EVERGREEN ECONOMICS

Independent EM&V Audit of the Ameren Missouri PY2018 Program Evaluations

Final Report

July 25, 2019

MichaelsEnergy

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1 Executive Summary

In early 2016, the Missouri Public Service Commission (PSC) approved the Missouri Energy Efficiency Investment Act (MEEIA) Cycle 2 DSM programs for Ameren Missouri (Case No. EO-2015-0055). All Cycle 2 programs were implemented no later than the second quarter of 2016 and will all terminate no later than February 28, 2019.[1] The MEEIA Cycle 2 Programs are:

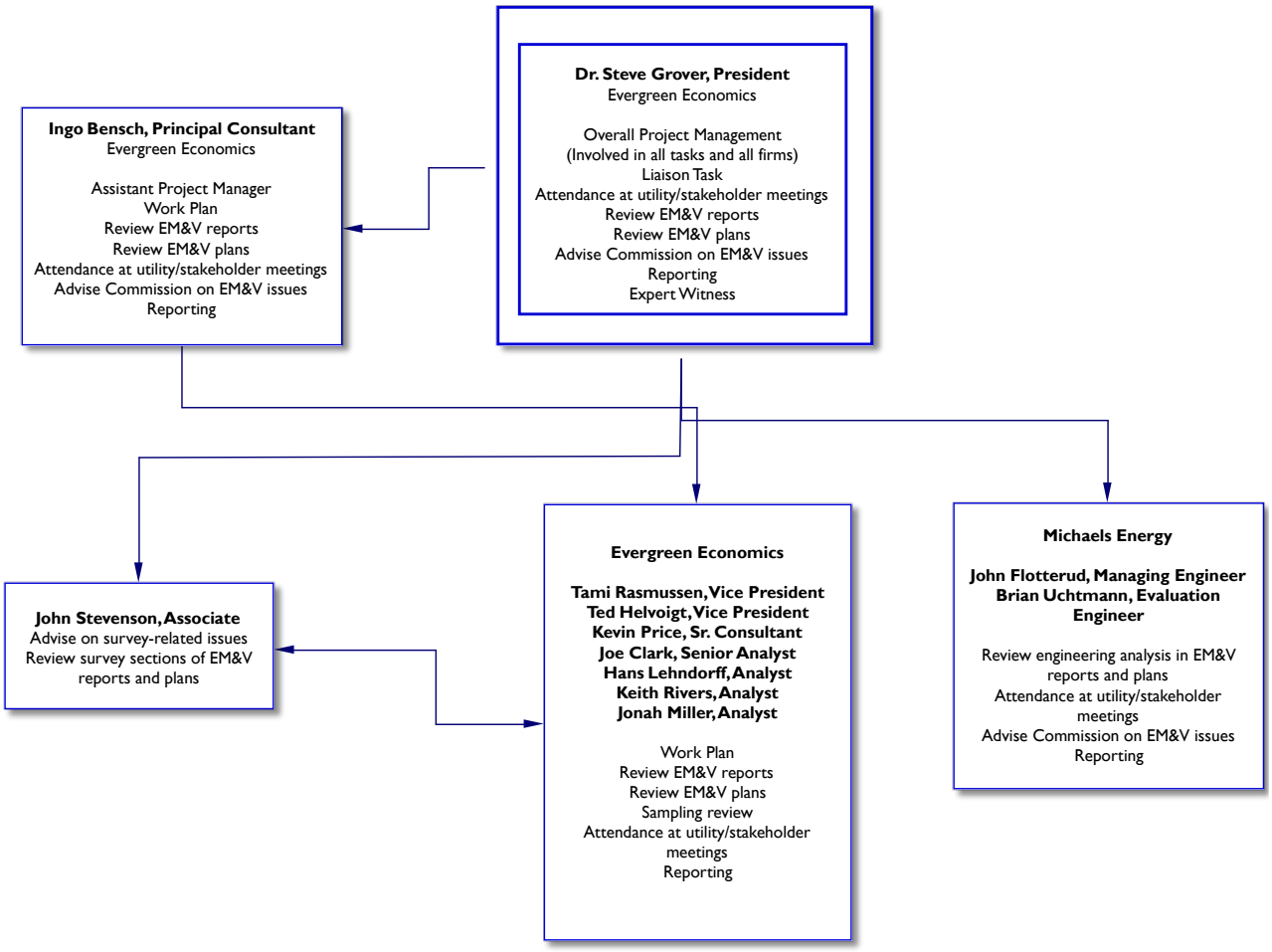
- **BizSavers –** Designed to help businesses identify and implement energy saving projects, the BizSavers Program includes the Custom, Standard, Energy Management System (EMS) Pilot, New Construction, Retro-Commissioning, and Small Business Direct Install programs.
- **Community Savers –** Provides financial incentives and services to encourage energy efficiency improvements in income-eligible multifamily properties.
- **Efficient Products** - Provides incentives to encourage customers to purchase technologies that can save money, improve comfort, and save energy.
- **Efficiency Kits –** Provides energy efficiency kits to residential customers through two separate delivery channels: schools and multifamily property managers.
- **Heating and Cooling** - Offers customers living in single-family homes, condos, or townhomes incentives for installing high-efficiency central air conditioners, heat pumps, and other heating and cooling measures through participating program contractors.
- **Home Energy Report** - Provides mailed home energy reports that encourage customers to reduce their energy consumption through behavioral changes.
- **Lighting** - Seeks to increase sales of highly efficient LEDs through mainstream retail channels across Ameren Missouri's territory.

Ameren Missouri contracted with two Evaluation, Measurement & Verification (EM&V) contractors—The Cadmus Group, Inc. (Cadmus) and ADM Associates, Inc. (ADM)—to conduct comprehensive impact and process evaluations of Ameren Missouri's energy efficiency portfolio for Program Year (PY) 2018. Cadmus conducted evaluations of the residential energy efficiency programs, and ADM conducted evaluations of the energy efficiency programs covering the non-residential sector.

[1] Some Cycle 2 long-lead projects are expected to continue after February 28, 2019, as a result of the PSC's July 20, 2017 *Order Approving Stipulation and Agreement*.

In 2018, the Missouri PSC contracted with Evergreen Economics to serve in the capacity of EM&V Auditor. Figure 1 shows the audit team members and organization, the individual team members by firm, and the associated audit responsibilities.

Figure 1: Evergreen Audit Team Organization



The audit team is required to review program evaluation activities and provide comments on compliance with 4 CSR 240-22.070(8) and the overall quality, scope, and accuracy of the program evaluation reports, as well as recommendations to improve the evaluation and reporting process.

A review of PY2018 evaluation indicates that all evaluation reports are well written, complete, and meet the minimum requirements for impact and process evaluations stipulated in 4 CSR 240-22.070(8). These reports are also generally consistent with the best practices established for the industry. During the course of the audit, we have identified areas where we believe the evaluations can be improved, and these recommendations are detailed below.

Cadmus and ADM provided a total of 24 recommendations on ways in which Ameren Missouri can improve its residential and commercial and industrial (C&I) programs going forward. Eight of these recommendations were related to the impact evaluation, and sixteen recommendations were related to the program processes.

Cadmus reviewed previous year recommendations and tracked if the recommendations have been adopted. Of 22 recommendations tracked from the previous year, 22 have been adopted or are in the process of being adopted.[2]

Our audit conclusions for the PY2018 Ameren Missouri program evaluations are presented below.

1.1 Midlife Savings Adjustments in Cost Effectiveness Calculations

Mid-life savings adjustments do not appear to have been incorporated into the cost effectiveness analysis, and there are several instances where we believe that they will have significant effect on the calculations. This recommendation was made as part of the PY2017 audit and is repeated here for PY2018.

These mid-life changes to baseline energy consumption are caused when the energy efficient measure has a longer effective useful life than the equipment it replaces, and the baseline equipment efficiency is expected to revert to code minimum efficiency over the duration of the cost effectiveness analysis.

The Missouri TRM[3] provides an example of a mid-life adjustment needed for lighting:

> During the lifetime of a standard Omnidirectional LED, the baseline incandescent/halogen bulb would need to be replaced multiple times. Since the baseline bulb changes to a CFL equivalent in 2020 due to the EISA backstop provision, the annual savings claim must be reduced within the life of the measure to account for this baseline shift. **The reduced annual savings will need to be incorporated into the cost effectiveness screening calculations** (emphasis added).

A partial list of measures where we believe that a mid-life savings adjustment is needed include the following:

- BizSavers, CommunitySavers, and Residential Programs: Measure 3007: LED screw in lamp replacing incandescent or halogen reflector lamp: A mid-life adjustment for

[2] ADM did not include recommendation adoption tracking for both the BizSavers and CommunitySavers programs.
[3] *The Missouri Technical Reference Manual Volume 2: Commercial and Industrial Measures* (March 31, 2017), p 188.

the savings for this measure should be made in the cost effectiveness analysis after the year 2020 that is consistent with the Missouri TRM.

- BizSavers, CommunitySavers, and Residential Programs: Measure 3026: LED lamps replacing T12 Linear fluorescent lamps: A mid-life adjustment to the savings for this measure should be made in the cost effectiveness analysis to reflect code changes that are to become effective in 2020 that is consistent with the Missouri TRM.
- BizSavers, CommunitySavers, and Residential Programs: Other Lighting Measures with T12 and other baseline lighting wattages below 45 lumens per watt will require mid-life savings adjustments to be made in the cost effectiveness analysis after 2020.

These mid-life adjustments may also have significant impacts on the Earning Opportunity (EO) determinations, as the mid-life adjustments needed for the PY2018 measures may affect whether or not they are delivering energy savings in 2023.

For the Earning Opportunity calculations, the Ameren Missouri Stipulation and Agreement (p. 13) states the following:

> Corresponding kW savings for the year 2023 will be determined by applying an end-use category energy to coincident demand factor found in Appendix E to the first year energy savings that are determined by EM&V. 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. This means that eligible measures for inclusion in the EO calculations are measures with an expected useful life of 8 years or more for measures installed in 2016, measures with an expected useful life of 7 years or more for measures installed in 2017…

We did not attempt to calculate how large an effect these adjustments will have on the cost effectiveness and the Earning Opportunity, as this was outside the scope of the audit. We believe that these changes may be significant, however, and recommend that the mid-life adjustments be made where appropriate for PY2018 and future years.

1.2 Residential Lighting Market Share Model

We do not believe the Cadmus/Apex market share should be used in the calculation of net impact from Ameren's upstream lighting program. There are fundamental problems with the market share model and with the application of results from the model to compute net impacts and the net-to-gross (NTG) ratio. Perhaps the most serious issue is that the final version of the model still includes market effects in the calculation of net impacts, which is not allowed in Missouri.

The first issue is related to how the model is combined with the elasticity model to develop the overall NTG ratio. It is not appropriate to estimate a net-to-gross ratio using the market share model, subtract out an estimate of free ridership from the elasticity model, and then simply label the remainder as "spillover." This approach makes the elasticity model entirely superfluous, as the net impact calculation will ***always*** equal the NTG ratio obtained from the market share model. If, for example, the elasticity model yielded a free ridership estimate of 90 percent, the net impact calculation shown on page 20 of the report would result in an estimate of spillover of 62 percent from the market share model, so that the overall NTG ratio would always equal 72 percent (i.e., the original overall NTG ratio from the market share model). Having the calculation always yield the same result is not appropriate.

The second issue is related to the two program related variables in the market share model: *Program Spending per Household* and *Program Age*. Neither of these variables can be interpreted as an estimate of spillover, which makes the net impact calculation even less defensible. The *Program Spending per Household* variable captures the direct impact of the program, which may possibly include some spillover effects. The Cadmus/Apex model does not allow one to separate the spillover component of the *Program Spending per Household* variable from the direct program effects.

The third issue is that the program age variable reflects **market effects**, not spillover, and in Missouri market effects are not to be claimed as part of net savings. The program age variable presents an insurmountable problem for using the market share model in Missouri. On one hand, program age is an important variable that will affect LED sales, and therefore should be included in a model used to estimate market share. On the other hand, with a properly specified model (i.e., a logit model), it is not possible to remove the program age/market effects in the calculation of net impacts for the other program variables.

The final version of the market share model uses a multinomial logit specification, in response to the audit team's comments on the draft report.[4] With the logit specification, however, the program age variable is used in the calculation of the marginal effects for ***all*** other variables, including program spending. In other words, even if the program age number is held constant at 10 years (as was done in the final evaluation report), this value is still used in the calculation of net impacts for the program spending due to the structure of the logit model.[5]

[4] A logit or probit model is the appropriate specification to use when the dependent variable is a probability or similar number bounded by 0 and 1.

[5] See *Econometric Analysis* (1990) by William Greene (pp. 699-701) for additional technical detail on the marginal effects calculation for the multinomial logit model.

In the logit model, the marginal effect of any variable is the coefficient multiplied by two additional terms reflecting the average probability of the dependent variable. In notation form, the marginal effect is $\beta * p(1-p)$ where the estimated logit probability for market share "p" is calculated using the logit probability formula and the average values (typically) for all the model variables. In this case, the probability calculation will include program age (and therefore market effects) even when the focus is only on the program spending variable. As a consequence, it is not possible in the logit model to separate out the market effect component when calculating the net impact from program spending. Additionally, given the nonlinear form of the logit model, the $p(1-p)$ term will vary based on the value of program age, so holding the age constant in the calculation will not remove the market effects component from the calculation.[6] The effect on net impacts will also vary depending on program age; it makes a difference if the program age is set equal to 10 versus 1, 5, 9, etc. This issue alone is enough to prohibit the use of the market share model for Missouri.

A separate issue is how the model results are combined with LED market data to estimate the overall net impacts. Creation of the market share model required significant data manipulation from multiple sources covering all states, which is not clearly described in the report. We have summarized some of this information in Table 1 below and then calculated the number of LED's purchased per household based on these data and other information provided in the Cadmus report.

Rows a, b, and c of the table show the number of residences in Ameren Missouri territory (1.05 million), the proportion of Missouri residents that purchased one or more light bulbs (60%), and the national average number of bulbs purchased (10.8 million). Based on this information, Evergreen calculated 632,334 Ameren Missouri customers purchased one or more light bulbs (row d) and on average these customers purchased 17 light bulbs (row f).

Likewise, rows g and h show the proportion of Missouri residents that purchased one or more LED's (49%), and the total number of LED's purchased by Ameren Missouri residential customers (6.6 million). Based on this information, Evergreen calculated 516,406 Ameren Missouri customers purchased one or more LED's (row i) and on average these customers purchased 12.7 LED's (row k).

[6] While the OLS model included in the draft evaluation report is inferior to the logit model in this application, it does alleviate this problem to some degree if the program age variable is not used in the net impact calculation. This would result in a NTG ratio of approximately 0.34, which is less than the NTG ratio of 0.48 that we are recommending using the elasticity model.

Table 1: Bulb Sales per Household Implicit in the Cadmus Analysis

Row	Metric	Value	Where in Report
a	Residential households in Ameren MO Territory:	1,053,890	Page 53
b	Percent of Missouri households that purchased one or more bulbs:	60%	Page 18
c	Total Ameren Missouri bulb sales	10,827,745	Table 33
d	Ameren Households that purchased one or more bulbs (a * b)	632,334	Evergreen computed using Cadmus data
e	**Average # of bulbs purchased per household (c / a)**	**10.3**	**Evergreen computed using Cadmus data**
f	**Average # of bulbs purchased by households that did purchase one or more bulbs (c / d)**	**17.1**	**Evergreen computed using Cadmus data**
g	Percent of Missouri households that purchased one or more LEDs:	49%	Page 18
h	Total Ameren Missouri LED sales	6,559,925	Table 33
I	Ameren households that purchased one or more LEDs (a * g)	516,406	Evergreen computed using Cadmus data
j	**Average # of LEDs purchased per household (h / a)**	**6.2**	**Evergreen computed using Cadmus data**
k	**Average # of LEDs purchased by households that did purchase one or more bulbs (h / i)**	**12.7**	**Evergreen computed using Cadmus data**

Even using the lower national sales average for bulb purchases (row c), we do not believe that the assumptions of 10.3 bulbs (6.2 LED's) per Ameren household and 17.1 (12.7 LED's) per resident that purchased any light bulbs are realistic. The total sales numbers are also not credible when compared with the program tracking data on LED sales for PY2018 (213,854) LED's total from the program data, compared to 6,559,925 LED's estimated by Cadmus from the market share model.[7]

[7] In the non-participant phone survey it appears that Cadmus asked Ameren customers how many light bulbs they had purchased in the prior year. This information would have been useful to develop an estimate of light bulb purchases in Ameren's territory and compare with the sales numbers used in the net impact

The final net impact estimate is very dependent upon the assumptions regarding the size of the overall lighting market. If a more realistic estimate of the total Ameren MO lighting market were used, then a much smaller NTG estimate would result from the market share model. For example, if the entire Ameren MO lighting market were 2,000,000 (roughly 2 light bulbs purchased per household in 2018, on average), then the resulting net impact from the market share model would be 1 percent, or 20,000 LEDs. Comparing this to the program LED's yields a NTG ratio of just 9.4 percent (20,000/213,854).

Finally, a new issue is that – for the final evaluation report – Cadmus increased the spending per household number from $0.43 to $1.27 (an increase of 295%) in the net impact calculation, which has the effect of increasing the NTG ratio from 0.24 to 0.72. Virtually no explanation is given for this switch to the larger number, which is alarming given how large an impact it has on the final NTG ratio.

This higher number may reflect the overall program dollars allocated to the residential lighting program for the cost effectiveness calculations, but this was not discussed in the report. If true, this is not the appropriate program spending number to use for the counterfactual scenario in the net impact calculations. The higher dollar figure will include some of the Ameren overhead costs that are allocated across programs so that they are included in the cost effectiveness calculations. This is simply an accounting exercise and these overhead costs are not tied specifically to the residential lighting program (otherwise they would be direct program costs rather than overhead) and therefore should not be expected to disappear in the 'no program' scenario used in the net impact calculation.

If a more appropriate number for program spending is used – one that is based on only those program costs that would disappear in the 'no program' scenario – it would include (at a minimum) the program incentive costs and marketing costs ($399,609 + $40,316) for a total of $439,609 or $0.42 program dollars spent per household. While this still excludes some other direct program costs, it is a more appropriate number to use to calculate the direct effect program spending has on the LED market share. This number is also very close to the $0.43 number originally used by Cadmus in the draft version of this report.

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analysis. Unfortunately, the survey data for this question do not appear to have been used in the evaluation analysis.

Using a lower and more appropriate program spending amount has the effect of reducing the NTG ratio by 66 percent, from 0.72 to 0.24, which is lower than the NTG estimate obtained from just using the elasticity model. However, this adjustment still does not address the issue of market effects discussed earlier.

Given all these issues, we strongly urge that the market share model be dropped entirely from the evaluation and that the net impacts be calculated solely from the lighting elasticity model. This would result in the NTG ratio for the residential lighting program to decrease from 0.72 to 0.48.

1.3 Individual Program Report Comments

The audit team made several comments on draft versions of the evaluation reports, many of which have been addressed in the final reports. A few of the issues that we believe still need to be resolved are discussed below.

Overall, the verified gross impact savings appear to have been calculated correctly, and the audit team did not find any significant math errors or misapplication of engineering formulas. The demand savings for most measures are calculated using a set of deemed coincident peak load factors. On the whole, these values seem to be appropriate to estimate the average demand savings that are likely to accrue within a given program or specific end-use. However, the demand savings for specific measures may be higher or lower than is assumed when applying generic end-use load shapes to estimate demand savings.

Going forward, the evaluation teams should continue to research and validate that the deemed coincident peak load factors are accurate and are reasonable given the specific equipment mix installed through Ameren's programs.

BizSavers and CommunitySavers

The use of deemed coincident peak load shapes is reasonable for the BizSavers and CommunitySavers programs. The evaluation of the gross impacts from the BizSavers program was robust, and the appendices and supporting information were complete and easy to read.

The evaluation does not currently utilize a dual-baseline to reflect likely changes to the lighting market for LED measures that with a long effective useful life. The evaluators should update their lighting baselines and savings assumptions to reflect the changing lighting market as more information is collected. Provisions should be made to incorporate future federal rules regarding lighting efficiency as they are promulgated.

Residential Cooling and Heating

The PY2018 EM&V verified savings have largely addressed the baseline efficiencies used to determine the energy savings for central air conditioner and heat pump measures. The

audit team's primary concern with demand savings has been addressed through the use of coincident peak load factors. A pre-post billing analysis on a sample of homes should be completed to provide more certainty that the use of the deemed coincident peak load factors is appropriate for CAC and heat pump early replacement measures and for measures with electric resistance baselines. For example, the savings for residential 14 SEER + GSHPs with electric heating baseline equipment is 11.64 kW, which is likely overstated. The evaluators should continue to monitor that the deemed coincident load factors reflect the measure mix installed through the programs.

Additionally, as noted earlier, it may not be appropriate to use the deemed coincident peak load factors for measure-level cost-benefit screening for future programs. The deemed coincident peak load factors are intended to reflect the average demand savings by end use, and the demand savings for specific measures may not be accurately reflected using this average value.

1.3.1 Portfolio Level Findings

Table 2 and Table 3 show the overall effect of the audit recommendations on the entire PY2018 program portfolio. The savings revisions are limited to using the elasticity model (rather than the market share model) to calculate net impacts for the residential lighting program, which decreases the NTG ratio from 0.72 to 0.48. Overall, the recommended changes from the audit result in a reduction of approximately 1 percent for both energy and demand savings for the PY2018 portfolio.

