the names of its residential programs. Table 9 shows the program names in PY13 and the corresponding name in PY14/PY15.

Table 9. Program Name Changes

PY14/PY15 Name	PY13 Name
Efficient Products	RebateSavers
Home Energy Analysis	PerformanceSavers
HVAC	CoolSavers
Lighting	LightSavers
Low Income	CommunitySavers
ENERGY STAR New Homes (PY14 only)	ConstructionSavers
Appliance Recycling	Appliance Savers

Ameren did not offer the ENERGY STAR New Homes program in PY15. The following sections describe Ameren Missouri's six residential programs offered in PY15

Efficient Products

The Efficient Products Program began in 2009 as the energy-efficient product rebate component of the combined PY09 Lighting and Appliance Program.

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

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

Beginning in PY12, Ameren Missouri discontinued the appliance portion of the combined Lighting and Appliance Program and focused exclusively on lighting products. Ameren Missouri and CLEAResult reintroduced Efficient Products in PY13 (called RebateSavers at that time) as a new, stand-alone appliance program, designed to promote a variety of energy-efficient products. In PY14, Ameren Missouri changed the program name from RebateSavers to Efficient Products.

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

The PY15 Efficient Products program provided downstream mail-in and online rebates for the following:

- ENERGY STAR®-certified room air conditioners (RACs)
- ENERGY STAR-certified heat pump water heaters
- ENERGY STAR-certified air purifiers

- ENERGY STAR-certified water coolers[3]
- ENERGY STAR-certified two-speed pool pumps
- ENERGY STAR-certified variable-speed pool pumps
- Programmable thermostats[4]
- Electric storage water heaters with an Energy Factor (EF) of 0.93 or higher[5]

In addition to providing mail-in and online rebates, Ameren Missouri offers a Home Energy Kit upon request to customers with electric hot water heaters. Customers could choose between a free kit (Kit 1) or paying $4.95 for a kit that included an advanced power strip (Kit 2).

Ameren Missouri also provides direct-install kits for multifamily properties. Eligible properties receive Kit 1, with the expectation that property staff will follow instructions and will install the items in each unit. Advanced power strips are available for purchase at a discounted price through Ameren Missouri's online store.

Home Energy Analysis

Ameren Missouri added the HEA pilot program to the residential ActOnEnergy® portfolio in PY13. This program was designed to encourage residents of single-family homes to reduce energy consumption by making improvements to weatherization, lighting, HVAC, and water heating appliances.

Ameren Missouri provides direct install energy-efficient measures at no cost to program participants, and offers rebates for other measures (i.e., air sealing, ceiling insulation, and energy-efficient windows), hereafter referred to as major measures. While all single-family homes receiving electricity and natural gas from Ameren Missouri are eligible to participate, participants must pay $25 for an in-home energy audit.

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

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

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

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[3] Ameren Missouri did not market water coolers but honored its customers' rebate requests.

[4] Ameren Missouri did not market programmable thermostats but honored its customers' rebate requests.

[5] Ameren Missouri phased out electric storage water heaters in February and March 2015.

HVAC

Through the HVAC Program, Ameren offered customers living in single-family homes, condos, rowhouses or townhomes incentives for installing high-efficiency central air conditioners (CAC) or heat pumps through a participating program contractor. The program also offered incentives for diagnostic testing and tuning of existing HVAC systems to manufacturer specifications and for installation of variable-speed fan motors. ICF International (ICF) implements the HVAC Program.

To participate, a residential customer must have had a measure installation performed by a participating contractor. The participating contractor submitted all required paperwork for incentive processing. To become a participating contractor, an HVAC company representative needed to attend a program training session conducted by ICF International (ICF), the implementer.

Lighting

Ameren Missouri designed the Lighting Program to increase sales of energy-efficient lighting products through a variety of retail channels. Ameren Missouri works with CLEAResult (formerly Applied Proactive Technologies) to implement the Lighting program, providing a per-unit discount for eligible CFLs and LEDs. In addition to reducing prices, CLEAResult leverages its relationships with participating retailers to place discounted lighting in prominent locations within stores where they can place Ameren Missouri signage and marketing materials nearby. EFI also assists in markdown program implementation by maintaining the tracking system and selling discounted lighting products through an online store.

The Lighting program primarily operates through a point-of-sale markdown system at major chain retailers. In addition to the markdown channel, the program includes coupons and social marketing distribution (SMD). The coupon channel is available to retailers without a point-of-sale system (i.e., a computer software system that tracks all purchases), in which they allow customers to complete coupons at the register to receive a discount. Through the SMD channel, Ameren Missouri distributes free 13-watt and 23-watt CFLs to lower income customers through partnerships with area food banks and related community organizations.

Low Income

Through the Low Income program, Ameren Missouri delivers cost-effective energy efficiency services to low-income residents in multifamily properties having three or more dwelling units.

Honeywell, the program implementer, contracts the direct installation of the following low-cost energy efficiency measures to multiple contractors:

- Lighting (CFLs);
- Insulation of hot water heaters and pipes;
- Showerheads and faucet aerators; and
- Programmable thermostats.

Additionally, Ameren Missouri offers replacements of older appliances—such as refrigerators and air conditioners (both room and through-the-wall units)—with ENERGY STAR models. In PY13, Ameren Missouri also began offering program tune-ups for CAC systems, which continued through PY15.

Program participants for multifamily buildings are defined as program-enrolled owners, operators, and managers of income-eligible, multifamily residential properties; these individuals determine whether a property participates. Program participants for multifamily buildings must commit to implementing standard lighting installations in property common areas, as applicable through Ameren Missouri's Business Energy Efficiency Program or Residential Energy Efficiency Program.