Table 2: Summary of Audit Recommended PY2018 Savings (MWh) – All Programs

Program	Ex Post Gross Savings (MWH/Yr)	Total Net Savings (MWh/Yr)	NTG Ratio	% Change from Evaluation Savings
Efficient Products	4,270	3,278	77%	0%
Smart Thermostats	2,163	1,518	70%	0%
Energy Efficiency Kits	5,915	5,031	85%	0%
Home Energy Reports	26,376	26,376	100%	0%
Heating and Cooling	54,444	41,388	75%	0%
Lighting	8,383	4,024	76%	-34%
Residential Total	**101,550**	**81,615**	**80%**	**-2%**
BizSavers	318,610	302,484	95%	0%
CommunitySavers	9,915	9,915	100%	0%
Non-residential Total	**328,525**	**312,399**	**95%**	**0%**
Portfolio Total	**430,076**	**394,014**	**92%**	**-1%**

Table 3: Summary of Audit Recommended PY2018 Savings (MW) – All Programs

Program	Audit Ex Post Gross Savings (MW)	Audit Total Net Savings (MW)	NTG Ratio	% Change from Evaluation Savings
Efficient Products	1.175	0.874	74%	0%
Smart Thermostats	2.049	1.436	70%	0%
Energy Efficiency Kits	1.058	0.927	88%	0%
Home Energy Reports	12.293	12.293	100%	0%
Heating and Cooling	36.987	27.008	73%	0%
Lighting	1.261	0.60528	48%	-35%
Residential Total	54.823	43.14328	**79%**	**1%**
BizSavers	75.920	71.134	94%	0%
CommunitySavers	2.073	2.073	100%	0%
Non-residential Total	**77.979**	**73.193**	**94%**	**0%**
Portfolio Total	**132.802**	**116.336**	**88%**	**<1%**

2 Introduction

The Missouri Energy Efficiency Investment Act (MEEIA) was passed in 2009, launching a new era for energy efficiency programs in Missouri. The Missouri Public Service Commission (the PSC) adopted four administrative rules (4 CSR 240-3.163, 4 CSR 240-3.164, 4 CSR 240-20.093 and 4 CSR 240-20.094) referred to as "MEEIA rules") to implement MEEIA.[8] MEEIA directs the PSC to permit electric corporations to implement PSC-approved demand side management (DSM) programs, with a goal of achieving cost-effective demand-side savings.

In 2009, the State of Missouri and Ameren Missouri reached an agreement to create Ameren Missouri's suite of residential and commercial energy efficiency programs, which began in 2013 as MEEIA Cycle 1. The MEEIA Cycle 1 programs ended on December 31, 2015, for Ameren Missouri (Case No. EO-2012-0142). In early 2016, the PSC approved MEEIA Cycle 2 DSM programs for Ameren Missouri (Case No. EO-2015-0055). All Cycle 2 programs were implemented no later than the second quarter of 2016, and all will terminate no later than February 28, 2019.[9] The MEEIA Cycle 2 programs are:

- **BizSavers –** Designed to help businesses identify and implement energy saving projects, the BizSavers Program includes the Custom, Standard, Energy Management System (EMS) Pilot, New Construction, Retro-Commissioning, and Small Business Direct Install Programs.
- **CommunitySavers –** Provides financial incentives and services to encourage energy efficiency improvements in income-eligible multifamily properties.
- **Efficient Products –** Provides incentives to encourage customers to purchase technologies that can save money, improve comfort, and save energy.
- **Efficiency Kits –** Provides energy efficiency kits to residential customers through two separate delivery channels: schools and multifamily property managers.
- **Heating and Cooling –** Offers customers living in single-family homes, condos, or townhomes incentives for installing high-efficiency central air conditioners, heat pumps, and other heating and cooling measures through participating program contractors.
- **Home Energy Report –** Provides mailed home energy reports that encourage customers to reduce their energy consumption through behavioral changes.
- **Lighting –** Seeks to increase sales of highly efficient LEDs through mainstream retail channels across Ameren Missouri's territory.

[8] The PSC is currently in the process of revising the MEEIA rules.

[9] Some Cycle 2 long-lead projects are expected to continue after February 28, 2019, as a result of the PSC's July 20, 2017 *Order Approving Stipulation and Agreement*.

To ensure that programs comply with Missouri's rules regarding electric utility resource planning, the PSC has long-term resource planning rules that contain requirements for impact evaluations and process evaluations. The goal of the impact and process evaluations is "to develop the information necessary to evaluate the cost-effectiveness and improve the design of existing and future demand-side programs and demand-side rates, to improve the forecasts of customer energy consumption and responsiveness to demand-side programs and demand-side rates and to gather data on the implementation costs and load impacts of demand-side programs and demand-side rates for use in future cost-effectiveness screening and integrated resource analysis."[10]

Key requirements of the evaluations as outlined in 4 CSR 240-22.070(8) include the following:

- Utilities are expected to complete annual full process and impact evaluations for each DSM program.
- At a minimum, impact evaluations should
    1. "develop methods of estimating the actual load impacts of each demand-side program" using one or both of the following methods:
        a. "Comparisons of pre-adoption and post-adoption loads of program participants, corrected for the effects of weather and other intertemporal differences"; and
        b. "Comparisons between program participants' loads and those of an appropriate control group over the same time period".
    2. "develop load-impact measurement protocols that are designed to make the most cost-effective use of the following types of measurements, either individually or in combination: monthly billing data, load research data, end-use load metered data, building and equipment simulation models, and survey responses or audit data on appliance and equipment type, size and efficiency levels, household or business characteristics, or energy-related building characteristics".
    3. Develop protocols to collect data regarding demand-side program market potential, participation rates, utility costs, participant costs and total costs.
- At a minimum, process evaluations should address the following five questions:
    1. What are the primary market imperfections that are common to the target market segment?
    2. Is the target market segment appropriately defined or should it be further subdivided or merged with other segments?

[10] 4 CSR 240-22.070(8) Evaluation of Demand-Side Programs and Demand–Side Rates

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 segment?
4. Are the communication channels and delivery mechanisms appropriate for the target segment?
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 contracted with two Evaluation, Measurement & Verification (EM&V) contractors—The Cadmus Group, Inc. (Cadmus) and ADM Associates, Inc. (ADM)—to conduct comprehensive impact and process evaluations of Ameren Missouri's energy efficiency portfolio. Cadmus conducted evaluations of the residential energy efficiency programs, and ADM conducted evaluations of the business energy efficiency and multi-family programs.

In 2018, the PSC contracted with Evergreen Economics and Michaels Energy (the Evergreen team) to serve in the capacity of EM&V Auditor to review program evaluation activities. The audit involved verifying compliance with 4 CSR 240-22.070(8) in addition to assessing the overall quality, scope, and accuracy of the program evaluation reports. The following report presents the Evergreen team's review of the Ameren Missouri program evaluations for program year 2018 (PY2018).

To conduct this review, the Evergreen team conducted the following activities:

- Reviewed each program's evaluation report in its entirety, including impact, process, and cost effectiveness methodologies and results;
- Reviewed the evaluation survey instruments and responses (where available) to confirm that the methodologies used were reasonable and consistent with best practices and that reported findings aligned with the data collected; and
- Reviewed specific evaluation tools and methodologies used for calculating program savings, including selected measure-level savings calculations, and survey methods for developing net program impacts.

The remainder of this report presents the results of the PY2018 audit.

3 Impact Evaluation Summary

This section summarizes the key findings and recommendations from the impact evaluations of Ameren Missouri's residential and business energy efficiency program portfolio.

3.1 Summary of Impact Evaluation Methods and Results

The evaluation teams conducted an array of impact evaluation approaches summarized by program below.

Efficient Products Program

In PY2018, the Efficient Products Program provided downstream mail-in and online rebates for the following measures:

- ENERGY STAR®-certified room air conditioners (RACs)
- ENERGY STAR–certified heat pump water heaters (HPWHs)
- ENERGY STAR–certified room air purifiers
- ENERGY STAR-certified multi-speed pool pumps
- ENERGY STAR-certified variable-speed pool pumps
- Smart thermostats (selected models)

A total of 10,623 rebates were delivered to Ameren Missouri participants for the Efficient Products Program in PY2018.

Using the Vision database,[11] Cadmus reviewed program-tracking data to identify variables needed for the impact calculations. Cadmus used customer feedback from two online surveys (the first administered directly after the customer received the rebate and the second six months after) to evaluate various aspects of the Efficient Products Program. This feedback included measure and program satisfaction, program free ridership, and demographic and household characteristics. Cadmus estimated gross savings for most program measures using engineering algorithms established in the Efficient Products Evaluation Plan, the ENERGY STAR appliances calculator, and the Missouri Statewide Technical Reference Manual (TRM). Cadmus then compared the deemed per-unit savings, provided in the Ameren Missouri TRM, to Cadmus' gross savings estimates.

Energy Efficiency Kits Program

Ameren and ICF International collaborated to implement the PY2018 Energy Efficiency Kits program, which provides energy efficiency kits through two separate delivery channels: schools and multifamily property managers. The school kits provide

[11] The Vision database is the Ameren Missouri demand side management program tracking system.

participating teachers with classroom curriculum and energy savings kits to distribute to their students. The kits contain various home energy efficient products, including one energy-efficient showerhead, one energy-efficient kitchen faucet aerator, one energy-efficient bathroom faucet aerator, one furnace filter alarm, three feet of water heater pipe wrap, and four LEDs. Multifamily kits include similar products, with minor differences.

Using the Vision database, Cadmus tracked shipments of school kits from Ameren Missouri to the implementer. The Vision database was also used to track shipments of multifamily kits from Ameren Missouri to the one participating program manager. Cadmus used *ex ante* savings values from the Ameren Missouri TRM and the evaluated *ex post* savings to estimate a per-unit gross realization rate for all Energy Efficiency Kits measures.

Heating and Cooling Program

For the impact evaluation, Cadmus began reviewing program-tracking data that had been recorded in the Vision database in order to identify variables necessary for impact calculations. To update gross kWh savings estimates, Cadmus conducted an engineering review of Ameren Missouri's TRM. Furthermore, customers were asked to complete two surveys similar to those sent to solicit feedback on the Efficient Products program. These surveys sought to collect answers to questions regarding measure and program satisfaction, program free ridership, and customer demographics. Additionally, numerous contractors and distributors were interviewed to provide information regarding the heating and cooling system market and to inform nonparticipant spillover in Missouri.

Home Energy Report Program

Using a randomized sample of customers, Cadmus assigned customers to a treatment group and to a control group. Five home energy reports, which contained information about customers' home energy consumption, were mailed to the treatment group, with the hope that this would motivate participants to adopt energy-saving home improvements and behaviors. Energy savings are estimated using a fixed effects billing regression model that utilizes data from both the treatment and control groups.

Lighting Program

On a quarterly basis, Cadmus reviewed the lighting-tracking database to ensure all information was collected to inform the impact analysis. Additionally, Cadmus completed 200 in-home lighting inventory site visits to collect information on the number, location, and type of bulbs installed in all sockets within each home. The purpose of the on-site visits was to record information to calculate saturation by bulb type, LED distribution by room type, initial installation rate, and other market characteristics and impact evaluation inputs. Additionally, interviews were conducted with various retailers and manufacturers to collect information to determine program influence on non-program sales. Furthermore, using a series of algorithms, Cadmus was able to calculate program LED lighting savings.

Net impacts were calculated based on a lighting elasticity regression model that was developed as part of the PY2016 evaluation.

CommunitySavers Program

Through a process of reviewing program materials, on-site inspections, and interviews with Ameren Missouri staff, the evaluation team was able to collect data for the CommunitySavers program evaluation. In order to collect data on participants' experience and satisfaction with the program, the evaluation team conducted surveys with participating property managers and owners. Furthermore, a tenant survey was also developed, which surveyed tenants of participating buildings to help verify measure installations and develop in-service rates, as well as to provide information on the satisfaction with the measures that had been installed in their buildings and the process of the installation of the measures.

BizSavers Program

To estimate the program's *ex post* gross kWh savings and *ex post* gross peak savings, ADM selected a stratified represented sample of completed projects for each program. Using this sample, ADM performed an estimation of savings using a ratio estimate that allowed the verified and measured sample to accurately calculate the annual *ex post* gross savings for all projects. Upon completion of the sampling, ADM then reviewed each project's incentive measure documentation using the Vision database maintained by Ameren Missouri. Additionally, trained staff conducted on-site visits to collect and verify data at the participants' facilities and implemented energy efficiency measures. Interviews were also conducted with facility representatives to collect any additional information that would guide the calculation of the *ex post* energy savings.

3.1.1 Portfolio Level Findings

In this section, we provide a summary of the energy savings goals and accomplishments across Ameren Missouri's PY2018 energy efficiency program portfolio, as reported by the evaluation teams. Note that some audit recommendations for revising the PY2018 savings are discussed in Section 6 of this report.

Table 4 and Table 5 show Ameren Missouri's energy efficiency targets, *ex ante* gross values, *ex post* gross values, the evaluated *ex post* net savings (evaluated) and net achievement compared to the targets for energy savings (kWh) and demand reductions (kW), respectively. To ensure clarity, these terms are defined as follows:

- **PSC-Approved Targets:** Annualized savings targets for the residential and commercial and industrial (C&I) sectors.
- ***Ex Ante* Gross Savings:** Annualized savings reported by Ameren Missouri, or calculated using tracked program activity and the Ameren Missouri TRM savings values.

- ***Ex Post* Gross Savings:** Annualized savings calculated and provided by the evaluation team.
- ***Ex Post* Net Savings:** *Ex post* gross savings multiplied by the net-to-gross ratio, accounting for free ridership, participant spillover, and non-participant spillover.
- **Net-to-Gross (NTG) Ratio:** *Ex post* net savings divided by *ex post* gross savings.

Table 4: Ameren Missouri Portfolio Energy Savings in PY2018, MWh

Program	PSC – Approved Targets	*Ex Ante* Gross Savings	*Ex Post* Gross Savings	*Ex Post* Net Savings	NTG Ratio	% of Target Reached
Efficient Products*	4,760	-	4,270	3,278	77%	69%
Smart Thermostats*	2,087	-	2,163	1,518	70%	73%
Energy Efficiency Kits*	6,228	-	5,915	5,031	85%	81%
Home Energy Report	33,750	46,602	26,376	26,376	100%	78%
Heating and Cooling*	22,320	-	54,444	41,388	76%	185%
Lighting*	9,943	-	8,383	6,094	73%	61%
Total Residential Portfolio	**79,088**	**46,602**	**101,551**	**83,685**	**82%**	**106%**
CommunitySavers	4,298	11,829	9,915	9,915	100%	231%
Total Multifamily Portfolio	**4,298**	**11,829**	**9,915**	**9,915**	**100%**	**231%**
BizSavers Custom*	71,139	99,789	96,011	82,205	86%	122%
BizSavers EMS		5,354	4,818	4,838	100%	
BizSavers Standard	34,350	196,013	175,945	174,513	99%	508%
BizSavers New Construction	6,016	21,830	20,893	19,732	94%	328%
BizSavers RCx	8,129	6,702	6,610	6,630	100%	82%
BizSavers SBDI	12,600	16,072	14,334	14,565	102%	116%
Total C&I Portfolio	**132,234**	**345,750**	**318,610**	**302,484**	**95%**	**229%**
Total*	**215,620**	**404,182**	**430,075**	**396,083**	**92%**	**184%**

* Ameren Missouri did not update ex ante savings for PY2018 Residential Programs with the exception of the Home Energy Report Program.

The residential portfolio surpassed the target savings goal, achieving 106 percent of the net savings target. The Heating and Cooling had the highest savings relative to its target,

surpassing Ameren Missouri's savings target with 185 percent of its goal achieved. All other residential programs missed their goals, with the Smart Thermostat Program achieving 73 percent of its goals, the Efficient Products Program achieving 69 percent of its goals, and the Lighting Program achieving the lowest, at 61 percent of its goals.

The 2018 C&I portfolio surpassed its approved targets, achieving 229 percent of the net savings target. Of the six PY2018 program areas, the BizSavers New Construction Program significantly surpassed its energy savings target, achieving 508 percent of its goal. The BizSavers Standard Program also exceeded its energy savings target, achieving 328 percent of its goal in PY2018. The BizSavers RCx Program was the only C&I Program to not reach its goal, achieving 82 percent of its saving goals.

Table 5 displays approved targets for demand savings. The residential portfolio did not reach its demand targets, achieving 83 percent of target savings. The Heating and Cooling Program performed best, achieving 190 percent of demand goals. The Efficient Products, Energy Efficiency Kits Program and Lighting Program all fell short of their target savings, obtaining 71 percent, 89 percent, and 62 percent of their goals, respectively.

The 2018 C&I portfolio over-performed compared to the 2017 program year, achieving 262 percent of its target demand savings. Similar to energy savings (MWh), the BizSavers Standard Program and New Construction Program performed the best, achieving 498 percent and 309 percent of their target savings, respectively. The rest of the BizSavers Programs surpassed their demand targets, with The BizSavers RCx, the combined target of BizSavers Custom and EMS, and BizSavers SBDI achieving 169 percent, 164 percent, and 116 percent respectively.

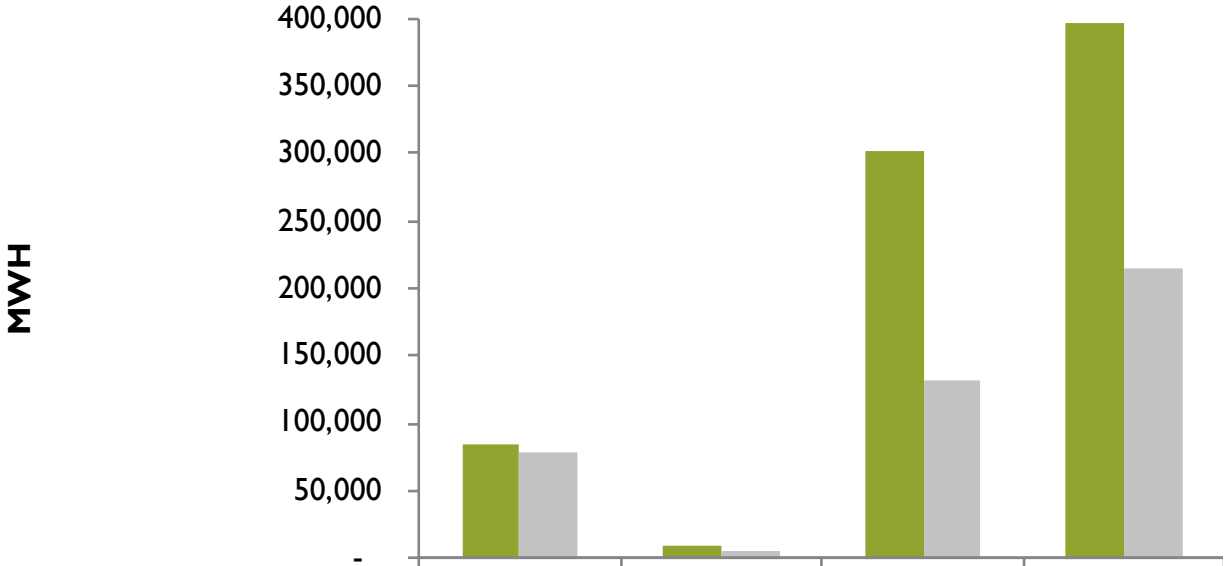
Table 5: Summary of PSC-Approved Targets for Demand Savings, MW

Program	PSC – Approved Targets	*Ex Ante* Gross Savings	*Ex Post* Gross Savings	*Ex Post* Net Savings	NTG Ratio	% of Target Reached
Efficient Products*	1.235	-	1.175	.874	74%	71%
Smart Thermostats*	1.974	-	2.049	1.436	70%	73%
Energy Efficiency Kits*	1.046	-	1.058	.927	88%	89%
Home Energy Report	15.714	21.702	12.293	12.293	100%	78%
Heating and Cooling*	14.193	-	36.987	27.008	73%	190%
Lighting*	1.485	-	1.261	.928	**74%**	62%
Total Residential Portfolio	**35.647**	**21.702**	**54.823**	**43.466**	**79%**	**122%**
CommunitySavers	1.004	2.943	2.072	2.073	**100%**	**207%**
Total Multifamily Portfolio	**1.004**	**2.943**	**2.072**	**2.073**	**100%**	**207%**
BizSavers Custom*	15.073	28.729	27.758	23.313	84%	164%
BizSavers EMS		3.159	2.791	2.804	100%	
BizSavers Standard	6.279	37.089	33.270	33.003	99%	526%
BizSavers New Construction	1.861	6.677	6.264	6.120	98%	329%
BizSavers RCx	1.738	3.278	3.117	3.129	100%	180%
BizSavers SBDI	2.151	3.052	2.720	2,764	102%	128%
Total C&I Portfolio	**27.102**	**81.985**	**75.920**	**71.134**	**94%**	**262%**
Total	**63.753**	**106.630**	**132.815**	**116.672**	**88%**	**183%**

* Ameren Missouri did not update ex ante savings for PY2018 Residential Programs with the exception of the Home Energy Report Program.

The following figures present summaries of program achievements in comparison with program goals. **Figure 2** and **Figure 3** display the PY2018 energy and demand savings targets and achievements by sector, as reported by evaluators.