Refrigerator Recycling

Through the Refrigerator Recycling program, Ameren Missouri offers residential customers a $50 incentive and free pick-up service for recycling an operable refrigerator and stand-alone freezer manufactured before 2002 (up to a total of three per customer per year). Customers may also recycle a working room air conditioner or dehumidifier, along with a qualifying refrigerator or freezer. Incentives are not provided for air conditioners or dehumidifiers. The program is implemented by the Refrigerator RecyclingCenters of America, Inc. (ARCA). In PY15, the scale of the program was considerably larger than in PY14 (8,988 appliances) and was greater than either PY13 or PY14.

Cost-Effectiveness Details

Methodology

To analyze PY15 program cost-effectiveness, MMP used DSMore and assessed cost-effectiveness using the following five tests, defined by the California Standard Practice Manual:[6]

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

DSMore took hourly energy prices and hourly energy savings from specific measures, provided by Ameren Missouri, and correlated prices and savings to 30 years of historic weather data. Using long-term weather ensured the model captured and appropriately valued low probability but high consequence weather events. Consequently, the model's produced an accurate evaluation of the demand-side efficiency measures relative to alternative supply options.

Table 10 presents the key cost-effectiveness analysis assumptions and corresponding source.

Table 10. Assumptions and Source for Cost-Effectiveness Analysis

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

In PY15, MMP updated the avoided energy, capacity, and transmission and distribution (T&D) costs to be consistent with Ameren's 2014 Integrated Resource Plan (IRP). In addition, MMP used the Batch Tools (model inputs) that Ameren Missouri used in its original analysis, modified solely with avoided costs from the 2014 IRP and evaluated participation, per-unit gross savings, and the measure-level net-to-gross ratios (e.g., PY15-specific Lighting participation counts, per-unit gross savings, and NTG), which ensured consistency. For HVAC, we also updated the per-unit demand reduction based on our analysis of primary sub-meter data.

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

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

A key step in the analysis process required acquiring PY15 Ameren Missouri program spending data: actual spending, broken down into implementation, incentives, and administration costs. MMP applied these numbers at the program level, not the measure level. While applying incentives at the measure level can be useful for planning purposes, it proves unnecessary for cost-effectiveness modeling since results are based on a program overall. Table 11 summarizes PY15 electric spending by program and for other portfolio-related activities.

Table 11. Ameren Missouri PY15 Spending Data

2015 Residential Program Costs	Non-Incentive Costs	Incentive Costs	Total Costs
Efficient Products	$957,451	$1,045,946	$2,003,397
Home Energy Analysis	$71,187	$152,806	$223,994
HVAC	$4,643,903	$7,442,256	$12,086,159
Lighting	$1,457,668	$4,700,248	$6,157,916
Low Income	$3,111,119	$0	$3,111,119
Refrigerator Recycling	$2,015,569	$0	$2,015,569
Total Residential Programs[1]	**$12,256,897**	**$13,341,256**	**$25,598,153**
2015 Other Portfolio Costs			
Residential Evaluation, Measurement, and Verification	$356,739	$0	$356,739
Educational Outreach	$17,293	$0	$17,293
Portfolio Administration	$959,403	$0	$959,403
Potential Study Costs	$0	$0	$0
Data Tracking Costs	$95,357	$0	$95,357
Closing ENERGY STAR New Homes Program	$429	$0	$429
Total Other[1]	**$1,429,220**	**$0**	**$1,429,220**
Total Portfolio Costs[1]	**$13,686,117**	**$13,341,256**	**$27,027,373**

[1] May not sum exactly due to rounding.

As noted previously, all the program-specific cost-effectiveness results include the program's share of portfolio-level or indirect costs ($1,429,220). The Cadmus team determined each program's share of indirect costs using the present value of each program's UCT lifetime benefits (i.e., the present value in 2013 dollars of avoided generation costs, as well as deferral of capacity capital and transmission and distribution capital costs). Table 12 shows these UCT benefits (gross) for each program, as well as the resulting share allocated of other portfolio costs.

Table 12. Allocation of Portfolio/Other Costs to Programs[1]

Program	Present Value of UCT Benefits	Percentage of Portfolio/ Allocation	Total Other Portfolio Costs	Allocated Portfolio Costs
Efficient Products	$2,870,124	5.4%	$1,429,220	$76,995
Home Energy Analysis	$147,791	0.3%		$3,965
HVAC	$24,431,963	45.9%		$655,423
Lighting	$20,457,518	38.4%		$548,802
Low Income	$2,439,379	4.6%		$65,440
Appliance Recycling	$2,929,764	5.5%		$78,595
Portfolio[2]	**$53,276,539**	**100.0%**		**$1,429,220**

[1] The Cadmus team used the UCT benefits in 2013 dollars to determine the percentage allocation to each program. The Total Other Portfolio Costs are in 2015 dollars, and were added to the individual program costs in 2015 dollars as an input to DSMore.

[2] May not sum exactly due to rounding.

Table 13 summarizes benefit and cost inputs for each cost-effectiveness test.

Table 13. Summary of Benefits and Costs Included in Each Cost-Effectiveness Test

Test	Benefits	Costs
UCT	**Perspective of utility, government agency, or third-party program implementer**	
	• Energy-related avoided costs • Capacity-related costs avoided by the utility, including generation, transmission, and distribution	• Program overhead costs • Utility/program administrator incentive costs • Utility/program administrator installation costs
TRC	**Perspective of all utility customers (participants and nonparticipants) in the utility service territory**	
	• Energy-related avoided costs • Capacity-related avoided costs, including generation, transmission, and distribution • Additional resource savings • Applicable tax credits	• Program overhead costs • Program installation costs • Incremental measure costs (whether paid by customer or utility)[1]
RIM	**Impact of efficiency measure on nonparticipating ratepayers overall**	
	• Energy-related avoided costs • Capacity-related avoided costs, including generation, transmission, and distribution	• Program overhead costs • Utility/program administrator incentives • Utility/program administrator installation costs • Lost revenue due to reduced energy bills
SCT	**Perspective of all utility customers (participants and nonparticipants) in the utility service territory (uses a societal discount rate)**	
	• Energy-related avoided costs • Capacity-related avoided costs, including generation, transmission, and distribution • Additional resource savings • Applicable tax credits • Non-energy Benefits	• Program overhead costs • Program installation costs • Incremental measure costs (whether paid by customer or utility)[1]
PCT	**Perspective of the customers installing the measures**	
	• Bill savings • Incremental installation costs • Applicable tax credits or incentives	• Incentive payments • Incremental equipment costs

[1] Incentives are considered in the incremental measure costs

The majority of costs and savings are presented on a net basis, meaning that the NTG ratio was applied to account for the impacts of free ridership, spillover, and market effects. However, the participant borne costs, as applied to the PCT, are presented on a gross basis.