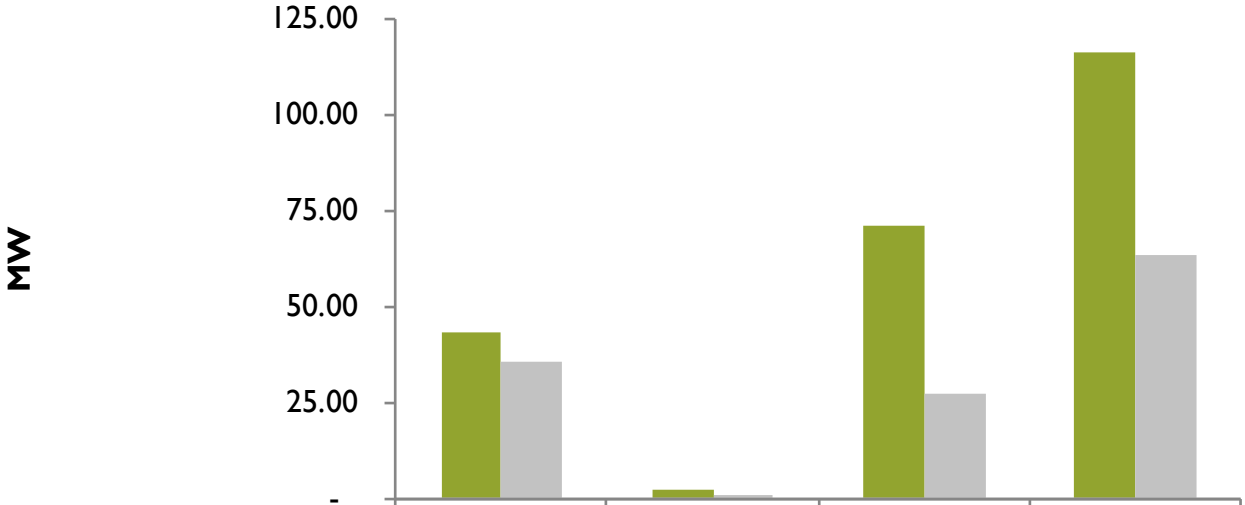
Figure 2: Energy Savings and Achievements by Sector: PY2018 MWh



	Residential	Multifamily	C&I	Total
MWH ExPost Net Savings	83,685	9,915	302,484	396,084
MWH 2018 Target Savings	79,088	4,297	132,234	215,619

The PY2018 portfolio had a target energy savings goal of 215,619 MWh and actual net savings of 396,083 MWh, equating to approximately 184 percent of the program year energy goal. All three Portfolios outperformed their energy savings goals, with the C&I portfolio achieving 229 percent of its energy savings target, the Multifamily Residential Portfolio reaching 231 percent of its energy savings target, and The Residential portfolio reaching 106 percent of its 2018 energy savings goal.

Figure 3: Demand Savings Targets and Achievements by Sector: PY2018 MW

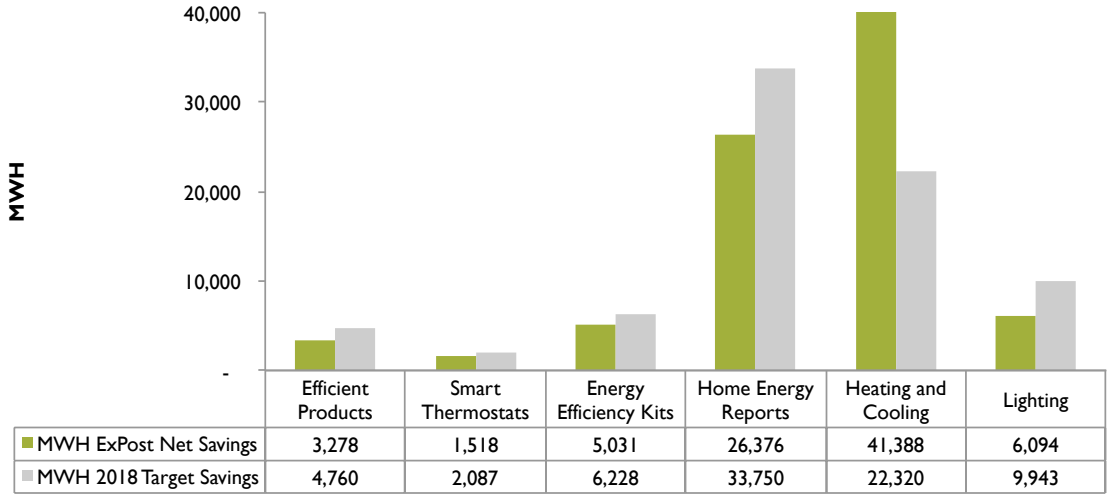


	Residential	Multifamily	C&I	Total
MW ExPost Net Savings	43.47	2.07	71.13	116.67
MW 2018 Target Savings	35.65	1.00	27.10	63.75

PY2018 had a target demand savings goal of 63.75 MW and actual net savings of 116.67 MW, equating to approximately 183 percent of the year's demand goal. All three of the portfolios surpassed their demand goals, with the Multifamily Residential portfolio achieving 207 percent of the 2018 goal, the C&I portfolio reaching 262 percent of target savings and the Residential Programs portfolio achieving 122 percent of target savings.

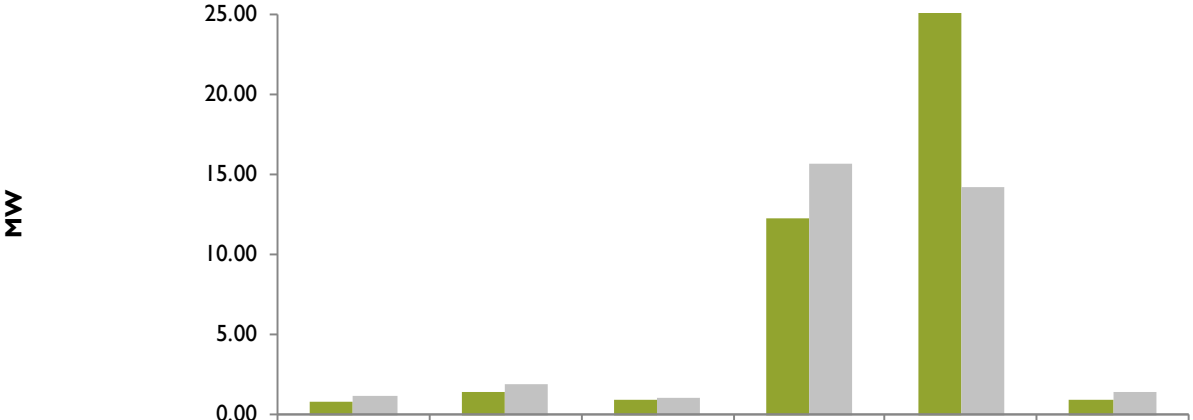
Figure 4 and **Figure 5** present the findings for the 2018 energy target and demand savings goals and accomplishments across all six residential programs.

Figure 4: Residential Programs Planned and Evaluated Savings: PY2018 MWh



	Efficient Products	Smart Thermostats	Energy Efficiency Kits	Home Energy Reports	Heating and Cooling	Lighting
MWH ExPost Net Savings	3,278	1,518	5,031	26,376	41,388	6,094
MWH 2018 Target Savings	4,760	2,087	6,228	33,750	22,320	9,943

Figure 5: Residential Programs Planned and Evaluated Savings: PY2018 MW



	Efficient Products	Smart Thermostats	Energy Efficiency Kits	Home Energy Reports	Heating and Cooling	Lighting
MW ExPost Net Savings	0.87	1.43	0.93	12.29	27.01	0.93
MW 2018 Target Savings	1.24	1.97	1.05	15.71	14.19	1.49

At the portfolio level, the Residential sector surpassed energy savings and demand savings goals, achieving 106 percent of its net energy savings target of 79,088 MWh and 122 percent of its net demand savings target of 35.64 MW.

The 2018 Heating and Cooling significantly surpassed its energy savings goal of 22,320 MWh and demand target of 14.19 MW, achieving 185 percent and 190 percent of the goals, respectively**.** Furthermore, the Heating and Cooling Program recorded a savings-weighted NTG ratio of 76 percent for energy savings, which was a decrease from PY2017, which had an overall weighted NTG of 97 percent.

The 2018 Home Energy Reports Program missed its net energy and demand savings goals of 33,750 MWh and 15.71 MW, achieving 78 percent and 79 percent respectively for its energy and demand goals. Based on the Ameren Missouri TRM assumptions, which assume a full program year that includes all seasons, the program is expected to save 150 kWh per year per customer.

The 2018 Lighting Program missed its net energy and demand savings goals of 9,943 MWh and 1.49 MW, achieving 61 percent and 62 percent of its energy and demand goals. Additionally, all measures in the Lighting Program achieved realization rates below 90 percent, with the exception of the 10.5-watt Downlight and the 12-watt Special Function categories which experiences significant change in the bulb mix that led to a higher than expected per unit saving.

The 2018 Efficient Products program missed its net energy and demand savings goals of 4,760 MWh and 1.23 MW, achieving 69 percent and 71% of its energy and demand goals.

All measures in the Efficient Products program achieved gross realization rates of 91% or more except for the smart thermostats, which achieved a 70% realization rate.

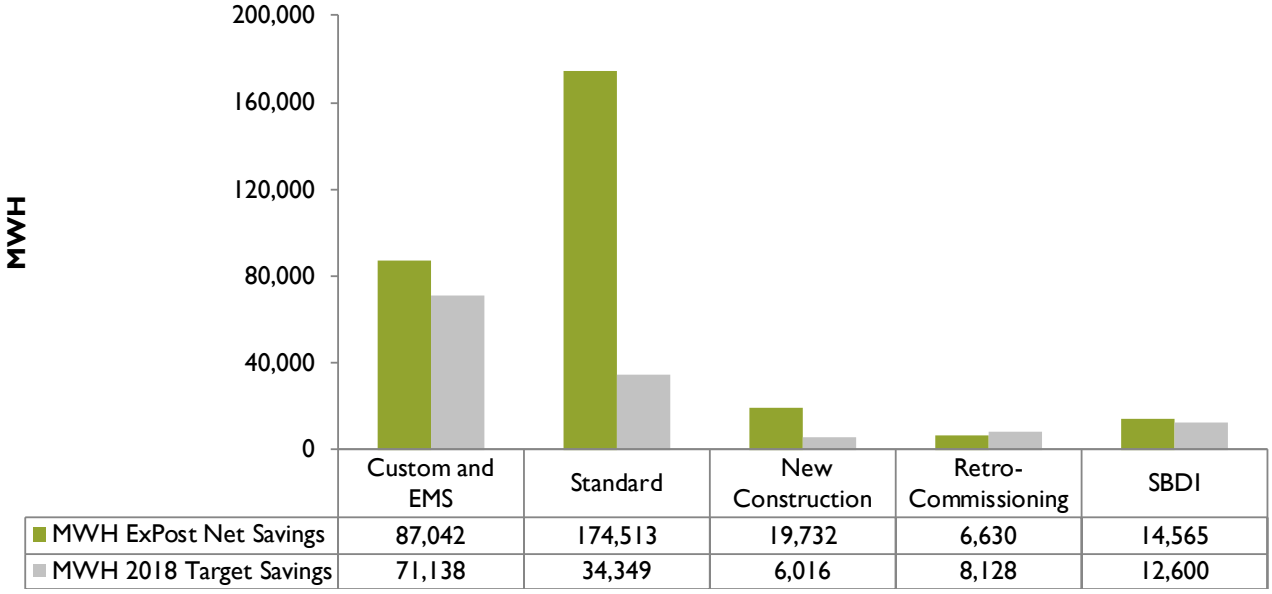
The 2018 Energy Efficiency Kits Program missed its net energy and demand savings goals of 6,228 MWh and 1.05 MW, achieving 81 percent and 89 percent, respectively. Additionally, using Ameren Missouri's ex ante savings from the Ameren Missouri TRM and Cadmus ex post savings, Cadmus estimated the per-unit gross realization rates for the 2018 program measures.

For the Multi-Family kit, the Energy Efficient Showerhead and Furnace Filter Alarm achieved the highest realization rates of 102 percent and 91 percent, respectively. Energy-Efficient Bathroom Faucet Aerators, LEDs, Energy-Efficient Kitchen Faucet Aerators, and Water Heater Pipe Wrap measures all achieved high realization rates of 90 percent, 90 percent 86 percent and 86 percent respectively. For School Kits Energy Efficient Bathroom Faucet Aerators, Efficient Showerheads, Energy Efficient Kitchen Faucet Aerators, and all achieved realization rates above 100 percent, and achieved the highest realization rate of 128 percent, 116 percent, and 114 percent respectively.

The PY2018 CommunitySavers Program surpassed its net energy and demand savings goals of 4,280 MWh and 1.00 MW, achieving 231 percent and 117 percent, respectively. Additionally, the overall CommunitySavers program kWh gross realization rate was 84 percent.

Figure 6 and **Figure 7** summarize the planned and evaluated savings for each C&I sector program for PY2018.

Figure 6: Planned and Evaluated Savings: PY2018 MWh



	Custom and EMS	Standard	New Construction	Retro-Commissioning	SBDI
MWH ExPost Net Savings	87,042	174,513	19,732	6,630	14,565
MWH 2018 Target Savings	71,138	34,349	6,016	8,128	12,600

The BizSavers Program is comprised of five separate programs: the Custom Program, Standard Program, New Construction Program, Retro-commissioning Program, and the Small Business Direct Install (SBDI) Program. The BizSavers EMS program targets are combined in with the targets for the BizSavers Custom portfolio.

Based on the five active programs, the C&I portfolio had a target savings goal of 132,233 MWh, of which 229 percent of the goal was achieved. The BizSavers Standard Program performed the best among the five programs, achieving 508 percent of its net energy target savings. The New Construction Program had an energy savings target of 6,016 MWh and ex post net MWh savings of 19,732, accounting for 328 percent of its 2018 target. The only BizSavers program to miss its target was the Retro Commissioning program, which achieved 82 percent of its 8,128 MWh goal.

Figure 7: BizSavers Planned and Evaluated Savings: PY2018 MW

	Custom and EMS	Standard	New Construction	Retro-Commissioning	SBDI
MW ExPost Net Savings	26.11	33.00	61.20	3.13	2.76
MW 2018 Target Savings	15.07	6.28	1.86	1.74	2.15

Based on the BizSavers programs that were active at the time of the evaluation, the C&I portfolio had a target savings goal of 27.10 MW, of which 262 percent of the goal was achieved. The Standard Program performed the best among the BizSavers programs, achieving 526 percent of its net energy target savings. The Custom & EMS Programs accounted for the next largest portion of the overall demand net savings, achieving 26.11 MW of demand savings and 164 percent of its goal.

3.2 Summary of Key Impact Evaluation Recommendations

3.2.1 Recommendation Adoption Tracking

A list of PY2017 recommendations and adoption status are included in Table 6.

Table 6: PY2017 Impact Evaluation Recommendation Tracking

EM&V PY2017 Recommendations	Program Response
Continue to offer smart thermostats through Ameren Missouri's online store and consider offering more products through this channel when practical to do so. In PY17, the Efficient Products program measures with the highest free ridership rates were RACs and air purifiers. Consider offering these measures for sale through the online store, provided the program can sell them at cost-effective price points, including shipping costs.	Ameren Missouri 2019–2021 Products plan intends to expand the Online Marketplace store to include rebated measures (e.g., Smart Thermostats, Tier 2 Advanced Power Strips, LEDs) and to include other energy-saving products.
Consider initiating a RAC early retirement program that provides coupons for new units, when old, but operating, units are turned in. This could be designed in concert with an appliance recycling program, or with special "turn-in" events at convenient locations across the service territory or through the retail partners already in the program. This change would increase the gross savings for this measure and could also reduce free ridership.	Ameren Missouri 2019–2021 Products has discontinued rebates for RAC measures.
Review ex ante calculations for water heater pipe wrap.	Ameren Missouri updated the TRM in January 2018 to include a new algorithm agreed to through the settlement of PY16 results. In the review of the PY17 gross savings results, Ameren Missouri found an incorrect thickness had been used in the calculations. The final PY17 settlement included an update of these values. The PY18 evaluation uses the correct thickness.

Evaluate furnace filter alarm performance.	Discussions between Ameren Missouri and the implementer showed that filter whistles were installed, but often did not "go off" before the filter was changed in the course of routine management. In some cases, the filter whistle was not reinstalled when a new filter was placed into service. The program already began to educate property managers that filter whistles would only "go off" when routine maintenance was neglected. The program will consider whether filter alarms are redundant, given routine filter checks.
Monitor PY18 verification surveys against temperature drop data to determine whether the implemented PY18 program changes have minimized differences between verification surveys and reported early retirement classifications to assess whether additional early retirement criteria may be warranted. There is no industry consensus on the best definition of early retirement, and the definition of "operable" or "operating" (as used below) remains subject to interpretation. A sample of other early retirement programs utilized the following criteria: • System must be operable and existing SEER of 10 or less (Ameren Illinois) • System must be in operating condition, at least 5 years old, with a maximum nominal SEER of 10 (KCP&L) • System must be operating or have a repair cost estimate of $1,500 or less (Xcel Energy)	Ameren Missouri required temperature drop data for early retirement systems, along with a cold weather rule, effective March 1, 2018. The program will use results from PY18 contractor data, as well as EMV contractor verification surveys, to inform program rules for early retirement eligibility and data reporting requirements for PY19 and beyond. Program tracking data under the new reporting requirements resulted in an 84% reported percentage of replaced systems as early retirements.
Ameren Missouri should explore incremental cost differences among various system replacement tiers to determine if incentives align with those costs. With the lower market share found in the higher-tier systems, Cadmus recommends Ameren Missouri explore whether a realignment of incentives may drive higher participation in these tiers while remaining cost-effective.	Ameren Missouri explored options to drive higher participation in higher-efficiency tier systems, targeting implementation for PY19. Starting March 1, 2019, rebate tiers have evolved to include higher-efficiency tiers for

Ameren Missouri should continue to deliver the HER reports every other month in PY18 to continue to increase savings. Recognizing that this recommendation has already been implemented, starting in January 2018, Cadmus recommends that Ameren Missouri proceed with its plan to deliver HER reports in March, May, July, September, and November in 2018 and in January 2019 to further increase savings.	Increased cadence to six reports in 2018
Stop sending HER reports to customers with low usage. Recognizing that Ameren Missouri removed low-usage customers from the Wave 1 and Wave 2 treatment groups in March 2018, Cadmus recommends it follow through with its plan to stop sending HER reports to customers with low energy usage and to identify eligible customers as those with high usage for the PY18 HER reports backfill and PY18 eHER reports treatment group.	Backfilled with high users in Wave 3, March 2018
Recommendation 4. Revise HER program savings targets and TRM savings in future program years. Cadmus expects HER program savings to increase from the program total of 0.3% to between 0.4% and 0.5%, or between 1.5 to 2.2 kWh per customer per day in future HER program years, provided Ameren Missouri only targets high-usage customers and continues with plans to implement the email reports. Ameren Missouri should continue to monitor HER program savings, especially with the addition of the eHER delivery channel in PY18 and should update its savings targets and TRM savings according to PY16–PY18 results.	Updated TRM for next cycle of programs
The program implementer can reduce free ridership on reflectors by maintaining a high markdown (above 50%) and concentrating sales through high elasticity channels (such as mass market and DIY). The implementer should consider specific bulbs, attributes, and competitive options in the specialty market when deciding whether to incentivize a product and to what extent.	Ameren Missouri continued to market reflectors and specialty LEDs in mass market and DIY retail channels. The average markdowns in big box channels ranged from 30% to 44%, by measure category.

Planning for the next program cycle should anticipate that lighting savings will decline rapidly up to 2021, due to falling prices, reduced elasticity, reduced demand for lighting, and falling HOUs. If the U. S. DOE implements a new definition for general service lamps that includes specialty bulbs, and the backstop provision of 45 lumens per watt goes into effect in 2020, savings from LEDs will likely disappear entirely	Ameren Missouri's 2019–2021 Lighting program will target hard-to-reach and low-income customers. The program also has incorporated anticipated falling prices and the U.S. DOE backstop provision.

3.2.2 PY2018 Recommendations

The evaluation team provided the following recommendations, which seek to guide and improve future impact evaluations. To assist readers, we have included the source evaluation document in parentheses where appropriate.

Efficient Products Program

- Consider adding additional limitations on smart thermostat rebates, such as no more than two per household per three-year program cycle, and disqualifying rebates through Heating and Cooling program contractors for projects where smart thermostats are replacing other smart thermostats. Limiting retail sales to the online store (as Ameren Missouri already plans for PY19) will also reduce overall free ridership, as free ridership has been lower through the online store than retail outlets. (Efficient Products Program, PY2018, p.9).
- Pursue fulfillment solutions for cost-effectively delivering more energy-saving products through the Ameren Missouri online store. Ameren Missouri could offer products through its online store, and work with retailers or fulfillment subcontractors to fulfill the orders. As Cadmus reported in the PY17 evaluation, measures delivered through the online store had lower free ridership than those purchased through retailers. This is because it is impossible for customers to make a purchase and then discover there is a rebate available after the fact, a situation that is scored as a 100% free rider when estimating free ridership. Additionally, in the PY16 evaluation Cadmus reported that many customers were purchasing their rebated equipment from online retailers rather than making in-store purchases, a trend that has likely continued as online sales in general continue to gain market share from "brick-and-mortar" retail. (Efficient Products Program, PY2018, p.9).

Home Energy Reports

- Revise HER program savings targets and TRM savings in future program years. Ameren Missouri should continue to monitor HER program savings, especially with the addition of the web portal. It should update its savings targets and TRM savings according to PY16-PY18 results.

Lighting

- The program should continue to grow the share of program sales in small chain retailers, and to offer substantial markdowns through those channels, in order to minimize free ridership and penetrate hard to reach market segments. As the market for LEDs matures, non-program LEDs will make up a larger share of products available in big box retailers. One recent study in Wisconsin found that a nonparticipating big box Do-It-Yourself (DIY) chain had roughly the same number of LED models, at similar prices, as a participating DIY chain. Market characterization data for Missouri showed that 50% of state-wide lighting sales are LEDs which correlates with the higher overall free ridership levels relative to last year. However, the PY17 home inventory study showed that LED penetration (and therefore saturation) was much lower among multifamily and renter populations, which are often correlated with low income areas. The program is likely to have lower free ridership in retail channels with fewer LEDs competing with program LEDs and in channels that target households with lower LED saturation, such as the small chain retailers. (Lighting Evaluation Report, PY2018, p.8)

BizSavers Program

- Modify the New Construction application to require input of both a baseline equipment cost and the proposed efficient equipment cost, to calculate incremental cost. (BizSavers, PY2018, p.5)
- Modify the lighting tabs with the program application to encourage the disaggregation of unique usage areas within a measure. Add a method to permit applicants that have already created a lighting survey to transfer data to the application. The application currently uses two merged cells per field, which hinders the applicant's ability to cut/paste lighting data. Add an additional worksheet to permit transfer of applicant's data to the formatted lighting application. (BizSavers, PY2018, p.5)

CommunitySavers Program

- The evaluation found that the non-24-hour lighting stipulated coincident peak demand factor was incorrectly applied to 24-hour lighting measures installed in common areas. The correct value should be applied in future program years. (CommunitySavers, PY2018, p.80)
- Energy saving estimates of replacements of electric furnace systems with air source heat pumps at failure should reference time-of-sale (i.e., normal replacement) heating season performance factors for air source heat pumps. (CommunitySavers, PY2018, p.80)

4 Process Evaluation Summary

This section summarizes key methods and findings from the PY2018 process evaluations of Ameren Missouri's residential and business energy efficiency program portfolio. The first subsection summarizes the process evaluation methods applied by the evaluation team, and includes an assessment of how the process evaluations align with the minimum requirements for demand-side process evaluations set forth by the Missouri Code of State Regulations (CSR). The second subsection reviews the status of the program evaluation recommendations from the PY2017 evaluations. Lastly, the final subsection summarizes the PY2018 process evaluation overall findings and recommendations.

In general, the audit team found that the process evaluations were thorough and followed best practices established for the industry. As noted below, the process evaluations were generally able to provide substantive answers to the required CSR questions.

4.1 Summary of Process Evaluation Methods and Alignment with Missouri CSR Minimum Requirements

The residential and C&I program evaluations adopted a wide range of process evaluation methods. Table 7 below summarizes the process evaluation methods applied for each program.

Table 7: Process Evaluation Method Summary

Program	Methods	Description
Efficient Products	Tracking Data Review	Provide assurance that all necessary program data are tracked accurately and incorporated into savings estimates.
	Stakeholder Interviews	Identify changes to program delivery and identify successes and challenges.
	Participant Surveys	Collect customer feedback about program processes, satisfaction, and information sources about the program. Confirm equipment disposition.
	Program Benchmarking	Identify gaps and opportunities in program offerings, incentive levels, and results in comparison with similar programs in other territories.
	Key Performance Indicator Review	Update on key progress indicators developed in PY16 to track progress in subsequent program years.
Energy Efficiency Kits	Stakeholder Interviews	Cadmus interviewed program managers and implementers to understand their perspectives on program effectiveness.
	Property Manager Interviews	For the multifamily kit delivery channel, Cadmus interviewed corporate and site-level property managers to gather information to inform the NTG assessment, installation rates, and program processes.

Program	Methods	Description
	Student Family Participant Surveys	For the school-based delivery channel, Cadmus surveyed student family participants receiving school kits to gather information to inform the NTG assessment, installation rates, and program processes.
	Program Benchmarking	Cadmus benchmarked Ameren Missouri's Energy Efficiency Kits program against similar programs to assess program design and implementation, and to identify opportunities for program delivery improvements.
	Key Performance Indicator Review	Cadmus tracked key progress indicators for the third program year.
Heating and Cooling	Tracking Data Review	Provide assurance that all necessary program data are tracked accurately and incorporated into savings estimates. Update gross kWh savings estimates.
	Participant Surveys	Collect customer feedback about program processes, satisfaction, and information sources about the program. Confirm measure baseline equipment and equipment disposition. Evaluate program free ridership and spillover.
	Key Performance Indicator Review	Update on key progress indicators developed in PY2016 to track progress in subsequent program years
Home Energy Report	Program Material and Marketing Review	Review program materials to understand the program's structure and implementation. The HER program does not include additional marketing materials apart from the HER reports themselves, which were reviewed as part of the program material review.
	Benchmarking Research	Compare evaluated savings to previously benchmarked savings from other similar programs.
	Program Manager and Implementer Interviews	Conduct interviews with the Ameren Missouri's HER program manager and implementer to gather insights into the program's design, challenges, and expectations.
	Customer Surveys	Survey customers in the treatment group to collect data on perceptions about recent behavior changes, energy efficiency awareness, attitudes towards energy efficiency, customer satisfaction, and satisfaction with both the HER reports and Ameren Missouri.
	Key Performance Indicator Review	Update the key progress indicators to track progress compared to PY2016 and PY2017.
Lighting	Tracking Data Review	Conducted semiannually to ensure collection of information necessary to inform the impact analysis, provide ongoing support to ensure all necessary

Program	Methods	Description
		program data are tracked accurately, and identify gaps for EM&V purposes.
	Stakeholder Interviews	Interview utility staff and implementer staff to provide insights into program design, delivery, satisfaction, and marketing effectiveness.
	Program Benchmarking	Compare program metrics to similar programs to identify the potential for program improvements.
	Key Performance Indicator Review	Update on key progress indicators developed in PY2016 to track progress in subsequent program years.
BizSavers (Custom, Standard, New Construction, RCx, and SBDI Programs)	Program Staff Interviews	Program management; communication; current and new offerings; goals and progress; trade ally relations; marketing and outreach; tracking and reporting; quality assurance
	Program Document Review	Review of key program documentation and databases
	Participant Online Survey	Program awareness, decision-making, equipment preferences; experience and satisfaction
	Non-Participant Surveys	Program awareness, interest, and barriers to participating; equipment decisions
	Tracking Data Review	Number of projects; project type and details; data quality
	Trade Ally Survey	Awareness and effect of program changes; customer awareness of BizSavers; awareness of and interest in new programs; spillover.
CommunitySavers	Tenant Survey	Site visit recruitment; program experiences; satisfaction with program
	Participant Online and Telephone Survey	Program experiences; satisfaction with program
	Program Staff Interviews	Program function; communication; tracking and reporting; quality control
	Site Visits	Verify baseline operating conditions
	Tracking Data Review	Number of projects; project type and details; data quality

The Public Service Commission set minimum requirements for the program process evaluations in 4 CSR 240-22.070(9).[12] At a minimum, process evaluations should answer the following five key questions:

[12] *Rules of Department of Economic Development, Division 240 - Public Service Commission, Chapter 22 - Electric Utility Resource Planning*. 2011. https://www.sos.mo.gov/cmsimages/adrules/csr/current/4csr/4c240-22.pdf

- **Question 1:** What are the primary market imperfections common to the target market segment?
- **Question 2:** Is the target market segment appropriately defined, or should it be further subdivided or merged with other market segments?
- **Question 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?
- **Question 4:** Are the communication channels and delivery mechanisms appropriate for the target market segment?
- **Question 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?

Each program evaluation provided a response to all five questions, and the full text response to these questions is provided as Appendix A to this report. Evergreen reviewed each text response to determine if the process evaluations provided a substantive response to each question. Across the program evaluations, we found that most provided a thoughtful, substantive response to each question, although in some cases the response was largely similar or identical to previous year evaluations. Table 8 below presents an assessment of the responses to the five key questions across the program evaluations. For each question, we assigned a score of 1, 2, or 3:

- **1** indicates an updated, substantive response clearly linked to process evaluation findings.
- **2** indicates a response that is different from the previous program year evaluation but is not linked to process evaluation findings or is not substantive in nature.
- **3** indicates that the response has not changed at all from the previous year process evaluation.

In general, the evaluations provide substantive, updated responses to the five key questions that are clearly linked to the most recent evaluation findings. On the residential side, the Energy Efficiency Kits, Home Energy Report, and Lighting Programs provide comprehensive, substantive responses to most of the five key questions. The Heating and Cooling Program responses to questions 1, 2, and 3 are identical to the previous year evaluations and the Efficient Products Program responses to questions 1 and 2 are identical to PY2017. The BizSavers and CommunitySavers Program evaluations provide comprehensive, substantive responses to all five key questions.

Table 8: Assessment of Response to Minimum Required Process Evaluation Questions

Program	Question 1: Primary Market Imperfections	Question 2: Target Market Segment	Question 3: Diversity of End-Use Needs	Question 4: Communication Channels and Delivery Mechanisms	Question 5: Overcoming Market Imperfections
Efficient Products	3	3	1	3	1
Energy Efficiency Kits	1	1	2	3	1
Home Energy Report	1	1	3	1	1
Heating and Cooling	3	3	3	1	1
Lighting	1	1	1	1	1
CommunitySavers	1	1	1	1	1
BizSavers Programs	1	1	1	1	1

* **1:** updated, substantive response linked to process evaluation findings. **2:** different from the previous program year evaluation but is not linked to process evaluation or not substantive in nature. **3:** response has not changed at all from the previous year process evaluation.

4.2 Summary of 2018 Process Evaluation Findings and Recommendations

This subsection presents overall program process evaluation findings and evaluator recommendations.

4.2.1 Efficient Products Program

Program Design

In 2018, Ameren Missouri's Efficient Products Program provided rebates for six product categories to residential customers:

- ENERGY STAR®-certified room air conditioners (RACs)
- ENERGY STAR-certified heat pump water heaters (HPHWs)
- ENERGY STAR-certified room air purifiers
- ENERGY STAR-certified multispeed pool pumps
- ENERGY STAR-certified variable-speed pool pumps
- Smart thermostats (selected models)

In 2018, the Efficient Products program did not undergo major changes in program delivery: the program offered the same incentive amounts for the same measures, through the same delivery channels.

Ameren Missouri has contracted with ICF International to implement the program for the 2016-2018-program cycle. ICF International processes rebates on Ameren Missouri's behalf, manages the network of retail partners that sell qualifying equipment, and operates Ameren Missouri's online store.

Customer Satisfaction

Similar to 2017, customers reported high satisfaction with the Efficient Products Program. Across all survey respondents, the Efficient Products Program received very high ratings; 98 percent said they were "very satisfied" or "somewhat satisfied" with the performance of measures that they purchased and 97 percent gave similar satisfaction ratings for the program overall. These ratings remained consistent between participants surveyed immediately after receiving rebates and participants surveyed six months later. These ratings are almost identical to 2017.

Program Participation

In 2018, the Efficient Products Program delivered 10,636 rebates to Ameren Missouri participants, which included 6,453 smart thermostat instant discounts (53% decline from PY2017). Program stakeholders reported that the programs' greatest success was Ameren Missouri's and the implementer's management of participation levels through strategic marketing decisions. In particular, marketing efforts were reduced to decrease participation thus conserving budget so rebates remained available through the entire year.

Program participants' motivations for purchasing program measures varied by measure type, as it did in PY2017. Some key participation findings included:

- Smart thermostats were again the most popular measure in the program in 2018, although smart thermostat rebates decreased the most from the previous years' participation levels, experiencing a 53% decline.
- Nest thermostat models continued to be the most popular thermostats rebated through the program, but they no longer accounted for most rebates for this measures (41%, down from 61% in PY2017).
- Respondents primarily learned of pool pump rebates through contractors that installed the equipment (50%) and store representative (29%). HPWH participants learned of the rebates through Ameren Missouri's website (29%), store representatives (24%) and in-store displays (15%), while only 10% learned about the rebate through installation contractors. Smart Thermostat customers most

commonly learned of the rebates through Ameren Missouri's website (31%) or through word of mouth (30%).

Program Marketing

Ameren Missouri markets the Efficient Products Program directly and through participating retailers, which utilize Ameren Missouri's program marketing materials and co-branded materials.

Program Delivery

The evaluator reported that the program was delivered according to program design. It was also reported that the programs' greatest success was Ameren Missouri's and the implementer's management of participation levels through strategic marketing decisions. In particular, marketing efforts were reduced to decrease participation thus conserving budget so rebates remained available through the entire year.

Program Implementation Challenges

The evaluator noted the following challenges and areas for future exploration:

- Program stakeholders reported the rapid pace of market change as a challenge for program implementation. Specifically, customer adopted smart thermostats at an unanticipated pace, resulting in challenges maintaining the program's budget while keeping incentive amounts at effective level.
- The implementer also noted that changes to retailer stocking practices had presented challenges in meeting HPWH participation targets.

4.2.2 Energy Efficiency Kits Program

Program Design

The Energy Efficiency Kits Program was implemented for its third year, having begun in PY2016. The program provides energy efficiency kits through two separate delivery channels:

- **School-Based Delivery Channel.** Participating teachers receive classroom curriculum and energy saving kits to distribute to their students. Each school kit contains one energy-efficient showerhead, one energy-efficient kitchen faucet aerator, one energy-efficient bathroom faucet aerator, one furnace filter alarm, three feet of water heater pipe wrap, and four LEDs. In PY2018, the program is co-delivered the school-based delivery channel with natural gas providers, Ameren Missouri and Spire, which serves Eastern and Western Missouri.
- **Multifamily Delivery Channel.** This delivery channel partnered with Ameren Missouri Natural Gas in PY2018 to provide energy saving kits to property managers of eligible multifamily homes. Each multifamily kit contains up to two energy-efficient showerheads (one per bathroom), one energy-efficient kitchen

faucet aerator, up to two energy-efficient bathroom faucet aerators (one per bathroom), one furnace filter alarm, six feet of water heater pipe wrap, and six LEDs. In PY2018, the program enrolled multifamily properties that were Ameren Missouri electric customers with electric hot water heating, or gas hot water heating if they were also Ameren Missouri Natural Gas customers. The property manager (or staff) installed multifamily kit items in each of the property's units.

For the 2016-2018-program cycle, Ameren Missouri contracted with ICF International to implement the program. ICF International implements the multifamily and school-based delivery channels, with support from the National Energy Foundation (NEF) for delivery of the school-based delivery channel. Starting in PY2017, ICF co-delivered the school kits with Spire, a gas provider. In PY2018, ICF partnered with Ameren Missouri Natural Gas for both delivery channels.

Customer Satisfaction

The evaluation reported that both teachers and participating families expressed enthusiasm about the school-based delivery channel, with 100 percent of surveyed families agreed that they are satisfied with their child's experience in the program.

Participating property managers reported positively about their experiences with the multifamily delivery channel. Property managers who did not strongly agree with the program satisfaction statement mentioned time pressures and the need for additional lighting measures.

Program Participation

The program exceeded the participation goal of 16,000 kits for the school-based delivery channel, providing 16,366 school kits. This was similar to the number of kits delivered in PY2017, 16,227. The multifamily kit distribution goal of 3,600 kits was not met, with the program delivering 591 kits to six properties.

Program Marketing

The evaluator found that marketing materials for both school-based and multifamily delivery channels follow best practices..

In PY2018, marketing efforts for the multifamily delivery channel continued as in PY2017. The program marketed this channel to multifamily property owners in tandem with the Low-Income program to efficiently provide a one-stop shop for property managers. Joint market rate and low-income multifamily marketing efforts included Apartment Association outreach to generate contacts and build relationships with property management companies overseeing a suite of properties. Ameren Missouri account managers marketed the multifamily kits to property managers through direct-mail postcards, followed by phone calls, emails, and other outreach. Additionally, an

improvement from PY2017, all property managers recalled receiving the Ameren Missouri door hangers and pre- and post-installation letters.

Program Implementation Challenges

The evaluation identified three challenges to program implementation.

1. **Redundant school kit participation.** Based on PY2018 HEW responses, 13% of school kits were sent to households that received a kit in PY2016 or PY2017, and nearly 2% of kits were sent to households that had already received a kit in PY2018. NEF reported that 79% of schools receiving Ameren Missouri-Spire kits, and 77% receiving Ameren Missouri kits, in PY2018 had participated in a prior year. The program does not have a mechanism for recovering unused kit items; instead, it encourages participants to give items to a neighbor or someone local to maximize the chance of keeping items within Ameren Missouri's service territory.
2. **Low enrollment in the multifamily kit delivery channel.** As in PY2017, the multifamily delivery channel did not reach soft program targets despite the added partnership with Ameren Missouri Natural Gas. This is primarily due to challenges in finding qualified properties. The Ameren Missouri Natural Gas territory is small and not concentrated in urban areas with significant multifamily property presence. ICF observed that the biggest opportunity for multifamily properties would be in the St. Louis area—Spire's natural gas service area.
3. **Re-envisioning the kits program.** Stakeholders mentioned possible broad changes for the next incarnation of the Energy Efficiency Kits program, including considering kit distributions to single-family households. Similarly, the multifamily channel could expand to provide a broader set of services to properties, such as complete retrofits.

4.2.3 Home Energy Report Program

Program Design

The Home Energy Report Program continued in 2018. The program provides mailed and electronic home energy reports encouraging customers to reduce their energy consumption through behavioral changes. Ameren Missouri designed the program so that a sample of residential customers receives home energy reports using a randomized control trial experimental design. The design of the program is similar to other Home Energy Report programs.

In response to evaluation feedback in PY2017, Ameren Missouri made some changes to the design of the home energy reports. The home energy reports in 2018 were updated with a

link to a newly created webpage that offered interactive videos and tips to provide customers with the knowledge needed to implement the recommendations in the HER reports. Also included in 2018 was a data-driven module in summer and winter HER reports to disaggregate heating and cooling energy and normative comparisons to other homes.

Customer Satisfaction

The evaluator's customer surveys indicated that customer satisfaction with the Home Energy Report program remained high (91%). Customers continued to express high satisfaction with Ameren Missouri in general (95%).

Program Delivery

In PY2018, the Home Energy Report program distributed home energy reports in three waves to a total of 319,641 customers.

The evaluation reported the following findings about aspects of the program:

- **Open rate for emailed eHER reports met or exceeded ICF's expectations.** The implementer reported that the eHER reports' open rate started at around 40% and dropped to 35% at the end of PY2018.
- **Customer engagements.** The implementer reported that the interactive tips webpage resulted in customer engagement that met ICF's expectations, based on the number of clicks and time that customers spent with the webpage.
- **Low Attrition.** Reported opt-out rates were again very low in PY2018 (59 HER and 343 eHER customers).
- **Energy savings.** Savings continued to trend upward in PY2018, compared to PY2016 and PY2017.

Program Implementation Challenges

The evaluation noted the following challenges in the implementation of the Home Energy Report Program:

- **Personalization.** Customer survey feedback indicated that 28% (n=40) of customers believed Ameren Missouri did not recognize significant events in their households and did not know or account for significant sources of energy consumption in their home. For example, some customers indicated that recent electric vehicle purchases caused increased electricity consumption and wished the HER reports reflected this.
- **Enhancing digital customer experience.** Ameren Missouri and the implementer recognized that providing better digital platforms where customers could connect the information in the HER reports to their

customer accounts, enter information about efficient equipment purchases, and track behavior is a future priority for the HER program.

4.2.4 Heating and Cooling Program

Program Design

Ameren Missouri's Heating and Cooling Program provides its residential customers with rebates to install energy-efficient heating and cooling equipment through participating contractors. In PY2018, the Heating and Cooling program provided rebates for the following:

- Central Air Conditioners (CACs)
- Air Source Heat Pumps (ASHPs) (including ductless heat pumps)
- Ground Source Heat Pumps (GSHPs)
- Dual Fuel Heat Pumps (DFHPs)
- Electronically Commutated Motors (ECMs)
- Air-conditioner and heat pump tune-ups (tune-up)

ICF International continues to implement the program.

Customer Satisfaction

As in PY2017, the evaluator reported that the Heating and Cooling Program was well received by participants and contractors; however, unlike PY2017, PY2018 satisfaction with the program fell over time. Evaluators found that 87% percent of participants reported they were very satisfied immediately after their participation in the program; however, satisfaction had diminished (82%) at the time of the Follow-up Participant Survey, approximately six months after participation.

Program Participation

As in PY2016 and PY2017, participants heard about the program primarily from their contractors or from a store (59%), and also heard about the program from the Ameren Missouri website (10%). A small number of program participants initially heard about the program from television (2%) or newspaper ads (<1%).

Program Marketing

The evaluator found that the Heating and Cooling Program's marketing effectively promoted the program to its target audience, and marketing efforts served as an important driver to encourage customers to purchase efficient equipment. Ameren Missouri provided materials and co-branding opportunities to help participating contractors market the program during PY2018 and advertised rebates by direct mail, radio and television ads, digital advertisements, and bill inserts.