Residential Portfolio

Table 14 through Table 18 show total benefits and costs for the residential portfolio, along with the benefit/cost ratio for each cost-effectiveness test. As shown, the residential portfolio assed the UCT, TRC, PART, and Societal TRC tests and generated more than $28 million in UCT net lifetime benefits, significantly less than PY14 benefits. This difference is primarily due to the updated avoided energy costs, which are significantly lower than those assumed in PY14.

Table 14. Utility Cost Test Inputs and Results

	Benefits	Costs
Avoided Electric Production	$38,457,108	
Avoided Electric Capacity	$9,793,060	
Avoided T&D Electric	$5,026,372	
Incentives		$11,663,668
Program Overhead Costs		$11,965,165
Total	**$53,276,539**	**$23,628,833**
UCT Benefit/Cost Ratio	**2.25**	

Table 15. Total Resource Cost Test Inputs and Results

	Benefits	Costs
Avoided Electric Production	$38,457,108	
Avoided Electric Capacity	$9,793,060	
Avoided T&D Electric	$5,026,372	
Participant Costs (net)		$34,994,044
Program Overhead Costs		$11,965,165
Total	**$53,276,539**	**$46,959,209**
TRC Benefit/Cost Ratio	**1.13**	

Table 16. Ratepayer Impact Measure Test Inputs and Results

	Benefits	Costs
Avoided Electric Production	$38,457,108	
Avoided Electric Capacity	$9,793,060	
Avoided T&D Electric	$5,026,372	
Program Overhead Costs		$11,965,165
Incentives		$11,663,668
Lost Revenue		$100,395,438
Total	**$53,276,539**	**$124,024,271**
RIM Benefit/Cost Ratio	**0.43**	

Table 17. Societal Cost Test Inputs and Results

	Benefits	Costs
Avoided Electric Production	$53,416,888	
Avoided Electric Capacity	$9,793,060	
Avoided T&D Electric	$6,222,797	
Program Overhead Costs		$12,900,478
Participant Costs (net)		$37,729,519
Total	**$69,432,745**	**$50,629,997**
SCT Benefit/Cost Ratio	**1.37**	

Table 18. Participant Cost Test Inputs and Results

	Benefits	Costs
Participant Bill Savings (gross)	$104,793,483	
Incentives	$11,663,668	
Participant Costs (gross)		$36,869,910
Total	**$116,457,151**	**$36,869,910**
PCT Benefit/Cost Ratio	**3.16**	

Efficient Products

Table 19 through Table 23 show total benefits and costs for the Efficient Products Program, along with the benefit/cost ratio for each cost-effectiveness test.

Table 19. Utility Cost Test Inputs and Results

	Benefits	Costs
Avoided Electric Production	$2,098,147	
Avoided Electric Capacity	$565,257	
Avoided T&D Electric	$206,720	
Incentives		$914,424
Program Overhead Costs		$904,371
Total	**$2,870,124**	**$1,818,795**
UCT Benefit/Cost Ratio	**1.58**	

Table 20. Total Resource Cost Test Inputs and Results

	Benefits	Costs
Avoided Electric Production	$2,098,147	
Avoided Electric Capacity	$565,257	
Avoided T&D Electric	$206,720	
Participant Costs (net)		$1,820,308
Program Overhead Costs		$904,371
Total	**$2,870,124**	**$2,724,678**
TRC Benefit/Cost Ratio	**1.05**	

Table 21. Ratepayer Impact Measure Test Inputs and Results

	Benefits	Costs
Avoided Electric Production	$2,098,147	
Avoided Electric Capacity	$565,257	
Avoided T&D Electric	$206,720	
Program Overhead Costs		$904,371
Incentives		$914,424
Lost Revenue		$5,468,150
Total	**$2,870,124**	**$7,286,944**
RIM Benefit/Cost Ratio	**0.39**	

Table 22. Societal Cost Test Inputs and Results

	Benefits	Costs
Avoided Electric Production	$2,835,818	
Avoided Electric Capacity	$565,257	
Avoided T&D Electric	$266,118	
Program Overhead Costs		$975,065
Participant Cost (net)		$1,962,601
Total	**$3,667,193**	**$2,937,666**
SCT Benefit/Cost Ratio	**1.25**	

Table 23. Participant Cost Test Inputs and Results

	Benefits	Costs
Participant Bill Savings (electric, gross)	$5,659,830	
Participant Bill Savings (natural gas, gross)	$0	
Incentives	$914,424	
Participant Costs (gross)		$1,956,721
Total	**$6,574,254**	**$1,956,721**
PCT Benefit/Cost Ratio	**3.36**	

Home Energy Analysis

Table 24 through Table 28 show total benefits and costs for the Home Energy Analysis Program, along with the benefit/cost ratio for each cost-effectiveness test.