Program Delivery

The evaluator found that two elements of the program worked particularly well in PY2018 including increasing program participation and continuing to grow the contractor pool.

Program Implementation Challenges

The evaluation noted two challenges to implementing the Heating and Cooling Program; however, both challenges were successfully addressed. The evaluation found that introducing additional training for and monitoring classification of failed or early retirements systems posed a challenge by adding new program elements in PY2018. Additionally, a challenge arose in controlling the program's growth, ensuring it did not exceed its budget.

4.2.5 Lighting Program

Program Design

As in PY2017, the Lighting Program had no major changes to the program design in PY2018. The program partners, eligible measures, and marketing activities remained largely consistent with the prior two years. Given the program's mature design, the Cadmus team conducted a limited process evaluation of the Lighting program in PY18.

Customer Satisfaction

The evaluation did not report on retailer satisfaction in PY2018.

Program Marketing

The evaluation reported that social media, in-store signage, billing statement messages, and a smart phone application were the primary marketing activities in 2018 for the Lighting Program.

Program Delivery

In PY2018, ICF International recruited 15 retail chains and franchise retailers and 14 manufacturers. Across the 15 retail chains, the retailers offered program incented bulbs through 287 storefront locations, and through the Ameren Missouri online store (operated by AMCG).

Program Implementation Challenges

The evaluation reported that the program implementers did not foresee any specific implementation challenges.

4.2.6 CommunitySavers Program

Program Design

The CommunitySavers Program provides financial incentives and services to encourage comprehensive energy efficiency improvements in income-eligible multifamily properties.

Multifamily properties with three or more units that receive electric service under Ameren Missouri Service Classification of Residential or Non-Residential (excluding lighting classifications) and that meet one of the two following tenant income requirements are eligible.

- Reside in federally subsidized housing units and fall within that program's income guidelines (U.S. Department of Housing and Urban Development (HUD), U.S. Department of Agriculture (USDA), and/or Public Housing Authorities). State Low-Income Housing Tax Credit (LIHTC) buildings are only eligible for in-unit efficiency improvements.
- Reside in non-subsidized housing with an income at 200 percent of poverty level or below.

Program Participation

The evaluation reported that the program served 137 properties (up from 62 properties in PY2017) and 3,749 tenant units (down from 4,486 tenant units in PY2017). HVAC efficiency measures in residential units accounted for 52 percent of program savings, lighting accounted for 20% of residential savings, refrigerators for 13%, and cooling measures for 10%.

Customer Satisfaction

Participating property managers were largely satisfied with the field service representatives performing measure installations. Participants were most likely to be dissatisfied with the length of time to complete the installations; 17 percent of property manager respondents were dissatisfied with the time required to install the measures. Most survey respondents were very satisfied with all components of the CommunitySavers program, including the efficiency improvements made to the common areas (88%), the information about the improvements provided (76%), the process for making the improvements (76%), and the efficiency improvements made to the home (70%).

The aspect that tenants were most likely to report dissatisfaction with was the energy efficiency improvements made. Most of this dissatisfaction was due to the home feeling less comfortable after the improvement and the equipment was faulty. Just over half of tenants reported that the energy efficiency measures resulted in non-energy benefits—most frequently, improved home comfort (55%).

Program Marketing

Program outreach efforts focus on direct outreach to owners and managers, working through multifamily/low-income associations and other groups, and earned media. Staff stated that identifying unsubsidized housing that does not receive the LIHTC was more difficult because of the lack of available listings of such properties.

Participants most frequently reported that they became aware of the program through word of mouth from another person in the organization, the program account manager or other representative, at a seminar, and through previous experience with the program

Program Delivery

The evaluator found that the communication and delivery channels are appropriate to the target market segment. Staff used a variety of approaches to promote the program incentives including direct outreach to property managers and owners, working with community groups and apartment associations, and working with Ameren Missouri trade allies to promote the program incentives. The implementer staff reported that there were not any group training of trade ally efforts in PY2018 but there were one-on-one outreach and training to trade allies.

Program Implementation Challenges

The evaluation noted the following key challenge noted by program staff:

- An ongoing challenge is encouraging properties to make non-lighting improvements to common areas such as building envelope improvements and improvements to centralized heating and cooling systems.

The evaluation also reported challenges faced by property managers in making efficiency improvements to their buildings. The challenges they noted are as follows:

- Financial challenges: Three respondents indicated they are limited by financial constraints ranging from funding to cost of project to nonpayment of rent.
- Equipment issues: One respondent stated they received the wrong bulbs.
- High cost for tenants: Two respondents stated that tenant energy bills were high.
- Trade ally issues: One respondent indicated they had difficulty working with the subcontractor.
- Scheduling issues: One respondent stated there are issues with scheduling.

4.2.7 BizSavers Program

Program Design

The BizSavers Program helps businesses identify and implement energy saving projects. The programs evaluated were:

- **Standard Program:** Prescriptive incentives for purchasing and installing efficient equipment and prescriptive delamping incentives when installing incentivized lighting equipment.
- **Custom Program:** Incentives are paid at six levels per kWh saved, depending on the end use or equipment type, subject to caps and payback timing
- **New Construction Program:** New construction is incentivized with increased energy efficient design and equipment.
- **Retro-Commissioning Program:** Incentives are based on estimated energy savings. The study incentive is payable up to 100 percent of the program-approved study cost.
- **Small Business Direct Install (SBDI) Program:** The SBDI Program assists participants classified under the Ameren Missouri 2M Small General Service electric rate category with energy efficiency measure installation. SBDI incentives are capped at $2,500 per electric account. The service provider purchases and installs the lighting equipment as well as handles the application process.
- **Energy Management System (EMS) Pilot Program:** Launched in 2016, the EMS Pilot Program provides incentives for the installation of EMS equipment and software designed to control, monitor, and log real-time energy consumption. Incentives to eligible public and private schools and tax-exempt organizations can cover 50 percent of the total EMS project cost.

Customer Satisfaction

The evaluation reported that participants and trade allies continue to express positive satisfaction with the BizSavers offerings. In particular, participants expressed high satisfaction with the Custom and Standard programs. Participants also reported that incentive amounts generally aligned with their expectations. Although participants largely rated the application instructions as being clear, custom incentive applications often require resubmittal with additional documentation or revised savings calculations. Additionally, of the respondents who reported low or medium satisfaction of the program elements, revealed they were dissatisfied with the project timeline; primarily the time it took to receive the incentive or to get approval for their application.

Program Participation

Overall, the evaluation reported that the BizSavers program is doing well with total *ex post* energy savings at 229 percent of its goal. For specific programs, some fared better than others. The Standard and New Construction Programs far exceeded their goals, driving the overall success. Overall, the representation of business types, sizes, and geographic areas in the program is consistent with their representation in the customer population.

The Retro-Commissioning Program was the only program to not achieve its *ex post* energy savings goal at 82%.

Program Marketing

The evaluation thoroughly documented marketing and outreach activities. According to the evaluation, staff reported that marketing and outreach activities closely followed the marketing plan and were going well. Program marketing efforts were focused on informing the general market about program offerings, customer success stories, and easy ways to save. Program staff reported adding additional marketing materials in PY2018, including a graphic illustrating the cost of waiting to install efficient measures, infographics for industry-focused marketing campaigns, SBDI brochures, and a light bulb "cheat sheet" to help participants identify incentive-eligible bulbs.

4.3 Summary of Key Process Evaluation Recommendations

Based on the evaluation findings, Cadmus and ADM provided overall evaluation conclusions and recommendations. Table 9 below presents the conclusions and associated recommendations by program.

Table 9: 2018 Program Conclusions and Recommendations

Program	Conclusions	Recommendations
Energy Efficiency Kits	School kits distribution may be redundant in some households with more than one school-aged child. Based on Home Energy Worksheet (HEW) responses, 13% of school kits in PY18 were sent to households that received a school kit in a previous year, and nearly 2% of school kits were sent to households that received a school kit in the current year. Installation rates, however, remained unchanged between PY17 and PY18. Households that received more than one kit had lower LED installation rates (77%) than households that had received just one kit (91%). Cadmus observed a similar trend for bathroom aerators and water pipe insulation, but the differences were not statistically significant. The rising saturation of kits among households with school-aged children supports investigating extending kit eligibility beyond schools. Stakeholders said, under the next incarnation of the kits program, single-family homes may be under consideration for eligibility to receive kits.	Increase distribution of school kits to a wider pool of schools or an alternative population. Continue to monitor prior participation in the school kits delivery channel through HEW responses. Consider varying schools and areas to reduce sibling participation without excessively limiting Ameren Missouri electric customers. Alternatively, investigate options for providing more kit items that participants could install multiple times in the home—for example, smart power strips or night lights.
	The multifamily delivery channel benefited from customizing multifamily kit contents to available properties. Multifamily kit delivery for this delivery channel became more customized to individual properties in PY18. Where apartment units included two bathrooms, one showerhead and bathroom faucet aerator were added to multifamily kits. Based on this change, the delivery channel delivered and installed an additional 193 showerheads and 184 bathroom faucet aerators compared to what it would have delivered with the prior multifamily kit measure configuration.	Build on the concept of altering the program to maximize participation of qualifying multifamily properties. Given this delivery channel has struggled to find qualified properties (despite efforts to expand qualification criteria through adding gas co-delivery), the program may benefit from focusing on maximizing participation of properties that qualify and offering more services to the qualified multifamily properties. Stakeholders discussed the possibility of the multifamily channel further expanding to provide a more holistic suite of services to properties, such as complete retrofits.

Home Energy Report	Customers who received only HER reports or eHER and HER reports saved more than customers who received eHER reports only. Customers who received the HER reports (separately or in combination with eHER reports) in PY18, saved between 0.4% and 0.7% kWh per day. Customers who only received the eHER reports in PY18 saved 0.2% kWh per day.	Ameren Missouri should expand the eHER delivery channel to email reports to all customers in the HER program. Cadmus recommends that Ameren Missouri proceed with its plan to deliver eHER reports to all customers (with email available in their customer data) assigned to a PY19 treatment group to increase savings across all participants.
	In contrast to PY16 and PY17, customers with lowest energy use saved as much or more than those in the highest energy usage group. Customers with pre-HER program energy consumption in the top 50th percentile of energy usage saved 0.1% to 0.9%, or 0.049 to 0.579 kWh per customer per day, whereas customers in the bottom 50th percentile saved 0.3% to 1.6%, or 0.059 to 0.343 kWh per customer per day.	Continue to monitor savings by energy use quartile to determine if the trend continues. If so, Cadmus recommends Ameren Missouri expand eligibility to include customers regardless of pre-program usage.
	Renters had more commitment to energy conservation than homeowners and more frequently said they had already done as much as possible.	Ameren Missouri should include actions and behaviors specific to renters in future HER reports to illuminate additional opportunities for energy savings for this part of the customer population.
	Most customers identified the following barriers to saving energy: unwillingness to replace working equipment, lack of bill savings from prior energy improvements, and/or prioritization of home renovations not related to saving energy. Few customers were not interested in energy savings at all and many reported that energy-using equipment or appliances in their household were in need of repair.	Ameren Missouri should increase its cross-program marketing to educate customers about the benefits of equipment retrofits or upgrades via the HER program in the future.

	Customers want to know the characteristics of similar homes included in the comparison. They wanted to know if the other homes used electric or gas for heating, if they included residents that were home all day or away during business hours, the number of residents in similar homes, and whether similar homes also supported the energy consumption of electric vehicles (EVs) or pools.	To the extent possible, Ameren Missouri should include additional detail in each customer's HER report about the homes included in its similar home comparison or add context about the type of information available.
Heating and Cooling	Customers indicated that they do not continue to operate their furnace fans as set by the installing contractor. The contractor documented furnace fan setting (auto or continuous) is used by Ameren Missouri to estimate ex ante savings. Regardless of the contractor furnace fan setting (as recorded in the application), customers operated their furnace fans in continuous mode approximately 18% of the time. Additionally, customers categorized as continuous mode operation, reportedly operated only 70% of the year, less than the 100% assumed for those customers. Also, some customers (8%) increased their fan usage after they installed the new fan. Combined, these factors reduced PY2018 realization rates for furnace fans. An upcoming federal standard change to increase fan efficiency is slated to take effect in July 2019, pending litigation and other circumstances. If implemented, program staff is considering eliminating this measure for PY2020.	Monitor impacts of the new planned ECM standard and modify tracking approach for ECM fans. Cadmus recommends eliminating tracking and estimating savings by the two different ECM fan settings measures (auto and continuous) as most customers adjust the contractors' fan setting; and only segregate ECM measures by whether it is included with the HVAC equipment's AHRI rating. ECM's purchased or added to a system where the ECM is not already included in the AHRI rating save incrementally more than when included in a high efficiency system that assumes an ECM (an ECM with a high efficiency CAC system already assumes an ECM in its efficiency rating). Cadmus recommends eliminating ECM measures when legacy products are no longer available in the market. Existing furnace fan retrofits are not impacted by the standard change as it applies to new HVAC equipment manufactured. Ameren Missouri should track ECM fans that are retrofitted into existing furnaces.

	PY2018 changes to program requirements for qualifying early retirement units successfully reduced discrepancies between reported and verified equipment. Ameren Missouri updated its rebate structure to provide the same incentives for new and early retirement units, required contractors to include qualifying conditions on applications, and provided training to educate contractors on program requirements. These efforts successfully reduced the number of early retirement measures that had to be reclassified during Cadmus' verification activities. In total, Cadmus reclassified 1% of the reported early retirement measures and the overall proportion of early retirement measures rebated through the program was consistent with early retirement rates verified by Cadmus in PY2017.	Continue following up on contractor measurements that don't comply with the program rules and updating the tracking database with details. Where contractors report no delta-t and the system is applying for a rebate as an early retirement, follow up with contractors to reconcile the error in data tracking.
Lighting	The effort to maintain retailer relationships in the face of significantly reduced sales targets may have reduced overall program savings. The program implementer indicated that while it concentrated the program's offering within each retailer by limiting the number of manufacturer partners and eligible models, it also ensured some program budget was available for all historically active retailers to preserve relationships for the next program cycle and ensure lighting discounts are readily available to all residential customers. However, this approach resulted in 62% of program sales moving through big box channels, which, as discussed above, are increasingly saturated with non-program LED products, and demonstrated high free ridership rates in PY2018.	In future years, Ameren Missouri should reevaluate the expectation that the Lighting program should serve the entire residential customer base. As LEDs become increasingly common – even without expected changes to federal lighting specifications – LED discounts may not be appropriate in retailers typically serving market segments with already high LED saturations. If the Lighting program is no longer expected to serve all customers, then many big box retail chains may also no longer be appropriate partners, and more program budget can be allocated to small chain retailers. However, if program targets are high enough to require sales in big box stores, the program is cost-effective even with 52% overall free ridership.
CommunitySavers	Staff noted that some properties have difficulty securing financing for more costly projects such as building envelope improvements.	The program should consider exploring offering on-bill financing as an alternative means for properties to arrange on-bill financing.

BizSavers	One factor that would prevent Ameren Missouri customers from taking advantage of the BizSavers programs is not being aware of the programs. This year's evaluation found that somewhat less than half (41%) of nonparticipants were aware of the BizSavers program. By contrast, most of the evaluations in the past several years had found that about half of surveyed nonparticipants were aware of the programs (47% in PY2017). It is possible that awareness has not actually decreased since PY2017: the 95% confidence intervals for the PY2018 and PY2017 awareness estimates overlap, with the former going as high as 46% and the former going as low as 43%.	Ameren Missouri and Lockheed Martin should assess how customers use the website, particularly to find information on energy efficiency and incentives to identify ways to make this information easier to find. Such an assessment could include web-use analytics as well as interviews or focus groups with customers.
	In general, the BizSavers Program does a good job of reaching all parts of the nonresidential market: for most building end uses, the distribution of program participants matches relatively well with the distribution of businesses in the population. Evaluation findings continue to support the establishment of the SBDI Program to serve small businesses, with savings in the 2M-rate class now at or above par with electric usage for several years in a row since the program's establishment. Surveyed nonparticipants indicated moderate-to-high likelihood of agreeing to schedule a walk-through assessment if approached by an SBDI Service Provider.	Lockheed Martin should continue efforts to educate trade allies and customers about the change in incentives for Custom cooling measures, such as through additional email blasts, webinars, and group events as well as tying information on the cooling incentives to industry-focused marketing and outreach activities.
	In the current program year, the implementer introduced some changes to incentive structures to promote certain measure types. One such change was a large increase in the incentive for cooling measures. Analysis of project tracking data suggests that this change may have stimulated more cooling projects and savings, increasing the overall amount of demand savings.	Lockheed Martin should put effort into increasing implementation of lighting controls such as by developing messaging that controls are valuable even with LED lighting and by working with trade allies that specialize in either lighting or building automation to encourage them to promote controls in their jobs.

	Some evidence suggests that communication of some program rules and incentive changes has not reached some trade allies and customers. Awareness of the change to the incentives for Custom cooling measures was low, including among Custom program participants. Even one-third of trade allies who deal with cooling equipment were not aware of it. In addition, as noted above, many trade allies made comments that seemed to suggest a belief that the program provided no incentives at all for exterior lighting.	Lockheed Martin should consider developing and implementing training for SBDI Service Providers to help them overcome resistance by business owners to scheduling a free walk-through assessment, thereby increasing the value of the Service Providers' outreach efforts and the savings achieved.
	The BizSavers program met or exceeded all savings targets and has done a good job of delivering the program to all segments of the nonresidential market.	Lockheed Martin should ensure that trade allies accurately understand the incentives available for external lighting so that opportunities are not lost because trade allies believe there are no incentives, and should consider re-introducing incentives for dusk-to-dawn external lighting if doing so will help ensure that other lighting replacements get made.

4.4 Status Of 2017 Process Evaluation Recommendations

The evaluators tracked and reported Ameren Missouri's response to process evaluation recommendations made in the 2017 evaluation reports. During the audit review, we found that eleven of eleven recommendations across all residential programs have been adopted or are in the process of being adopted. Table 10 below presents the PY2017 process evaluation recommendations by project and the evaluators' assessment of Ameren Missouri's response.

Table 10: PY2017 Process Evaluation Recommendation Tracking

Program	Recommendation	Adopted	Comments
Efficient Products	Monitor new product offerings in the "smart" and "interactive" technology space that offer potential energy savings through occupancy sensing, programmable schedules, remote access, and interconnectivity with other devices and systems. These technologies have been popular with customers, given the rapid adoption of smart thermostats. This occurred partly due to the measures' energy-saving potential and partly due to customers' enthusiasm with these devices' interactive features.	Yes - Ongoing	Ameren Missouri and the implementation contractors continue to review and analyze new measures and innovative technologies that pertain to energy efficiency measures.
Energy Efficiency Kits	Evaluate school kit showerhead performance and increase education on measure benefits.	Yes	Teachers were encouraged to emphasize the showerhead benefits in their curriculum discussions and to remind students about video instructions available online. In the next cycle, the Energy Efficiency Kits program has a new vendor and a different showerhead. The material promotes the showerhead in the following terms "...and still enjoy a full and satisfying shower."
	Modify PY2018 Home Energy Worksheets to gauge repeat participation.	Yes	PY2018 Home Energy Worksheets included the question, "Has your household received more than one Ameren Missouri efficiency kit?" Response options included: "No, we only received one Ameren Missouri

Program	Recommendation	Adopted	Comments
			efficiency school kit"; "Yes, we received one in a previous year [please explain]"; or "Yes, we received more than one this fall [please explain]."
	Reassess efforts to communicate with teachers, particularly through developing online resources.	In Progress	The new school kits vendor for the next program cycle offers more online communication options for teachers (including email).
	Extend gas co-delivery partnerships.	Yes	School kits were co-delivered with Ameren Missouri Natural Gas and Spire gas during the past cycle
	Establish a gas company partnership to co-deliver multifamily kits or have a kit version with only light bulbs.	Yes	The Market Rate Kit program now partners with Ameren Missouri Natural Gas. The light-bulb-only kit proposal was discussed with Ameren Missouri and stakeholders in previous years but was not pursued.
	Promote available informational materials for property managers' use.	Yes	Properties received door hangers and pre-and post-installation letters. In some cases, the program assisted the property in distributing the materials. The program will continue to review the steps, including material distribution with the properties during the application process.
Heating and Cooling	Encourage additional contractor training and requirements for minimum service offerings and documentation for tune-ups. Consider incentivizing training opportunities for contractors. Contractors often have difficulties finding time for training. Consider timing offers to accommodate various schedules. Additional training could be suggested through local community colleges, North American Technician Excellence (NATE),	Yes	Ameren Missouri introduced additional training components in PY18, specifically targeting technical training for a wider audience of high-volume, participating contractors. These trainings were held on-site with contractors to accommodate their schedules. On-demand training options continued to be offered

Program	Recommendation	Adopted	Comments
	or the Building Performance Institute (BPI).		through the online learning center.
Home Energy Reports	Launch an email channel to deliver HER reports in addition to the mailed version. Recognizing that the first emailed HER (eHER reports) reports were delivered in March 2018, Cadmus recommends Ameren Missouri continue to deliver HER reports via email to all Wave 1 and Wave 2 treatment customers as well as to a new wave of customers that will receive only eHER reports in PY2018.	Yes	eHER channel launched in March 2018
Lighting	The Cadmus team supports the program manager's intention to consider lowering the price floor to allow the program to operate in more discount stores and better serve low-income residents. In addition, Ameren Missouri may want to revisit the social marketing distribution strategy, historically used to promote CFLs in lower-income markets, for LEDs. Ameren Missouri also should consider delivery and marketing and outreach strategies that more specifically target renters, especially in multifamily homes.	Yes	Ameren Missouri lowered the price floor from $2/LED to $1/LED in select discount retail outlets. Ameren Missouri included a Low Income Energy Efficiency Grant program as part of its 2019–2021 plan, intended to allow distribution of LEDs in a manner similar to social marketing distribution in previous years. Ameren Missouri partnered with Spire and Ameren Missouri Gas to co-delivery the EE School Kits program. Ameren Missouri included a Multifamily Market Rate program as part of its 2019–2021 plan, which will help increase participation in the multifamily channel.

Program	Recommendation	Adopted	Comments
	Planning for the next program cycle should anticipate that lighting savings will decline rapidly up to 2021, due to falling prices, reduced elasticity, reduced demand for lighting, and falling HOUs. If the U. S. DOE implements a new definition for general service lamps that includes specialty bulbs, and the backstop provision of 45 lumens per watt goes into effect in 2020, savings from LEDs will likely disappear entirely in 2021 (allowing for some sell-through of older stock). The program should adopt a highly segmented approach, targeting those segments—renters and low-income customers—that offer the most market opportunity as well as individual bulb types.	Yes	Ameren Missouri's 2019–2021 Lighting program will target hard-to-reach and low-income customers. The program also has incorporated anticipated falling prices and the U.S. DOE backstop provision.

*Evaluator did not track PY2017 recommendation adoption for both the P2018 BizSavers and CommunitySavers evaluation reports

5 Review of Cost-Effectiveness Calculations

The Evergreen team reviewed residential and commercial summary findings from the portfolio reports and the appropriate DSMore output files. This process involved reviewing the residential and commercial program DSMore aggregate files to confirm that calculations were performed correctly. This review was similar to those conducted in prior audits, with specific tasks including the following:

- Confirm that the reported program summary values matched those in the DSMore results file;
- Confirm that the reported costs matched the costs included in the DSMore input files (both incentive and overhead);
- Report current (PY2018) program results and compare against previous year results (PY2017).

Confirm summary values reported matched the values in the DSMore results files

The Evergreen team reviewed the reported summary cost-effectiveness values, as well as the net lifetime benefit and cost of conserved energy values to confirm the reported values matched the DSMore aggregate file results. The review consisted of checking all five cost-effectiveness tests for both the residential and commercial portfolio files. The Evergreen team did not find any errors between the reported values and DSMore files.

Confirm that the reported costs matched the costs input into the DSMore cost-effectiveness input files (both incentive and overhead);

The Evergreen team reviewed the costs reported in each DSMore aggregate file for each program and compared them against the reported costs in the evaluation reports. No discrepancies were found.

Table 11 presents the total net lifetime benefits from residential and commercial programs reported in the PY2018 EM&V reports and compares the current year net benefits to previously reported PY2017 net benefits totals. Residential programs showed a decrease in the total net benefits, with the Heating and Cooling Program showing a significant decrease in benefits relative to 2017. The Commercial programs showed an increase in total net benefits with the BizStandard Program reporting significant increases. Overall there was a decrease in net lifetime benefits between 2017 and 2018.

Table 11: Net Lifetime Benefits per Program

Program	Net UCT Lifetime Benefit (Reported) 2017	Net UCT Lifetime Benefit (Reported) 2018
Efficient Products	$1,803,102	$1,237,031
Efficient Products – Smart Thermostats	$3,874,909	$1,189,287
Energy Efficiency Kits	$2,711,473	$2,293,834
Home Energy Report	$485,881	$1,152,239
Heating and Cooling	$62,298,901	$29,573,393
Lighting	$17,904,234	$3,578,373
BizSavers Custom	$44,421,551	$45,344,680
BizSavers Standard	$52,578,289	$89,136,901
BizSavers New Construction	$17,012,195	$11,830,564
BizSavers RCx	$2,740,284	$4,615,618
BizSavers SBDI	$3,478,391	$7,493,718
CommunitySavers	$3,293,392	4,173,059

Table 12 compares the results of the five cost effectiveness tests between PY2017 and PY2018.

Table 12: Cost Effectiveness Test Results

Program	UCT		TRC		RIM		PCT*		SCT	
	2017	2018	2017	2018	2017	2018	2017	2018	2017	2018
Efficient Products	1.82	1.16	1.48	1.07	0.44	0.33	4.19	5.15	1.76	1.47
Efficient Products – Smart Thermostats	2.06	2.43	1.51	1.19	0.61	0.55	2.57	2.58	1.78	1.55
Energy Efficiency Kits	3.65	2.77	9.26	2.85	0.43	0.39	N/A	N/A	12.25	4.69
Home Energy Report	0.60	1.32	0.60	1.32	0.30	0.33	N/A	N/A	0.60	1.32
Heating and Cooling	5.12	2.34	3.09	1.36	0.81	0.54	4.47	3.08	4.09	1.99
Lighting	6.22	2.77	6.22	2.76	0.47	0.37	N/A	N/A	9.24	4.06
CommunitySavers	1.56	0.85	2.75	0.80	0.43	0.33	32.75	7.35	3.53	1.01
BizSavers Custom	5.26	3.77	1.67	1.21	0.71	0.63	2.56	2.12	2.16	1.59
BizSavers Standard	4.66	3.73	2.24	1.92	0.56	0.48	4.67	4.50	2.90	2.49
BizSavers New Construction	6.13	4.00	1.31	.95	0.62	0.61	2.20	1.63	1.67	1.23
BizSavers RCx	3.89	4.37	3.29	4.78	0.91	0.83	5.3	8.75	4.29	6.08
BizSavers SBDI	3.24	2,37	2.23	1.67	0.53	0.44	4.71	4.03	2.79	2.16

* Energy Efficiency Kit programs and Home Energy Report do not have participant costs. The Lighting program's lifetime participant costs were lower over the bulb lifetime than if they had not participated, even though upfront costs were higher.

6 Conclusions

A review of PY2018 evaluation indicates that all evaluation reports are well written, complete, and meet the minimum requirements for impact and process evaluations stipulated in 4 CSR 240-22.070(8). These reports are also generally consistent with the best practices established for the industry. During the course of the audit, we have identified areas where we believe the evaluations can be improved, and these recommendations are detailed below.

Cadmus and ADM provided a total of 24 recommendations on ways in which Ameren Missouri can improve its residential and commercial and industrial (C&I) programs going forward. Eight of these recommendations were related to the impact evaluation, and sixteen recommendations were related to the program processes.

Cadmus reviewed previous year recommendations and tracked if the recommendations have been adopted. Of 22 recommendations tracked from the previous year, 22 have been adopted or are in the process of being adopted.[13]

Our audit conclusions for the PY2018 Ameren Missouri program evaluations are presented below.

6.1 Midlife Savings Adjustments in Cost Effectiveness Calculations

Mid-life savings adjustments do not appear to have been incorporated into the cost effectiveness analysis, and there are several instances where we believe that they will have significant effect on the calculations. This recommendation was made as part of the PY2017 audit and is repeated here for PY2018.

These mid-life changes to baseline energy consumption are caused when the energy efficient measure has a longer effective useful life than the equipment it replaces, and the baseline equipment efficiency is expected to revert to code minimum efficiency over the duration of the cost effectiveness analysis.

The Missouri TRM[14] provides an example of a mid-life adjustment needed for lighting:

> During the lifetime of a standard Omnidirectional LED, the baseline incandescent/halogen bulb would need to be replaced multiple times. Since the baseline bulb changes to a CFL equivalent in 2020 due to the EISA backstop provision,

[13] ADM did not include recommendation adoption tracking for both the BizSavers and CommunitySavers programs.

[14] *The Missouri Technical Reference Manual Volume 2: Commercial and Industrial Measures* (March 31, 2017), p 188.

the annual savings claim must be reduced within the life of the measure to account for this baseline shift. **The reduced annual savings will need to be incorporated into the cost effectiveness screening calculations** (emphasis added).

A partial list of measures where we believe that a mid-life savings adjustment is needed include the following:

- BizSavers, CommunitySavers, and Residential Programs: Measure 3007: LED screw in lamp replacing incandescent or halogen reflector lamp: A mid-life adjustment for the savings for this measure should be made in the cost effectiveness analysis after the year 2020 that is consistent with the Missouri TRM.
- BizSavers, CommunitySavers, and Residential Programs: Measure 3026: LED lamps replacing T12 Linear fluorescent lamps: A mid-life adjustment to the savings for this measure should be made in the cost effectiveness analysis to reflect code changes that are to become effective in 2020 that is consistent with the Missouri TRM.
- BizSavers, CommunitySavers, and Residential Programs: Other Lighting Measures with T12 and other baseline lighting wattages below 45 lumens per watt will require mid-life savings adjustments to be made in the cost effectiveness analysis after 2020.

These mid-life adjustments may also have significant impacts on the Earning Opportunity (EO) determinations, as the mid-life adjustments needed for the PY2018 measures may affect whether or not they are delivering energy savings in 2023.

For the Earning Opportunity calculations, the Ameren Missouri Stipulation and Agreement (p. 13) states the following:

> Corresponding kW savings for the year 2023 will be determined by applying an end-use category energy to coincident demand factor found in Appendix E to the first year energy savings that are determined by EM&V. 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. This means that eligible measures for inclusion in the EO calculations are measures with an expected useful life of 8 years or more for measures installed in 2016, measures with an expected useful life of 7 years or more for measures installed in 2017…

We did not attempt to calculate how large an effect these adjustments will have on the cost effectiveness and the Earning Opportunity, as this was outside the scope of the audit. We believe that these changes may be significant, however, and recommend that the mid-life adjustments be made where appropriate for PY2018 and future years.

6.2 Residential Lighting Market Share Model

We do not believe the Cadmus/Apex market share should be used in the calculation of net impact from Ameren's upstream lighting program. There are fundamental problems with the market share model and with the application of results from the model to compute net impacts and the net-to-gross (NTG) ratio. Perhaps the most serious issue is that the final version of the model still includes market effects in the calculation of net impacts, which is not allowed in Missouri.

The first issue is related to how the model is combined with the elasticity model to develop the overall NTG ratio. It is not appropriate to estimate a net-to-gross ratio using the market share model, subtract out an estimate of free ridership from the elasticity model, and then simply label the remainder as "spillover." This approach makes the elasticity model entirely superfluous, as the net impact calculation will ***always*** equal the NTG ratio obtained from the market share model. If, for example, the elasticity model yielded a free ridership estimate of 90 percent, the net impact calculation shown on page 20 of the report would result in an estimate of spillover of 62 percent from the market share model, so that the overall NTG ratio would always equal 72 percent (i.e., the original overall NTG ratio from the market share model). Having the calculation always yield the same result is not appropriate.

The second issue is related to the two program related variables in the market share model: *Program Spending per Household* and *Program Age*. Neither of these variables can be interpreted as an estimate of spillover, which makes the net impact calculation even less defensible. The *Program Spending per Household* variable captures the direct impact of the program, which may possibly include some spillover effects. The Cadmus/Apex model does not allow one to separate the spillover component of the *Program Spending per Household* variable from the direct program effects.

The third issue is that the program age variable reflects **market effects**, not spillover, and in Missouri market effects are not to be claimed as part of net savings. The program age variable presents an insurmountable problem for using the market share model in Missouri. On one hand, program age is an important variable that will affect LED sales, and therefore should be included in a model used to estimate market share. On the other hand, with a properly specified model (i.e., a logit model), it is not possible to remove the program age/market effects in the calculation of net impacts for the other program variables.

The final version of the market share model uses a multinomial logit specification, in response to the audit team's comments on the draft report.[15] With the logit specification,

[15] A logit or probit model is the appropriate specification to use when the dependent variable is a probability or similar number bounded by 0 and 1.

however, the program age variable is used in the calculation of the marginal effects for ***all*** other variables, including program spending. In other words, even if the program age number is held constant at 10 years (as was done in the final evaluation report), this value is still used in the calculation of net impacts for the program spending due to the structure of the logit model.[16]

In the logit model, the marginal effect of any variable is the coefficient multiplied by two additional terms reflecting the average probability of the dependent variable. In notation form, the marginal effect is $\beta * p(1-p)$ where the estimated logit probability for market share "p" is calculated using the logit probability formula and the average values (typically) for all the model variables. In this case, the probability calculation will include program age (and therefore market effects) even when the focus is only on the program spending variable. As a consequence, it is not possible in the logit model to separate out the market effect component when calculating the net impact from program spending. Additionally, given the nonlinear form of the logit model, the $p(1-p)$ term will vary based on the value of program age, so holding the age constant in the calculation will not remove the market effects component from the calculation.[17] The effect on net impacts will also vary depending on program age; it makes a difference if the program age is set equal to 10 versus 1, 5, 9, etc. This issue alone is enough to prohibit the use of the market share model for Missouri.

A separate issue is how the model results are combined with LED market data to estimate the overall net impacts. Creation of the market share model required significant data manipulation from multiple sources covering all states, which is not clearly described in the report. We have summarized some of this information in Table 1 below and then calculated the number of LED's purchased per household based on these data and other information provided in the Cadmus report.

Rows a, b, and c of the table show the number of residences in Ameren Missouri territory (1.05 million), the proportion of Missouri residents that purchased one or more light bulbs (60%), and the national average number of bulbs purchased (10.8 million). Based on this information, Evergreen calculated 632,334 Ameren Missouri customers purchased one or more light bulbs (row d) and on average these customers purchased 17 light bulbs (row f).

Likewise, rows g and h show the proportion of Missouri residents that purchased one or more LED's (49%), and the total number of LED's purchased by Ameren Missouri

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[16] See *Econometric Analysis* (1990) by William Greene (pp. 699-701) for additional technical detail on the marginal effects calculation for the multinomial logit model.

[17] While the OLS model included in the draft evaluation report is inferior to the logit model in this application, it does alleviate this problem to some degree if the program age variable is not used in the net impact calculation. This would result in a NTG ratio of approximately 0.34, which is less than the NTG ratio of 0.48 that we are recommending using the elasticity model.

residential customers (6.6 million). Based on this information, Evergreen calculated 516,406 Ameren Missouri customers purchased one or more LED's (row i) and on average these customers purchased 12.7 LED's (row k).

Table 13: Bulb Sales per Household Implicit in the Cadmus Analysis

Row	Metric	Value	Where in Report
a	Residential households in Ameren MO Territory:	1,053,890	Page 53
b	Percent of Missouri households tha purchased one or more bulbs:	60%	Page 18
c	Total Ameren Missouri bulb sales	10,827,745	Table 33
d	Ameren Households that purchasec one or more bulbs (a * b)	632,334	Evergreen computed using Cadmus data
e	**Average # of bulbs purchased per household (c / a)**	**10.3**	**Evergreen computed using Cadmus data**
f	**Average # of bulbs purchased by households that did purchase one or more bulbs (c / d)**	**17.1**	**Evergreen computed using Cadmus data**
g	Percent of Missouri households that purchased one or more LEDs:	49%	Page 18
h	Total Ameren Missouri LED sales	6,559,925	Table 33
I	Ameren households that purchased one or more LEDs (a * g)	516,406	Evergreen computed using Cadmus data
j	**Average # of LEDs purchased per household (h / a)**	**6.2**	**Evergreen computed using Cadmus data**
k	**Average # of LEDs purchased by households that did purchase one or more bulbs (h / i)**	**12.7**	**Evergreen computed using Cadmus data**

Even using the lower national sales average for bulb purchases (row c), we do not believe that the assumptions of 10.3 bulbs (6.2 LED's) per Ameren household and 17.1 (12.7 LED's) per resident that purchased any light bulbs are realistic. The total sales numbers are also not credible when compared with the program tracking data on LED sales for PY2018

(213,854) LED's total from the program data, compared to 6,559,925 LED's estimated by Cadmus from the market share model.[18]

The final net impact estimate is very dependent upon the assumptions regarding the size of the overall lighting market. If a more realistic estimate of the total Ameren MO lighting market were used, then a much smaller NTG estimate would result from the market share model. For example, if the entire Ameren MO lighting market were 2,000,000 (roughly 2 light bulbs purchased per household in 2018, on average), then the resulting net impact from the market share model would be 1 percent, or 20,000 LEDs. Comparing this to the program LED's yields a NTG ratio of just 9.4 percent (20,000/213,854).

Finally, a new and more troubling issue is that – for the final evaluation report – Cadmus increased the spending per household number from $0.43 to $1.27 (an increase of 295%) in the net impact calculation, which has the effect of increasing the NTG ratio from 0.24 to 0.72. Virtually no explanation is given for this switch to the larger number, which is alarming given how large an impact it has on the final NTG ratio.

This higher number may reflect the overall program dollars allocated to the residential lighting program for the cost effectiveness calculations, but this was not discussed in the report. If true, this is not the appropriate program spending number to use for the counterfactual scenario in the net impact calculations. The higher dollar figure will include some of the Ameren overhead costs that are allocated across programs so that they are included in the cost effectiveness calculations. This is simply an accounting exercise and these overhead costs are not tied specifically to the residential lighting program (otherwise they would be direct program costs rather than overhead) and therefore should not be expected to disappear in the 'no program' scenario used in the net impact calculation.

If a more reasonable estimate of program spending is used – one that is based on only those program costs that would disappear in the 'no program' scenario – it would include (at a minimum) the program incentive costs and marketing costs ($399,609 + $40,316) for a total of $439,609 or $0.42 program dollars spent per household. While this still excludes some other direct program costs, it is a more appropriate number to use to calculate the direct effect program spending has on the LED market share. This number is also very close to the $0.43 number originally used by Cadmus in the draft version of this report.

Using a lower and more appropriate program spending amount has the effect of reducing the NTG ratio by 66 percent, from 0.72 to 0.24, which is lower than the NTG estimate

[18] In the non-participant phone survey it appears that Cadmus asked Ameren customers how many light bulbs they had purchased in the prior year. This information would have been useful to develop an estimate of light bulb purchases in Ameren's territory and compare with the sales numbers used in the net impact analysis. Unfortunately, the survey data for this question do not appear to have been used in the evaluation analysis.

obtained from just using the elasticity model. However, this adjustment still does not address the issue of market effects discussed earlier.

Given all these issues, we strongly urge that the market share model be dropped entirely from the evaluation and that the net impacts be calculated solely from the lighting elasticity model. This would result in the NTG ratio for the residential lighting program to decrease from 0.72 to 0.48.

6.3 Individual Program Report Comments

The audit team made several comments on draft versions of the evaluation reports, many of which have been addressed in the final reports. A few of the issues that we believe still need to be resolved are discussed below.

Overall, the verified gross impact savings appear to have been calculated correctly, and the audit team did not find any significant math errors or misapplication of engineering formulas. The demand savings for most measures are calculated using a set of deemed coincident peak load factors. On the whole, these values seem to be appropriate to estimate the average demand savings that are likely to accrue within a given program or specific end-use. However, the demand savings for specific measures may be higher or lower than is assumed when applying generic end-use load shapes to estimate demand savings.

Going forward, the evaluation teams should continue to research and validate that the deemed coincident peak load factors are accurate and are reasonable given the specific equipment mix installed through Ameren's programs.

BizSavers and CommunitySavers

The use of deemed coincident peak load shapes is reasonable for the BizSavers and CommunitySavers programs. The evaluation of the gross impacts from the BizSavers program was robust, and the appendices and supporting information were complete and easy to read.

The evaluation does not currently utilize a dual-baseline to reflect likely changes to the lighting market for LED measures that with a long effective useful life. The evaluators should update their lighting baselines and savings assumptions to reflect the changing lighting market as more information is collected. Provisions should be made to incorporate future federal rules regarding lighting efficiency as they are promulgated.

Residential Cooling and Heating

The PY2018 EM&V verified savings have largely addressed the baseline efficiencies used to determine the energy savings for central air conditioner and heat pump measures. The audit team's primary concern with demand savings has been addressed through the use of coincident peak load factors. A pre-post billing analysis on a sample of homes should be

completed to provide more certainty that the use of the deemed coincident peak load factors is appropriate for CAC and heat pump early replacement measures and for measures with electric resistance baselines. For example, the savings for residential 14 SEER + GSHPs with electric heating baseline equipment is 11.64 kW, which is likely overstated. The evaluators should continue to monitor that the deemed coincident load factors reflect the measure mix installed through the programs.

Additionally, as noted earlier, it may not be appropriate to use the deemed coincident peak load factors for measure-level cost-benefit screening for future programs. The deemed coincident peak load factors are intended to reflect the average demand savings by end use, and the demand savings for specific measures may not be accurately reflected using this average value.

6.3.1 Portfolio Level Findings

Table 14 and Table 15 show the overall effect of the audit recommendations on the entire PY2018 program portfolio. The savings revisions are limited to using the elasticity model (rather than the market share model) to calculate net impacts for the residential lighting program, which reduces the NTG ratio from 0.72 to 0.48. Overall, the recommended changes from the audit result in a reduction of approximately 1 percent for both energy and demand savings for the PY2018 portfolio.