Table 24. Utility Cost Test Inputs and Results

	Benefits	Costs
Avoided Electric Production	$105,246	
Avoided Electric Capacity	$32,885	
Avoided T&D Electric	$9,660	
Incentives		$133,592
Program Overhead Costs		$65,702
Total	**$147,791**	**$199,294**
UCT Benefit/Cost Ratio	**0.74**	

Table 25. Total Resource Cost Test Inputs and Results

	Benefits	Costs
Avoided Electric Production	$105,246	
Avoided Electric Capacity	$32,885	
Avoided T&D Electric	$9,660	
Participant Costs (net)		$200,710
Program Overhead Costs		$65,702
Total	**$147,791**	**$266,412**
TRC Benefit/Cost Ratio	**0.55**	

Table 26. Ratepayer Impact Measure Test Inputs and Results

	Benefits	Costs
Avoided Electric Production	$105,246	
Avoided Electric Capacity	$32,885	
Avoided T&D Electric	$9,660	
Program Overhead Costs		$65,702
Incentives		$133,592
Lost Revenue (electric)		$267,458
Total	**$147,791**	**$466,751**
RIM Benefit/Cost Ratio	**0.32**	

Table 27. Societal Cost Test Inputs and Results

	Benefits	Costs
Avoided Electric Production	$153,515	
Avoided Electric Capacity	$32,885	
Avoided T&D Electric	$14,225	
Program Overhead Costs		$70,838
Participant Costs (net)		$216,400
Total	**$200,624**	**$287,238**
SCT Benefit/Cost Ratio	**0.70**	

Table 28. Participant Cost Test Inputs and Results

	Benefits	Costs
Participant Bill Savings (electric, gross)	$309,916	
Incentives	$133,592	
Participant Costs (gross)		$232,573
Total	**$443,508**	**$232,573**
PCT Benefit/Cost Ratio	**1.91**	

Heating and Cooling

Table 29 through Table 33 show total benefits and costs for the HVAC Program, along with the benefit/cost ratio for each cost-effectiveness test.

Table 29. Utility Cost Test Inputs and Results

	Benefits	Costs
Avoided Electric Production	$15,610,777	
Avoided Electric Capacity	$5,349,580	
Avoided T&D Electric	$3,471,607	
Incentives		$6,506,434
Program Overhead Costs		$4,632,965
Total	**$24,431,963**	**$11,139,399**
UCT Benefit/Cost Ratio	**2.19**	

Table 30. Total Resource Cost Test Inputs and Results

	Benefits	Costs
Avoided Electric Production	$15,610,777	
Avoided Electric Capacity	$5,349,580	
Avoided T&D Electric	$3,471,607	
Participant Costs (net)		$18,604,798
Program Overhead Costs		$4,632,965
Total	**$24,431,963**	**$23,237,763**
TRC Benefit/Cost Ratio	**1.05**	

Table 31. Ratepayer Impact Measure Test Inputs and Results

	Benefits	Costs
Avoided Electric Production	$15,610,777	
Avoided Electric Capacity	$5,349,580	
Avoided T&D Electric	$3,471,607	
Program Overhead Costs		$4,632,965
Incentives		$6,506,434
Lost Revenue		$42,214,664
Total	**$24,431,963**	**$53,354,063**
RIM Benefit/Cost Ratio	**0.46**	

Table 32. Societal Cost Test Inputs and Results

	Benefits	Costs
Avoided Electric Production	$20,570,586	
Avoided Electric Capacity	$5,349,580	
Avoided T&D Electric	$4,157,543	
Program Overhead Costs		$4,995,123
Participant Costs (net)		$20,059,130
Total	**$30,077,708**	**$25,054,253**
SCT Benefit/Cost Ratio	**1.20**	

Table 33. Participant Cost Test Inputs and Results

	Benefits	Costs
Participant Bill Savings (electric, natural gas, gross)	$37,923,338	
Incentives	$6,506,434	
Participant Costs (gross)		$16,860,165
Total	**$44,429,772**	**$16,860,165**
PCT Benefit/Cost Ratio	**2.64**	

Lighting

Table 34 through Table 38 show total benefits and costs for the Lighting Program, along with the benefit/cost ratio for each cost-effectiveness test.

Table 34. Utility Cost Test Inputs and Results

	Benefits	Costs
Avoided Electric Production	$17,222,576	
Avoided Electric Capacity	$2,420,296	
Avoided T&D Electric	$814,646	
Incentives		$4,109,218
Program Overhead Costs		$1,754,168
Total	**$20,457,518**	**$5,863,386**
UCT Benefit/Cost Ratio	**3.49**	

Table 35. Total Resource Cost Test Inputs and Results

	Benefits	Costs
Avoided Electric Production	$17,222,576	
Avoided Electric Capacity	$2,420,296	
Avoided T&D Electric	$814,646	
Participant Costs (net)		$14,368,228
Program Overhead Costs		$1,754,168
Total	**$20,457,518**	**$16,122,396**
TRC Benefit/Cost Ratio	**1.27**	

Table 36. Ratepayer Impact Measure Test Inputs and Results

	Benefits	Costs
Avoided Electric Production	$17,222,576	
Avoided Electric Capacity	$2,420,296	
Avoided T&D Electric	$814,646	
Program Overhead Costs		$1,754,168
Incentives		$4,109,218
Lost Revenue		$43,178,981
Total	**$20,457,518**	**$49,042,367**
RIM Benefit/Cost Ratio	**0.42**	

Table 37. Societal Cost Test Inputs and Results

	Benefits	Costs
Avoided Electric Production	$25,335,145	
Avoided Electric Capacity	$2,420,296	
Avoided T&D Electric	$1,112,990	
Program Overhead Costs		$1,891,290
Participant Costs (net)		$15,491,388
Total	**$28,868,431**	**$17,382,679**
SCT Benefit/Cost Ratio	**1.66**	

Table 38. Participant Cost Test Inputs and Results

	Benefits	Costs
Participant Bill Savings (electric, gross)	$49,768,015	
Incentives	$4,109,218	
Participant Costs (gross)		$17,820,452
Total	**$53,877,233**	**$17,820,452**
PCT Benefit/Cost Ratio	**3.02**	

Low Income

Table 39 through Table 43 show total benefits and costs for the Low Income Program, along with the benefit/cost ratio for each cost-effectiveness test. The benefit/cost ratio for the PCT test is "N/A," as there are no participant costs.