Table 14: Summary of Audit Recommended PY2018 Savings (MWh) – All Programs

Program	Ex Post Gross Savings (MWH/Yr)	Total Net Savings (MWh/Yr)	NTG Ratio	% Change from Evaluation Savings
Efficient Products	4,270	3,278	77%	0%
Smart Thermostats	2,163	1,518	70%	0%
Energy Efficiency Kits	5,915	5,031	85%	0%
Home Energy Reports	26,376	26,376	100%	0%
Heating and Cooling	54,444	41,388	75%	0%
Lighting	8,383	4,024	76%	-34%
Residential Total	**101,550**	**81,615**	**80%**	**-2%**
BizSavers	318,610	302,484	95%	0%
CommunitySavers	9,915	9,915	100%	0%
Non-residential Total	**328,525**	**312,399**	**95%**	**0%**
Portfolio Total	**430,076**	**394,014**	**92%**	**-1%**

Table 15: Summary of Audit Recommended PY2018 Savings (MW) – All Programs

Program	Audit Ex Post Gross Savings (MW)	Audit Total Net Savings (MW)	NTG Ratio	% Change from Evaluation Savings
Efficient Products	1.175	0.874	74%	0%
Smart Thermostats	2.049	1.436	70%	0%
Energy Efficiency Kits	1.058	0.927	88%	0%
Home Energy Reports	12.293	12.293	100%	0%
Heating and Cooling	36.987	27.008	73%	0%
Lighting	1.261	0.60528	48%	-35%
Residential Total	**54.823**	**43.14328**	**79%**	**1%**
BizSavers	75.920	71.134	94%	0%
CommunitySavers	2.073	2.073	100%	0%
Non-residential Total	**77.979**	**73.193**	**94%**	**0%**
Portfolio Total	**132.802**	**116.336**	**88%**	**<1%**

Appendix A: Full Process Evaluation Responses to Minimum Question Requirements

The following appendix provides a summary of the detailed responses to minimum process evaluation requirement questions.

Table 16: Minimum Process Evaluation Questions

Issue Number	Question
Issue 1	What are the primary market imperfections common to the target market segment?
Issue 2	Is the target market segment appropriately defined, or should it be further subdivided or merged with other market segments?
Issue 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?
Issue 4	Are the communication channels and delivery mechanisms appropriate for the target market segment?
Issue 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?

Table 17: Issue 1 - What are the primary market imperfections common to the target market segment?

Program	2017 Summary Response	2018 Summary Response
Efficient Products	Less-efficient equipment is available at lower price points. Customers may not understand that more-efficient equipment can cost less to operate in the long run, or they may not be willing or able to pay the higher upfront costs of more efficient equipment. New products coming to market and changes in retail prices can complicate communications about the benefits of more-efficient equipment.	As in prior years, less-efficient equipment is available at lower initial cost. High costs present a barrier to customers who may be unable to make large purchases. Additionally, customers may not factor in the long-term cost savings that would result from purchasing more-efficient equipment that can cost less to operate. New products coming to market, changes in retail prices, and other changes to retailer stocking practices can complicate communications regarding the benefits of more-efficient equipment.
Energy Efficiency Kits	The Energy Efficiency Kits Program target market segments did not change in PY17. The school-based kit delivery channel targeted households receiving energy from Ameren Missouri, who lack sufficient knowledge of the energy-saving benefits of the high-efficiency measures provided through the school kits. Secondly, using schools as a distribution point for energy efficiency kits presents the inefficiency of providing kits to households not using electricity from Ameren Missouri, either because they are not Ameren Missouri customers, or because they do not use electricity to heat their water. The multifamily kit delivery channel targeted savings in multifamily properties. These types of properties are more likely to involve residents who are separate from property owners, such that the party who does not pay the electricity bill (that would benefit from the energy savings) has no incentive to install high-efficiency household items.	The Energy Efficiency Kits Program target market segments did not change in PY18. First, the school-based kit delivery channel targeted Ameren Missouri electric customers, specifically those with electric water heating; however, inefficiencies resulted from the disconnect between school enrollment areas, Ameren Missouri's service territory, and households having electric water heating. For PY18, Cadmus identified that 13% of school kits were sent to households that received a kit in a previous year, and 3% of kits reached the same households in PY18 alone, due to more than one household member attending a participating school. Next, participants did not opt-in to the school-based kit delivery channel and may have lacked sufficient knowledge of the energy-saving benefits of measures provided through the school kits. Lastly, for the multifamily kit delivery channel, which targeted residential units in multifamily properties, there was a higher likelihood (than for single-family housing) that property owners would be responsible for paying the electricity bill; this may prevent tenants, who would use the high-efficiency household items, from experiencing direct benefits through their electricity bills.
Home Energy Report	Primary market imperfections that the program is designed to address include customers not connecting behaviors with savings energy and not being motivated to change the behaviors to save energy. However, Cadmus found that nonparticipant Ameren Missouri customers are decreasing energy consumption almost as much as HER participants. Therefore, the additional savings potential from additional behavior and education changes may be limited. The lower than expected savings resulting from the program are also consistent with a neighboring utility's results for participants starting to receive reports at about the same time. Cadmus also found that HER treatment group customers with higher energy consumption save more energy than those with lower energy	In PY17, Cadmus found that nonparticipant Ameren Missouri customers reduced energy consumption at a similar rate as HER participants. Therefore, additional savings potential of energy education and behavior changes may be limited. The program is designed to address the market imperfection through education and motivation towards behavior change to save energy.

	consumption prior to receiving HER reports.	
Heating and Cooling	The primary market imperfection common to the target market is inadequate consumer information about the cost saving benefits of high-efficiency HVAC systems for cooling and electric heating and the investment/cost of installing a new HVAC unit. This can deter customers from ultimately making the decision to purchase high-efficiency and cost-savings equipment until absolutely necessary. The greater upfront costs of high- efficiency systems can deter customers from purchasing these units, even if these costs are recovered over the equipment's life though lower operating costs.	The target market revealed a primary market imperfection: lack of consumer information about the cost-saving benefits of high-efficiency HVAC systems for cooling, electric heating, and expenses of a new HVAC unit. These imperfections can deter customers from purchasing high-efficiency and cost-savings equipment, even if costs are recovered over the equipment's life though lower operating costs.
Lighting	LEDs are gaining market share rapidly, and survey results indicate customers are becoming more familiar with the technology. However, LEDs continue to represent a minority of bulbs sold, and a minority of bulbs installed. Despite a steadily decreasing price per unit, most LEDs remain more expensive than other, less-efficient bulb types. This is especially true for specialty bulb types.	LEDs continue to gain market share, but past survey results show that not all market segments are equally familiar with the technology; low-income, renter and multifamily populations show much lower saturation rates. LEDs also continue to be more expensive than other bulb types, especially for specialty bulb types, although prices have dropped substantially over the past three years.
BizSavers	Findings from previous evaluations have pointed to four factors that may affect the ability of Ameren Missouri customers to take advantage of the BizSavers programs to undertake energy efficiency upgrades: cost, lack of program awareness, business size, and geography. High up-front costs continue to be commonly cited barriers to efficiency upgrades, and the continued high net-to-gross ratios for the BizSavers Program, together with feedback from participants about the value of the incentives, again emphasize the importance of incentives in driving the efficiency upgrades. Analyses of program participation data as it compares to customer population data indicate that various business sizes and geographic areas are well represented in the program. Consistent with most of the evaluations in the past several years (excluding PY2016), this year's evaluation found that about half of nonparticipants were aware of the BizSavers program. This is more than twice the level of nonparticipant program awareness reported in the PY2016 evaluation. In the PY2016 report, the evaluation team conjectured that the low awareness may have been related to the program's three-month suspension in early 2016. Previously, awareness was assessed in the middle of the program cycle, and the assessment for the current evaluation came after nearly two years of continuous program operation. This suggests that maintaining program awareness may depend on continuous program operation; with its associated marketing, outreach, and trade ally engagement.	One factor that would prevent Ameren Missouri customers from taking advantage of the BizSavers programs is not being aware of the programs. This year's evaluation found that somewhat less than half (41%) of nonparticipants were aware of the BizSavers program. By contrast, most of the evaluations in the past several years had found that about half of surveyed nonparticipants were aware of the programs (47% in PY2017). It is possible that awareness has not actually decreased since PY2017: the 95% confidence intervals for the PY2018 and PY2017 awareness estimates overlap, with the former going as high as 46% and the former going as low as 43%. Still, the best guess is that awareness has dipped at least slightly. Slightly decreased program awareness in the general customer population did not keep the program from achieving enough savings this program year to exceed most savings targets. However, starting the next program cycle with reduced awareness in the customer population may put the program at a disadvantage. Recall that the PY2016 evaluation found a very low program awareness rate (20%), assessed a few months after the end of the program's three-month suspension, possibly suggesting that maintaining program awareness depends on continuous program marketing, outreach, and trade ally engagement.

Community Savers	Multiple market imperfections were identified that may prevent low-income multifamily property owners from investing in energy efficiency improvements either through the CommunitySavers Program or outside of it. The identified market imperfections are: cost, geography, lack of property staff resources, and split incentives. Cost. The cost of energy efficient equipment is a barrier to completing efficiency improvements through the program and outside of it. Program staff that work with multifamily property owners and managers noted that cost is a barrier to efficiency improvements in the properties managed. As an example, staff noted that cost of envelope improvements such as windows is high in comparison with the incremental cost covered by the incentive. This sentiment was echoed by six out of 32 survey respondents as well. Geography. Analysis of the program activity in comparison with the location of multifamily properties, lower income customers, and subsidized multifamily properties found that program activity was disproportionately concentrated in St. Louis and its surrounding suburbs. Insufficient Property Staff. Multifamily property operators may not have staff available to implement efficiency measures. As was the case in PY2016, one survey respondent stated that they did not have the staff available to implement efficiency improvements at the property.7 Additionally a program staff member suggested that in some cases properties that complete direct install projects are not willing to immediately initiate a common area project because their staff need to refocus on other priorities. CommunitySavers is designed to minimize the time required by property managers and owners through the assistance provided by the account manager who will assist with program paperwork and the scheduling of the work completed. Split Incentives: One form of split incentives in multifamily properties occurs when the tenant pays the cost of the electricity use, but the owner is responsible for choices that affect how efficiently the equipment and building utilizes electricity. This issue is most likely to occur for equipment and building characteristics that affect tenant energy use. The program addresses the barrier to efficiency resulting from the split incentives between owners and occupants by providing the direct install measures and HVAC tune-ups at no cost to the building operator or the tenant.	Multiple market imperfections were identified that may prevent low-income multifamily property owners from investing in energy efficiency improvements either through the CommunitySavers Program or outside of it. The identified market imperfections are: cost, geography, lack of property staff resources, and split incentives. Cost. The cost of energy efficient equipment is a barrier to completing efficiency improvements through the program and outside of it. Program staff that work with multifamily property owners and managers noted that cost is a barrier to efficiency improvements in the properties managed. It was noted that this is particularly the case for non-lighting measures. The cost of efficiency improvements was also noted as a barrier by three of the four respondents. Additionally, staff noted that some properties may be prevented from financing efficiency projects because of the terms of previous financing arrangements. Geography. Analysis of the program activity in comparison to the location of multifamily properties and lower income customers found that program activity was disproportionately concentrated in St. Louis and its surrounding suburbs. However, there was an increase in the share of projects completed in outer St. Louis suburbs from 10% of tenant units in PY2017 to 18% of units in PY2018. Insufficient Property Staff. Multifamily property operators may not have staff available to implement efficiency measures. Unlike prior years, none of the survey respondents cited this as a barrier. CommunitySavers is designed to minimize the time required by property managers and owners through the assistance provided by the account manager who will assist with program paperwork and the scheduling of the work completed.

Table 18: Issue 2 - Is the target market segment appropriately defined, or should it be further subdivided or merged with other market segments?

Program	2017 Summary Response	2018 Summary Response
Efficient Products	The program appropriately targets all residential customers who purchase qualified energy-saving items for use in their homes. Increasing crossover between participants who apply for Heating and Cooling program rebates and smart thermostat rebates could eventually lead to a merging of those segments, although to date most thermostat replacements do not involve HVAC replacement, and Heating and Cooling participants who applied for smart thermostat rebates appear very similar to Efficient Products participants who applied for thermostat rebates without replacing HVAC equipment.	The program continues to appropriately target all residential customers who purchase qualified energy-saving items for use in their homes. Increasing crossover between participants who apply for Heating and Cooling program rebates and smart thermostat rebates could eventually lead to a merging of those segments, although to date most thermostat replacements do not involve HVAC replacement, and Heating and Cooling participants who applied for smart thermostat rebates appear very similar to Efficient Products participants who applied for thermostat rebates without replacing HVAC equipment.
Energy Efficiency Kits	The school-based delivery channel and the multifamily delivery channel's target market segments are appropriately defined. The school-based delivery channel's target market segment consists of schools within Ameren Missouri's service territory. For the multifamily delivery channel, the target market segment consists of Ameren Missouri customers living in multifamily units that use electric water heating. While the electric water heating requirement is appropriate to the core program goals, expanding the target market by partnering with a gas provider to include gas hot water heating would enable to delivery channel to enroll more properties and generate savings for more non-hot water heating measures (i.e. LED bulbs and furnace filter alarms). The school-based delivery channel's educational component is designed to lessen the market imperfection of inadequate information or knowledge regarding energy-savings benefits from high-efficiency household items. In PY17, Ameren Missouri co-delivered the program with a natural gas provider to reduce the market imperfection of paying for gas saving measures of non-Ameren Missouri customers. This improved Ameren Missouri's ability to better target its customers.	The school-based delivery channel's target market segment is appropriately defined. The multifamily delivery channel target market segment may benefit from becoming broader. The school-based delivery channel's target market segment consists of schools within Ameren Missouri's service territory. For the multifamily delivery channel, the target market segment consists of Ameren Missouri customers living in multifamily units that use electric water heating or are Ameren Missouri Natural Gas customers. The school-based delivery channel's educational component is designed to lessen the market imperfection of inadequate information or knowledge regarding energy-savings benefits from high-efficiency household items. To reduce the market imperfection of paying for gas saving measures of non-Ameren Missouri customers, Ameren Missouri co-delivered school kits with a natural gas provider in PY17, and then expanded this approach to include it Ameren Missouri Natural Gas in PY18. This improved Ameren Missouri's ability to better target its customers. Similarly, the multifamily kits delivery channel became co-delivered with Ameren Missouri Natural Gas in PY18, but its limited natural gas service area did not overlap with sufficient numbers of new multifamily properties. At the same time, co-delivery with the natural gas provider having a more applicable service territory was abandoned, and identifying additional qualified properties continued to limit program participation. These considerations suggest that the program may benefit from redefining the target market segment to be more inclusive.
Home Energy Report	To improve the program cost-effectiveness, we recommend the target market be updated to include only customers in the top 50th percentile of energy consumption instead of all residential	To improve the program cost-effectiveness, we recommend Ameren Missouri continue to seek opportunities to improve its messaging and offerings towards increasing savings.

	customers.	
Heating and Cooling	The target market was defined as customers living in single- family homes; multifamily buildings of four units or fewer; or row houses. This is the appropriate market definition for a residential heating and cooling program designed to encourage property owners to choose high-efficiency equipment when making heating and cooling equipment purchases.	The target market did not change from prior years, and was defined as customers living in single-family homes, multifamily buildings of four units or fewer, or row houses. This market definition continues to be appropriate for a residential Heating and Cooling program designed to encourage property owners to choose high-efficiency equipment.
Lighting	The program targets the entire residential lighting market. This continues to be appropriate while the saturation remains low overall. However, renters, who may not expect to remain in their home long enough to experience the benefits, and low income residents, who may be more sensitive to price, have especially low penetration of LEDs.	The program targets the entire residential lighting market, but, in PY18, has concentrated on stocking and incentives for general-purpose bulbs in discount retailers. The program continues to work with mainstream big box retailers in addition to specialty retailers to stock and discount specialty bulbs.
BizSavers	In general, the BizSavers Program does a good job of reaching all parts of the nonresidential market: for most building end uses, the distribution of program participants matches relatively well with the distribution of businesses in the population. Evaluation findings continue to support the establishment of the SBDI Program to serve small businesses. Many small customers have little LED lighting installed and are motivated to replace lighting to reduce their electricity bill, and surveyed nonparticipants indicated moderate-to-high likelihood of agreeing to schedule a walk-through assessment if approached by an SBDI Service Provider. While most small customer types are about equally good targets for SBDI than others, Food and Beverage customers may provide the best return on recruitment effort, as a high percentage of such customers are responsible for lighting purchases and are motivated to change lighting to reduce their energy bills. By contrast, while healthcare customers show a high need for lighting replacements (nearly two-thirds had "none or very little" LEDs), they are the customer type that is least likely to be responsible for buying lighting and is least motivated to replace lighting to reduce electricity costs. Thus, the SBDI Program may not be the best vehicle to meet what may be a clear need for lighting replacement for this customer type. More broadly, the program may be challenged in serving businesses that lease their space and are not responsible for lighting purchases. A recent evaluation of a small business program for the State of Connecticut22 found that a key success factor was to bring the landlord and tenant together to present savings opportunities. While the SBDI Program in general serves small businesses, it achieved only about half of its savings goals. The program continues to rely on a few highly active Service Providers, with five providers accounting for three-quarters of savings and one	In general, the BizSavers Program does a good job of reaching all parts of the nonresidential market: for most building end uses, the distribution of program participants matches relatively well with the distribution of businesses in the population. Evaluation findings continue to support the establishment of the SBDI Program to serve small businesses, with savings in the 2M-rate class now at or above par with electric usage for several years in a row since the program's establishment. Surveyed nonparticipants indicated moderate-to-high likelihood of agreeing to schedule a walk-through assessment if approached by an SBDI Service Provider.

	responsible for about half of savings. Reasons for low activity are not entirely clear. Surveyed Service Providers, who well represented the population of all Service Providers, reported good success at scheduling walk-through assessments and in converting those to projects. They also cited few barriers to doing more projects and generally said that no business was too small to approach. The most common suggestion they made for helping them accomplish more projects was to increase program marketing. More than one-third of lighting trade allies said they would be interested in becoming a Service Provider, but about half of them reported being aware of the program. Thus, the program still has the opportunity to increase program participation through recruitment of new Service Providers as well as by driving greater participation among those already in the program. The EMS pilot has achieved limited participation. Like SBDI, it also achieved about half of its savings goals. About half of interviewed trade allies who reported doing relevant work were aware of its existence. One-quarter of tax-exempt respondents (and one- third of those with at least 50,000 kWh annual usage) reported being very interested in learning more about Ameren's EMS incentives.	
CommunitySavers	The target market is appropriately defined. The program targets subsidized multifamily properties and properties with tenants residing in non-subsidized housing with an income of at or below 200% federal poverty level. Because providing services to the low-income multifamily market requires a sufficiently specialized set of outreach and project implementation processes, maintaining the focus on this market with dedicated staff resources to serving is preferable to merging with resources serving other markets.	The target market is appropriately defined. The program targets subsidized multifamily properties and properties with tenants residing in non-subsidized housing with an income of at or below 200% federal poverty level. Because providing services to the low-income multifamily market requires a sufficiently specialized set of outreach and project implementation processes, maintaining the focus on this market with dedicated staff resources to serving is preferable to merging with resources serving other markets. Staff noted that the program offered in the third cycle of the Missouri Energy Efficiency Investment Act would target low-income customers living in single family and in manufactured/mobile homes.

Table 19: Issue 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?

Program	2017 Summary Response	2018 Summary Response
Efficient Products	Yes. For equipment other than smart thermostats, program rebates solely require that equipment has en ENERGY STAR-certified (i.e., the only quirement is energy efficiency). For smart rmostats, equipment is limited to the necessary hnological features (i.e., it must be a "learning" del with geofencing capabilities) and includes the st popular models in this emerging market. Ameren ssouri greatly expanded the list of qualified smart rmostats in PY17, in response to new models ning to market. The program includes rebates for a iety of equipment targeting a variety of end-uses ater heating, air conditioning, swimming pools, ating) that were cost-effective. The program does offer rebates for kitchen or laundry appliances cause current market offerings would not produce ings cost effectively. Other cost-effective end-use hnologies are targeted through other programs.	Yes, for measures that are cost-effective. It is increasingly challenging to offer a wide-variety of residential end-uses that are also cost-effective. For equipment other than smart thermostats, the program rebates solely require that equipment has been ENERGY STAR-certified (i.e., the only requirement is energy efficiency). For smart thermostats, equipment is limited to the necessary technological features (i.e., it must be a "learning" model with geofencing capabilities) and includes the most popular models in this emerging market. The program includes rebates for a variety of equipment targeting a variety of end-uses (water heating, air conditioning, swimming pools, heating) that were cost-effective. The program does not offer rebates for kitchen or laundry appliances because current market offerings would not produce savings cost effectively. Other cost-effective end-use technologies are targeted through other programs.
Energy Efficiency Kits	Kit programs focus on low cost measures that can easily be installed by non-energy professionals. The two kit delivery channels appropriately identified a diversity of low cost measures. Cadmus compared the school-based kit delivery channel and the multifamily kit delivery channel to similar utility programs to establish whether the kit contents represented standard practice or if other measures could be considered. For the multifamily delivery channel, all four benchmarked programs offered CFL light bulbs, showerheads, and kitchen and bathroom aerators to multifamily units. Compared to other programs, Ameren Missouri's multifamily kit delivery channel contained most of the common measures provided by utilities, along with measures typically not offered by other similar programs (e.g., LED light bulbs, pipe wrap). The Ameren Missouri school kits included a range of lightweight measures that students could bring home and easily install. All programs included in the benchmarking offered showerheads, aerators, and LED or CFL light bulbs to students and their families. Compared to five other school kit programs, Ameren Missouri's school kits contained all of the most common measures (e.g., light bulbs, showerheads, aerators, a filter alarm), except for an LED night light, which five other benchmarked programs offered. Results from the PY17 multifamily kits delivery channel participant survey suggest that furnace filter alarms may not	The two kit delivery channels appropriately identified a range of easily installed, low-cost measures that serve as the core of kit programs. Cadmus compared the school-based kit delivery channel and the multifamily-kit delivery channel to similar utility programs to establish whether the kit contents represented standard practice or if other measures could be considered. The Ameren Missouri school kits included a range of lightweight measures that students could bring home and easily install. Compared to five other school kit programs, Ameren Missouri's school kits contained all of the most common measures (e.g., light bulbs, showerheads, aerators, a filter alarm), with the exception of an LED night light, which five other benchmarked programs offered. Compared to other programs, Ameren Missouri's multifamily kit delivery channel contained most of the common measures provided by utilities (all four benchmarked programs offered LED or CFL bulbs, showerheads, and kitchen and bathroom aerators to multifamily units), along with measures typically not offered by other similar programs (e.g., LED bulbs, pipe wrap). In PY18, the multifamily kits were customized to include additional showerheads and bathroom faucet aerators for one additional bathroom, which better reflected the diversity of needs.

	be working in a way to meet the needs of property managers.	
Home Energy Report	This program does not incent end-use measures directly but does use tips in the HER reports to promote energy saving behaviors and measures. The tips target energy savings that could result from behaviors including changing settings on clothes dryers, cleaning the area around AC units, and changing thermostat settings—including most end uses that residential customers have in their homes.	This program does not incent end-use measures directly but does use tips in the HER reports to promote energy saving behaviors and measure installations for a diverse set of end-uses. The tips target energy savings that could result from behaviors including changing settings on clothes washers, water heaters, and thermostats, as well as replacing existing lighting with more efficient LED lighting, installing smart or programmable thermostats, and installing air sealing or insulation.
Heating and Cooling	The program targeted the heating and cooling end use. Within this end use the measures offer a range of energy-saving heating and cooling technologies, available at different price points to customers.	The program targeted the heating and cooling end use appropriately. Within this end use, measures offered a range of energy-saving heating and cooling technologies, available at different price points to customers. The program also correctly accounts for market and federal codes changes in its program design, phasing out program offerings when they are no longer effective under evolved market conditions.
Lighting	Yes. The program continues to offer a diverse array of bulb models that meet most household lighting needs. To ensure optimal savings going forward, Cadmus recommends to program shift the majority of sales of general-purpose bulbs from general market channels to discount channels.	Yes. The program continues to offer a diverse array of bulb models that meet most household lighting needs. The program has included an increasing number of reflector bulb types in recent years since saturation is lower for these bulbs, and savings opportunities are greater.
BizSavers	Participant surveys and interviews showed satisfaction with the range of program- eligible equipment, delivery time for ordered equipment, and the quality of the equipment and the installation. In the PY2016 evaluation, the primary measures-related concern was the elimination of incentives for exterior lighting, which reportedly had a largely adverse impact on trade allies. The current evaluation confirmed that the elimination of exterior lighting incentives in 2016 had a negative effect on business for trade allies involved in lighting sales and installations, particularly among lighting vendors (that is, those who largely sell lighting to installers or directly to customers who self-install). The evaluation found that reinstatement of exterior lighting incentives in 2017 produced a positive change in their business.	Participant surveys and interviews showed satisfaction with the range of program-eligible equipment, delivery time for ordered equipment, and the quality of the equipment and the installation. The evaluation identified several measure-specific findings. A variety of analyses of project tracking data provide evidence that the Energy Management System (EMS) pilot program, introduced in PY2016 to help non-profit and other tax-exempt entities install EMS, has had a positive effect on EMS projects and savings in the current program year. Specifically, it appears to have reduced the decline in EMS projects and savings compared to what might have occurred without the pilot. This suggests the EMS pilot program has met certain end-use needs. In the current program year, the implementer introduced some changes to incentive structures to promote certain measure types. One such change was a large increase in the incentive for cooling measures. Analysis of project tracking data suggests that this change may have stimulated more cooling projects and savings, increasing the

overall amount of demand savings.

Another change was to allow lighting fixture replacements to be made with Standard incentives, whereas previously they could be made only with Custom incentives. Surveyed trade allies were largely in favor of this change because it increased the speed and reduced the complication of making such replacements.

A class of measure types that may warrant attention in the future are lighting controls. The number of projects with lighting control measures, such as occupancy sensors, daylight sensors, and other dimming controls, declined sharply in PY2018 from previous years, possibly because of a perceived decrease in the value of controlling lighting as highly efficient LEDs become more pervasive. A large opportunity exists for increased penetration of lighting controls. Four out of five surveyed nonparticipants reported no lighting controls in their buildings. Those who have controls were twice as likely to report plans for more controls than those without controls, which suggests high satisfaction with controls among those who have them. Program staff reportedly has had discussions about how to drive Ethernet-controlled lights and more integration with building controls.

Finally, it should be noted that about one in five surveyed trade allies commented on the need for exterior lighting incentives – these were unsolicited open-ended comments, and so they may represent a higher percentage of all trade allies.

CommunitySavers	The program offers measures that cover all major multifamily in-unit end-use needs: lighting, appliances, space cooling and heating, and water heating. Additionally, the Standard and SBDI incentives available for common areas cover lighting, commercial refrigeration and kitchen equipment, and pool pumps. Building envelope and other improvements are eligible for Custom incentives. Participant survey respondents did not identify any additional measures that should be included in the program. Seventy-eight percent of participant survey respondents aware of the common area incentives stated that these incentives completely met their needs for efficiency improvements. One respondent indicated that the windows and doors were not addressed – these measures are allowable through the custom incentive component but may not have been addressed because they are cost prohibitive. Another respondent indicated that not all of the common area lighting was replaced. Additionally, 84% of property managers indicated satisfaction with the equipment installed through the program.	The program offers measures that cover all major multifamily in-unit end-use needs: lighting, appliances, space cooling and heating, and water heating. Additionally, the Standard and SBDI incentives available for common areas cover lighting, commercial refrigeration and kitchen equipment, and pool pumps. Building envelope and other improvements are eligible for Custom incentives. Participant survey respondents did not identify any additional measures that should be included in the program. Ninety percent of participant survey respondents were aware of the common area incentives stated that these incentives completely met their needs for efficiency improvements.

Table 20: Issue 4 - Are the communication channels and delivery mechanisms appropriate for the target market segment?

Program	2017 Summary Response	2018 Summary Response
Efficient Products	Yes. Customers may purchase qualified items from any retailer, within or outside of Ameren Missouri's service territory. Online purchases are also eligible for rebates, and Ameren Missouri's implementer began offering smart thermostats to customers through Ameren Missouri's online store in PY17, with a discount applied to the purchase price rather than a mailed rebate check. Ameren Missouri markets the program directly through a variety of channels and through the several large national retail chains that serve differing, broad, cross-sections of the population. Reviews of program marketing materials found Ameren Missouri follows marketing best practices.	Yes. Customers may purchase qualified items from any retailer, within or outside of Ameren Missouri's service territory. Online purchases are also eligible for rebates, and Ameren Missouri's implementer has offered smart thermostats to customers through Ameren Missouri's online store since PY17, with a discount applied to the purchase price rather than a mailed rebate check. Ameren Missouri markets the program directly through a variety of channels and through the several large national retail chains that serve differing, broad, cross-sections of the population. Reviews of program marketing materials found Ameren Missouri follows marketing best practices.
Energy Efficiency Kits	For school kits, communication flowed to and from Ameren Missouri, the implementers (ICF and NEF), school administrators and teachers, and students and families. Communication between these groups was clear and appropriate for the delivery channel. For the multifamily kits, communication flowed to and from Ameren Missouri, the implementer (ICF), the property	For school kits, communication flowed to and from Ameren Missouri, the implementers (ICF and NEF), school administrators and teachers, and students and families. Communication between these groups was clear and appropriate for the delivery channel. For the multifamily kits, communication flowed to and from Ameren Missouri, ICF, the property managers, and their tenants. According to Cadmus'

	managers, and their tenants. According to Cadmus interviews of stakeholders, the communication channels and delivery mechanisms for the multifamily delivery channel were appropriate, but there is an opportunity to better communicate available tenant informational materials.	interviews with stakeholders, communication channels and delivery mechanisms for the multifamily delivery channel were appropriate.
Home Energy Report	The communication channel for HER reports is mailing paper reports. Other similar utility programs supplement paper HER reports with emailed HER reports and web portals to engage customers more often and in more depth, which may result in deeper savings. Ameren Missouri plans to launch an email channel in PY18 for HER report delivery in addition to the mailed version.	Yes. The communication channel for HER reports includes mailing paper reports and emailing electronic reports (eHER reports were added in PY18). Other similar utility programs combine these channels as well as supplementing with web portals to engage customers more often and in more depth, which may result in deeper savings. Ameren Missouri plans to send mailed HER and emailed eHER reports to all customers in the program and to launch a web portal in PY19 for the HER program.
Heating and Cooling	Contractors are a critical interface to the public and can provide important program information when customers are likely to make equipment purchase decisions. The program also conducts broader marketing efforts to provide customers with information that could encourage them to replace their existing equipment before it experiences problems and/or engage their contractor about options when they come into contact (which also can encourage contractors to participate in the program). As such the communication and program delivery mechanisms are appropriate for the target market.	Heating and Cooling communication and program delivery mechanisms did not change from prior years and continued to be appropriate for the target market. Contractors serve as a critical interface with participants and can provide important, timely program information while customers are engaged in the decision-making process. The program also conducts broader marketing efforts to provide customers with information to encourage them to replace their existing equipment before it experiences problems.
Lighting	The program operates in several large national retail chains that serve differing, broad, cross-sections of the population. However, the program could better serve particularly underserved markets, such as low-income customers, by adding additional discount retailer partners, and a greater share of the budget to those retailers.	Yes. The program uses in-store and online marketing and makes discounts available in a variety of retail channels, including Do-It-Yourself (DIY), mass merchandise, dollar stores, community retailers (such as Goodwill), grocery stores, and other retailers.
BizSavers	The program implementer reported using a wide range of marketing outreach channels and methods to reach end-use customers and service providers (e.g., contractors, vendors, and distributors), including targeted outreach to decision makers representing customer account aggregates or "towers." While general program marketing may play an important role in generating overall program awareness and targeted outreach may be important in acquiring large projects, the importance of the program trade allies in generating savings cannot be underestimated. Using participant and non-participant reports on the source of program awareness, together with the estimated percentage of participation among customers, the evaluation team was able to calculate that trade allies are	The program implementer continued using a wide range of marketing outreach channels and methods to reach end-use customers and service providers (e.g., contractors, vendors, and distributors), including targeted outreach to decision makers representing customer account aggregates or "towers." Program staff reported continued efforts at targeting outreach to specific industries. This year's targeted efforts involved development of website infographics with industry-focused information on energy use, energy-saving tips, program savings, and program contact information. This industry-focused effort is follow-on to an effort targeting schools in PY2017, which produced results in the current program year.

about ten times as effective at generating projects as are other means: specifically, as much as one-third of customers who learn about BizSavers incentives from a contractor or vendor become participants, compared to about 3% of those who learn about the program from other means.

Given the above, the program's outreach efforts to trade allies are valuable. In this light, it is important feedback that half of equipment-appropriate trade allies are not aware of the SBDI Program or EMS pilot. Similarly, interviewed design professionals indicate limited awareness of New Construction program incentives, among themselves and their customers.

The potential for lost opportunities for savings in new construction projects (as it often will be more expensive to carry out deep-savings retrofits than to build the savings into the construction design) merits some attention to the New Construction Program. While the program exceeded its goals and achieved savings comparable to those achieved in several other large jurisdictions, program staff reported that the savings achieved are "expensive," relative to those achieved through the Standard and Custom programs. Activities that help achieve deeper savings in each project may improve the cost- effectiveness of the program.

One such activity may be to engage more effectively with design firms. Interviewed design professionals reported low-to-moderate program engagement and said they would like greater engagement. While New Construction participants learn about the availability of Ameren Missouri's New Construction incentives relatively early in their project, they do so primarily from a source other than their architecture or design firm. Possibly related to this, New Construction participants continue to be unsure about the requirement to apply for incentives before incorporating equipment into a project's plan, and thus they and the program may lose out on energy-saving opportunities.

The evaluation team identified two other factors that may point to the need for continuing and possibly increased program efforts at communicating program rules. First, about half of participants were not aware that the rules for Fast Track applications required customers to purchase and install all equipment before applying for incentives; lack of proper understanding of the program rules could result in project disqualification and loss of savings. Second, as before, the evaluation found that about one-quarter of Custom Program participants need to resubmit applications with additional documentation or

Another newly reported outreach activity is an effort to capitalize on a new St. Louis ordinance requiring benchmarking on all buildings above a certain size. The business development team identified owners of buildings above the threshold, helped them benchmark the buildings, and then steered them to the incentive program. Project tracking data suggest this effort so far may have had some limited effect.

	revised calculations, suggesting a continued need to clarify and communicate the application requirements to customers and trade allies.	

CommunitySavers	The communication and delivery channels are appropriate to the target market segment. Staff used a variety of approaches to promote the program incentives including direct outreach to property managers and owners, working with community groups and apartment associations, and working with Ameren Missouri trade allies to promote the program incentives. Staff stated that during PY2017 they were involved in the St. Louis Apartment Association and attended multiple events during the year, that they continued their association with the Tower Grove Neighborhood Association, and that they attended an application workshop hosted by the Missouri Housing Development Corporation and provided information about the program to developers and property management companies. Staff also continued their direct outreach to multifamily property owners and managers. Repeated contact with property managers and owners is important for this market segment because this segment is typically viewed as unresponsive and difficult to reach and staff continued to engage in this activity. Staff engaged with the Missouri Housing Development Corporation and attended PACE meetings during PY2017. Staff noted that they have provided information to property managers on PACE financing but that there was little interest in it. Staff engaged in outreach to trade allies during PY2017 and reported that they received project referrals from the trade allies. Staff emphasized the importance of outreach to HVAC contractors, in particular, because property managers or owners may contact them in the event that their HVAC equipment fails. Implementation staff noted that during PY2017 they focused on building a pipeline of common area projects distinct from the pipeline of direct install projects. This was contrasted with the approach used in PY2016 that focused on direct install projects as a first step in the participation process. Additionally, the	The communication and delivery channels are appropriate to the target market segment. Staff used a variety of approaches to promote the program incentives including direct outreach to property managers and owners, working with community groups and apartment associations, and working with Ameren Missouri trade allies to promote the program incentives. Staff reported that the outreach and marketing efforts in PY2018 were similar to the approaches used in other years. During the year, six email newsletters and six postcard mailings were sent to multifamily properties. Staff continued to engage in direct outreach to property managers. Staff also continued to make presentations to neighborhood associations. Among those participants that had not received common area, the share of participant survey respondents who reported that they were aware of common area incentives increased from 15% in PY2016, to 83% in PY2017, to 100% in PY2018. Additionally, 67% of respondents aware of the common area incentives reported that they were very likely to complete a common area project at the property.

	program implementation contactor increased staffing such that there are separate program staff members focused on managing the direct install and the common area components. Two case studies were developed in PY2017 featuring complexes that implemented lighting, HVAC, appliance, and water heating improvements. Among those participants that had not received common area incentives at the time of the survey, the share of participant survey respondents who reported that they were aware of common area incentives from 15% in PY2016 to 83% in PY2017. Additionally, 67% of respondents aware of the common area incentives reported that they were somewhat or very likely to complete a common area project at the property.	

Table 21: Issue 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	2017 Summary Response	2018 Summary Response
Efficient Products	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 for a given measure also helps implementation. Adjusting program incentives in response to market changes, and for the purpose of reallocating budget to more cost-effective measures, also improves implementation. In PY17, a higher incentive for RACs led to much higher participation for that measure, while the growing popularity of smart thermostats, accompanied by more models coming to market and falling prices, encouraged Ameren Missouri to lower the smart thermostat incentive to conserve program budget.	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 for a given measure also helps implementation. Adjusting program incentives in response to market changes, and for the purpose of reallocating budget to more cost-effective measures, also improves implementation. In PY18 program incentives were unchanged from PY17, however the program implementer reduced marketing efforts from previous years in order to conserve budget so that the program would be able to continue paying incentives through the end of the three-year program cycle.
Energy Efficiency Kits	For the school delivery channel, the evaluation analysis found that the vast majority of respondents to the school kits participant survey found the instructions provided with the kit to be useful or very useful. Installation rates were in the range of benchmarked peer programs, although it may be possible to mitigate showerhead dissatisfaction through stronger emphasis of measure benefits. Adding the gas partnership to the school kits delivery channel effectively reduced the inefficiency of providing kits to households not using electricity from Ameren Missouri to heat their water. For the multifamily delivery channel, the delivery channel reduced the problem of incentivizing property managers to install energy efficient measures by providing free measures. In PY17 the program achieved 100% installation for distributed measures distributed to property managers for multifamily properties.	For the school delivery channel, the evaluation analysis found that school kits' distribution may experience inefficiencies due to households with more than one eligible child receiving more than one kit. Adding further gas partnership to the school kits delivery channel continued to reduce the inefficiency of providing kits to households not using electricity from Ameren Missouri to heat their water. For the multifamily delivery channel, the delivery channel reduced the problem of incentivizing property managers to install energy-efficient measures by providing free measures. In PY18, the program maintained 100% installation for measures distributed to property managers for multifamily properties. The multifamily delivery channel further maximized the participation of qualified properties by offering additional showerheads and bathroom faucet aerators for units having two bathrooms.
Home Energy Report	Cadmus found that HER treatment group customers with higher energy consumption save more energy than those with lower energy consumption. To increase cost effectiveness, we recommend Ameren Missouri target higher usage customers to receive HER reports and implement the planned email report delivery channel.	In contrast to PY17, in PY18 Cadmus found that HER treatment group customers with lower energy consumption were able to save as much as customers with higher energy consumption (both in absolute value or relative percentages). Therefore, Cadmus recommends Ameren Missouri try to identify what changes could be driving the expanded participation and continue those messages or approaches.
Heating and Cooling	The program could conduct additional marketing to explain the long-term cost savings of energy-efficient heating and cooling equipment and reduce customers' initial barriers to purchasing equipment by increasing incentives or providing	The program could adjust marketing materials to focus on the long-term cost savings benefits of replacing inefficient heating and cooling equipment prior to experiencing issues. Additionally, the program could reduce

	financing options.	customers' initial barriers regarding purchasing equipment by increasing incentives or providing financing options.
Lighting	Customer acceptance, based on the residential survey results, appears high. In addition, education and age do not appear to be strong predictors of whether a customer has used an LED, while income, homeownership status and housing type do. These factors strongly point to price continuing to be the primary and perhaps only barrier to LED uptake. Reducing the price barrier for the lowest income populations could drive greater penetration.	Residential survey results from PY17 indicated that income and homeownership served as the strongest predictors of whether a customer uses LEDs. These factors strongly point to price and availability by retailer channel continuing as the primary barriers to LED uptake.
BizSavers	The evaluation team repeats the recommendation to continue to attempt to recruit more SBDI Service Providers and work with existing service providers to increase the number of projects they deliver to decrease the risk of relying on a single provider to deliver most program savings. One way to achieve the latter may be to work with Service Providers to help them penetrate businesses that are not responsible for buying or maintaining their lighting equipment. Small healthcare customers (such as medical and dental offices) may be special, but not exclusive, targets for such an effort. One way in which the program may help Service Providers is in facilitating efforts to bring landlords and tenants together to present savings opportunities. Although the New Construction program is exceeding goals, the program implementer should consider increasing engagement with architects and design firms to increase their awareness of the program and its rules and help ensure that the most possible savings are achieved with each project. In addition, the evaluators repeat last year's recommendation to increase awareness of the New Construction program and its rules among all contractors and vendors, such as by providing special recognition to contractors who attend specific training on, and demonstrate knowledge of, New Construction Program rules and processes. The implementer should augment efforts to improve awareness of the rules governing Fast Track applications to avoid loss of savings from disqualified applications. Working with lighting distributors to ensure that they fully explain the requirement to customers may be valuable.	As indicated above, the BizSavers program met or exceeded all savings targets and has done a good job of delivering the program to all segments of the nonresidential market.
CommunitySavers	Continued engagement with PACE may provide additional opportunities to finance higher cost measures with longer measure lives. Reviewed literature indicates that the inability of property managers and PACE administrators to estimate	Staff noted that some properties have difficulty securing financing for more costly projects such as building envelope improvements. The program should consider exploring offering on-bill financing as an alternative means for properties to

	project energy savings may be a factor that limits PACE participation. The program should consider identifying itself as a potential resource for property managers and PACE administrators for estimation of project energy savings. Provide links to PACE and other financing opportunities on the program website along with brief information about the key benefits of PACE financing (included in a tax assessment, transferable in the even the property is sold) to increase awareness of the opportunities.	arrange on-bill financing.