Table 39. Utility Cost Test Inputs and Results

	Benefits	Costs
Avoided Electric Production	$1,441,241	
Avoided Electric Capacity	$740,617	
Avoided T&D Electric	$257,521	
Incentives		$0
Program Overhead Costs		$2,777,124
Total	**$2,439,379**	**$2,777,124**
UCT Benefit/Cost Ratio	**0.88**	

Table 40. Total Resource Cost Test Inputs and Results

	Benefits	Costs
Avoided Electric Production	$1,441,241	
Avoided Electric Capacity	$740,617	
Avoided T&D Electric	$257,521	
Participant Costs (net)		$0.00
Program Overhead Costs		$2,777,124
Total	**$2,439,379**	**$2,777,124**
TRC Benefit/Cost Ratio	**0.88**	

Table 41. Ratepayer Impact Measure Test Inputs and Results

	Benefits	Costs
Avoided Electric Production	$1,441,241	
Avoided Electric Capacity	$740,617	
Avoided T&D Electric	$257,521	
Program Overhead Costs		$2,777,124
Incentives		$0
Lost Revenue		$3,762,794
Total	**$2,439,379**	**$6,539,918**
RIM Benefit/Cost Ratio	**0.37**	

Table 42. Societal Cost Test Inputs and Results

	Benefits	Costs
Avoided Electric Production	$1,994,602	
Avoided Electric Capacity	$740,617	
Avoided T&D Electric	$337,580	
Program Overhead Costs		$2,994,211
Total	**$3,072,800**	**$2,994,211**
SCT Benefit/Cost Ratio	**1.03**	

Table 43. Participant Cost Test Inputs and Results

	Benefits	Costs
Participant Bill Savings (electric, gross)	$3,927,760	
Incentives	$0	
Participant Costs (gross)		$0
Total	**$3,927,760**	**$0.00**
PCT Benefit/Cost Ratio	**N/A**	

Refrigerator Recycling

Table 44 through Table 48 show total benefits and costs for the Refrigerator Recycling Program, along with the benefit/cost ratio for each cost-effectiveness test.

Table 44. Utility Cost Test Inputs and Results

	Benefits	Costs
Avoided Electric Production	$1,979,122	
Avoided Electric Capacity	$684,425	
Avoided T&D Electric	$266,217	
Incentives		$0
Program Overhead Costs		$1,830,835
Total	**$2,929,764**	**$1,830,835**
UCT Benefit/Cost Ratio	**1.60**	

Table 45. Total Resource Cost Test Inputs and Results

	Benefits	Costs
Avoided Electric Production	$1,979,122	
Avoided Electric Capacity	$684,425	
Avoided T&D Electric	$266,217	
Participant Costs (net)		$0.00
Program Overhead Costs		$68,712
Total	**$2,929,764**	**$68,712**
TRC Benefit/Cost Ratio	**1.60**	

Table 46. Ratepayer Impact Measure Test Input and Results

	Benefits	Costs
Avoided Electric Production	$1,979,122	
Avoided Electric Capacity	$684,425	
Avoided T&D Electric	$266,217	
Program Overhead Costs		$1,830,835
Incentives		$0
Lost Revenue		$5,503,392
Total	**$2,929,764**	**$7,334,227**
RIM Benefit/Cost Ratio	**0.40**	

Table 47. Societal Cost Test Inputs and Results

	Benefits	Costs
Avoided Electric Production	$2,527,222	
Avoided Electric Capacity	$684,425	
Avoided T&D Electric	$334,342	
Program Overhead Costs		$1,973,951
Total	**$3,545,989**	**$1,973,951**
SCT Benefit/Cost Ratio	**1.80**	

Table 48. Participant Cost Test Inputs and Results

	Benefits	Costs
Participant Bill Savings (electric, gross)	$7,204,625	
Incentives	$0	
Participant Costs (gross)		$0
Total	**$7,204,625**	**$0.00**
PCT Benefit/Cost Ratio	**N/A**	

CSR Evaluation Summaries

According to the Missouri Code of State Regulations (CSR), demand-side programs operating as part of a utility's preferred resource plan are subject to ongoing process evaluations that address, at a minimum, the five questions listed in Table 49 through Table 54. In addition, each program must meet the data requirements listed in Table 55 through Table 60. This section offers the Cadmus team's summary responses for the specified CSR requirements for each of the six PY15residential programs.

Process CSR Summaries

Table 49. Efficient Products: Summary CSR Responses

CSR Requirement Number	CSR Requirement Description	Summary Response
1	What are the primary market imperfections common to the target market segment?	Prior research has indicated that lack of energy-efficiency awareness and the higher upfront cost of energy-efficient products are common barriers to this market segment. The PY15 evaluation did not determine that these imperfections have been addressed and it is assumed that the primary market has remained stable across the PY13-PY15 period.
2	Is the target market segment appropriately defined, or should it be further subdivided or merged with other market segments?	PY13 findings indicated the target market of all residential customers is appropriate for the equipment rebate programs. The target market segments remain unchanged from PY13 and it was determined that a market study would not be completed in PY14 or PY15. Efficiency Kits are limited to those with electric water heating. This is appropriate for this program. Additional markets, such as schools, may be explored in future years.
3	Does the mix of end-use measures included in the program appropriately reflect the diversity of end-use energy service needs and existing end-use technologies within the target market segment?	The Efficient Products program continues to be a highly diverse program, offering 13 energy-efficient home technologies in HVAC, lighting, plug-load, pumps, and water heating end-uses. This is a dynamic, responsive program, as demonstrated by the addition of multiple measures in PY14 and the discontinuation of measures in PY14 and PY15.
4	Are the communication channels and delivery mechanisms appropriate for the target market segment?	Unchanged from PY14, the delivery channels are appropriate and reach customers through retail and direct-mail efforts, including in-store advertisements, bill inserts, contractors, postcards, and Ameren

CSR Requirement Number	CSR Requirement Description	Summary Response
		Missouri's website. In PY15, outreach to multifamily property owners resulted in increased installation of kit products.
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?	Program promotions that provide program and energy education can help to overcome market imperfections. Timing product promotions so that they coincide with seasons of high use may also help implementation, as demonstrated by the higher participation in the pool pump rebate in PY15.

Table 50. Home Energy Analysis: Summary CSR Responses

CSR Requirement Number	CSR Requirement Description	Summary Response
1	What are the primary market imperfections common to the target market segment?	The primary market imperfection remains largely unchanged from PY13: customers have inadequate information and/or regarding the benefits of increasing energy efficiency within existing homes.
2	Is the target market segment appropriately defined, or should it be further subdivided or merged with other market segments?	The program target market of dual fuel customers is an appropriate market segment. The program could have potentially increased overall uptake if the target market had not been limited to dual fuel customers, however, single fuel customers may provide less savings per home.
3	Does the mix of end-use measures included in the program appropriately reflect the diversity of end-use energy service needs and existing end-use technologies within the target market segment?	The mix of end-use measures offered through the program was appropriate in PY15 with the addition of electric water heater measures.
4	Are the communication channels and delivery mechanisms appropriate for the target market segment?	Yes, communication and delivery channels were appropriate. Future program design should consider the impact of the audit fee on recruitment and overall program performance.
5	What can be done to more effectively overcome the identified market imperfections and to increase the rate of customer acceptance and implementation of each end-use measure included in the program?	Additional customer education and awareness was needed regarding the benefits—financial and nonfinancial—that the program's major measures contribute by increasing the efficiency and comfort of their homes. Future programs should focus more resources on case studies to communicate the benefits of the major measures.

Table 51. HVAC Program: Summary CSR Responses

CSR Requirement Number	CSR Requirement Description	Summary Response
1	What are the primary market imperfections common to the target market segment?	The primary market imperfection common to the target market was inadequate information and/or knowledge regarding the energy-saving benefits of proper HVAC maintenance, high-efficiency HVAC systems for cooling and electric heating, and the use of

CSR Requirement Number	CSR Requirement Description	Summary Response
		electric resistance heating. Additionally, the investment/cost of installing a new HVAC unit deterred customers from ultimately making the decision to purchase until absolutely necessary. Further, when customers replaced a system, the greater upfront cost of high-efficiency systems could cause them to purchase a lower-efficiency unit, even if the lifetime operating costs of the system were greater.
2	Is the target market segment appropriately defined, or should it be further subdivided or merged with other market segments?	The target market segment was appropriately defined and comprehensively served for the single-family residential market. The program expanded in 2015 to include "rowhouses" (townhouse-style buildings with more than four units). Specifically, the Heating and Cooling Program was designed to help customers maintain the efficiency of operable systems (through tune-ups) and offered tiered incentives for customers replacing a failed and functional system (early retirement).
3	Does the mix of end-use measures included in the program appropriately reflect the diversity of end-use energy service needs and existing end-use technologies within the target market segment?	The program targeted the primary end-use technologies within the targeted market segment. When given the opportunity to offer suggestions for program changes or improvements, participating contractors and participants did not suggest that the program precluded any type of end-use measure. Thermostat with internet connectivity and adaptive temperature control strategies are relatively new to the market. The program could include incentives for this type of measure.

CSR Requirement Number	CSR Requirement Description	Summary Response
4	Are the communication channels and delivery mechanisms appropriate for the target market segment?	Current communication channels were appropriate. The program expanded marketing efforts in PY15 and communicated information through high-propensity direct marketing, television advertisements and banners, website and internet radio advertisements and also increased its outreach to equipment distributors. Participating contractors contributed to marketing strategies during contractor advisory group sessions.
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?	The marketing materials allocated a significant proportion of resources specific to the targeted market. In the first program year, the most common suggestion for improvement from program participants surveyed was the need to increase program awareness and benefits, an indication that marketing efforts should continue or increase. The program could continue to perform billing data analysis to market to customers with relatively high apparent heating and cooling energy consumption.

Table 52. Lighting Program: Summary CSR Responses

CSR Requirement Number	CSR Requirement Description	Summary Response
1	What are the primary market imperfections common to the target market segment?	The rapid pace of change in the lighting sector means customers continue to face an information barrier. The PY15 resident survey indicates customers are becoming more familiar with different technology types, such as halogens, LEDs and CFLs. However, the typical lighting customer probably still does not recognize or understand the variety of options in lighting products currently on the market. Further complicating this issue is the fact that new products, such as the non-ENERGY STAR LEDs, are emerging on shelves. As a result, customers fall back on price to determine which products they buy, and less efficient options continue to be less expensive than high efficiency bulbs.

CSR Requirement Number	CSR Requirement Description	Summary Response
2	Is the target market segment appropriately defined, or should it be further subdivided or merged with other market segments?	The target market for the Lighting program is determined by measure. For standard lighting measures, the program targets the subsets of the general residential lighting market that have had less exposure or access to high-efficiency lighting. For specialty lighting measure, the program targets the residential lighting market more broadly. This is appropriate as the general customer base is becoming more familiar with high-efficiency technology, though more so for general purpose bulbs than specialty bulbs.
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?	For the most part, yes. The program offers a diversity of both LEDs and CFLs that represent the majority of common consumer lighting needs, including a range of wattages and specialty bulbs such as decorative shapes, three-way and four-way bulbs and reflectors. However, the emergence of non-ENERGY STAR bulbs that offer the same energy savings at a fraction of the price (as a result of limiting non-energy features) may be meeting customer demand for high efficiency at an even lower price that available from the program.
4	Are the communication channels and delivery mechanisms appropriate for the target market segment?	Retailers report Ameren Missouri signage is effective. As the big box stores that typically partnered with the program in the past are now carrying and selling more high-efficiency product on their accord, the program has shifted a greater percentage of sales to non-big-box retailers. The placement-based marketing techniques that were effective at driving very high volumes through big box stores are no longer available for lower-volume measures still sold through big box stores, or for more common measures sold through non big box outlets. The program has identified some new marketing techniques, but in general relies less on placement marketing than in the past. This is appropriate for the lower sales targets in the current year relative to PY13 and PY14.

CSR Requirement Number	CSR Requirement Description	Summary Response
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?	Ameren Missouri continues to reach out to more retailers and audiences and to expand the list of eligible measures. As the volume of the program falls, it is more difficult to find an appropriate place and time in store front locations for the educational promotion activities that help customers learn to navigate new lighting options. Ameren Missouri should shift educational focus as well as marketing focus to more online activity, as a lower cost alternative to face-to face interaction.

Table 53. Low Income: Summary CSR Responses

CSR Requirement Number	CSR Requirement Description	Summary Response
1	What are the primary market imperfections common to the target market segment?	It is assumed that the primary market remains largely unchanged from PY13 and that the primary market imperfections included: split incentives between property managers and tenants; and the work required by the property manager/maintenance staff to facilitate installations.
2	Is the target market segment appropriately defined, or should it be further subdivided or merged with other market segments?	The low-income, multifamily market could have been merged with a low-income, single-family market; however, this concept was suspended due to stakeholder concerns. Additionally, the current target market could be revised to include low-income tenants.
3	Does the mix of end-use measures included in the program appropriately reflect the diversity of end-use energy service needs and existing end-use technologies within the target market segment?	The mix of measures were appropriate for multifamily buildings for low-income residents. The program measures addressed lighting, water heating, appliances, and heating, and cooling. In PY14, advanced power strips were discontinued because of low evaluated savings. Additional measures were supplied in PY14 for households with natural gas heating or water heating. Program stakeholders have also suggested including ceiling insulation, air sealing, windows, CAC repair, and LEDs in future program cycles.

CSR Requirement Number	CSR Requirement Description	Summary Response
4	Are the communication channels and delivery mechanisms appropriate for the target market segment?	The communication channels for the target market included direct contact with property managers by Honeywell staff as well as word-of-mouth. Communication with tenants was handled by property managers through workshops with Honeywell staff and directly with installation contractors in apartments. The delivery mechanism was direct installation, performed by program subcontractors. The communication and delivery mechanism were necessarily direct and hands-on as both the tenant and property managers were considered a hard-to-reach population and have split incentives.
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?	The Low Income Program design and implementation had great success for several years, with high levels of participation and tenant acceptance of new measures. Many federally-subsidized properties were treated, and LIHTC properties generated additional participation. It is likely that most multifamily properties with at least 50% low-income residents will be treated in the next few years. It may behoove the program to consider drawing in some market rate properties under different cost-effectiveness criteria in future program cycles. Alternatively, the program can assess the feasibility of treating individual units as opposed to the requiring treatment of the entire complex.

Table 54. Appliance Recycling: Summary CSR Responses

CSR Requirement Number	CSR Requirement Description	Summary Response
1	What are the primary market imperfections common to the target market segment?	There were no changes to the primary market for refrigerator recycling in Ameren MO territory in PY15. The primary market imperfections common to the target market are an inadequate understanding of the operating costs of old or secondary refrigerators, misconceptions regarding the market for used appliances or costs associated with appliance disposal, and, in many cases, the inability to physically discard the appliance without assistance.

CSR Requirement Number	CSR Requirement Description	Summary Response
2	Is the target market segment appropriately defined, or should it be further subdivided or merged with other market segments?	Without conflicting evidence, based on PY15 research, we continue to feel that the target market segment is appropriately defined as it serves all single-family residential customers regardless of the appliance's usage type (primary or secondary), age, part-use, or aesthetic condition.
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 current mix of end-use measures included in the program is appropriate. In PY13, the program began collecting room air conditioners and dehumidifiers with eligible refrigerators and freezers, which provided additional benefits for customers and savings for Ameren Missouri. The program continued this practice in PY14 and PY15. As recommended in PY13, the program could also provide energy efficiency kits (including LEDs and other easy-to-install measures) to achieve deeper savings and encourage participation in other programs.
4	Are the communication channels and delivery mechanisms appropriate for the target market segment?	Yes, delivery channels are appropriate. The implementer ARCA handles scheduling and pick-up for appliances recycled through the program, which makes the program convenient for participants.
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?	Cadmus recommends that the program continue to explore new communication channels through which customers can learn about the program. Possible channels could include advertising through social media, YouTube, and other popular social network sites.

Impact CSR Summaries

Table 55. Efficient Products: Summary Impact CSR Responses

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	Unchanged from the PY14 approach, the program compares the pre-adoption load based on assumed baseline technology with the post-adoption load based on program technology and estimates weather and interactive effects using TRM and industry assumptions, metering, and modeling, when necessary
Comparisons between program participants' loads and those of an appropriate control group over the same time period		
Data: The evaluation must use one or more of the following types of data to assess program impact:		
Monthly billing data		
Hourly load data		
Load research data		
End-use load metered data	X	Unchanged from the PY14 approach, Cadmus used metered lighting hours of use by room in a sample of homes in the program area during 2013-2014.
Building and equipment simulation models	X	Unchanged from the PY14 approach, Cadmus used simulation modeling to determine the waste-heat impact of efficient lighting.
Survey responses	X	Cadmus relied on PY14 participant surveys on purchasing practices and other product participants to determine installation rates.
Audit and survey data on:		
Equipment type/size efficiency	X	Cadmus relied on the PY14 audit of all lighting in sample of homes in program area and an audit of equipment type/efficiency for other products through review and analysis of the program database.
Household or business characteristics	X	Cadmus relied on PY14 household characteristics from homes participating in lighting audit: home type, own/rent home, and kit participants and Low Income program participants.
Energy-related building characteristics		

Table 56. Home Energy Analysis: Summary Impact CSR Responses

CSR Requirement	Method Used	Description of Program Method
Approach: The evaluation must use one or both of the following comparisons to determine the program impact:		
Comparisons of pre-adoption and post-adoption loads of program participants, corrected for the effects of weather and other intertemporal differences	X	The evaluation compares the pre-adoption load based on assumed baseline technology with the post-adoption load based on program technology, estimates of lighting hours of use and water usage (based on metered data), waste-heat impact (based on equipment simulation), and survey data (based on feedback from program participants).
Comparisons between program participants' loads and those of an appropriate control group over the same time period		
Data: The evaluation must use one or more of the following types of data to assess program impact:		
Monthly billing data		
Hourly load data		
Load research data		
End-use load metered data	X	Metered lighting hours of use for a sample of homes in the program area during 2013-2014.
Building and equipment simulation models	X	Use simulation modeling to determine the waste-heat impact of efficient lighting
Survey responses	X	Surveyed program participants in 2013 and 2014 regarding measure verification, installation rates, free ridership, and spillover.
Audit and survey data on:		
Equipment type/size efficiency	X	Evaluation team conducted surveys in 2013 and 2014 to verify installation and use of each direct install and rebated measure type.
Household or business characteristics	X	Evaluation team verified program audit data.
Energy-related building characteristics		

Table 57. HVAC: Summary Impact CSR Responses

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 savings based on submetered data from sample of participants
Comparisons between program participants' loads and those of an appropriate control group over the same time period		
Data: The evaluation must use one or more of the following types of data to assess program impact:		
Monthly billing data		
Hourly load data		
Load research data		
End-use load metered data	X	Metered HVAC power, indoor temperature, and outdoor conditions at 2-minute intervals during 2013
Building and equipmentsimulation models		
Survey responses	X	Verified measure installation through participant surveys in 2013, 2014, and 2015.
Audit and survey data on:		
Equipment type/size efficiency	X	Evaluation team gathered equipment information from homes participating in metering and from program data
Household or business characteristics	X	Evaluation team collected household characteristics from homes participating in metering and from program data.
Energy-related building characteristics		

Table 58. Lighting: Summary Impact CSR Responses

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 program participants' loads and those of an appropriate control group over the same time period		
Data: The evaluation must use one or more of the following types of data to assess program impact:		
Monthly billing data		
Hourly load data		
Load research data		
End-use load metered data	X	Metered lighting hours of use by room in a sample of homes in the program area during 2013-2014.
Building and equipment simulation models	X	Use simulation modeling to determine the waste-heat impact of efficient lighting
Survey responses	X	Surveyed residents on purchasing practices and date of purchase of efficient technology to determine installation rates.
Audit and survey data on:		
Equipment type/size efficiency	X	Evaluation team conducted an audit of all lighting in sample of homes in program area.
Household or business characteristics	X	Evaluation team collected household characteristics from homes participating in lighting audit: home type, own/rent home
Energy-related building characteristics		

Table 59. Low Income: Summary Impact CSR Responses

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 compared 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) and waste-heat impact (based on equipment simulation).
Comparisons between program participants' loads and those of an appropriate control group over the same time period	X	The Cadmus team conducted a regression analysis using customer payment data to analyze the impacts of installed high-efficiency measures on customer bill payment behavior. The analysis included a comparison group to enable us to assess the presence and magnitude of this effect.
Data: The evaluation must use one or more of the following types of data to assess program impact:		
Monthly billing data	X	The Cadmus team conducted an analysis of monthly bill payment data for participants, spanning from 2012 through 2015.
Hourly load data		
Load research data		
End-use load metered data	X	The Cadmus team metered lighting hours of use by room and hourly thermostat usage in a sample of program properties during 2013-2014.
Building and equipment simulation models		
Survey responses		
Audit and survey data on:		
Equipment type/size efficiency	X	The Cadmus team gathered equipment information from homes participating in metering, and from program data in PY14.
Household or business characteristics	X	The Cadmus team collected household characteristics from homes participating in metering, and from program data in PY14.
Energy-related building characteristics		

Table 60. Appliance Recycling: Summary Impact CSR Responses

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 estimated pre-participation load based on the characteristics of recycled appliances, usage data from surveys, weather, and participants' self-reported alternative disposal methods, with the estimated post-participation load based upon these same data given that the appliance was taken off the grid by the program.
Comparisons between program participants' loads and those of an appropriate control group over the same time period		
Data: The evaluation must use one or more of the following types of data to assess program impact:		
Monthly billing data		
Hourly load data		
Load research data		
End-use load metered data	X	Cadmus used yearly energy consumption data from 563 appliances metered in DTE, Consumer's Energy, PGE, SCE, and SDGE service territories to model annual unit energy consumption as a function of each unit's age and configuration and Ameren PY14 average part-use and appliance location (conditioned or unconditioned space).
Building and equipment simulation models		
Survey responses	X	Cadmus surveyed PY14 RRP program participants to determine average part-use, freeridership, and secondary market impacts.
Audit and survey data on:		
Equipment type/size efficiency	X	Evaluation team received the age and configuration of all appliances recycled through the program from ARCA and used this, in combination with PY14 survey results, to determine unit energy consumption and gross and net savings.
Household or business characteristics		
Energy-related building characteristics		