



Independent EM&V Audit of the Ameren Missouri PY2017 Program Evaluations

Final Report

July 24, 2018



MichaelsEnergy

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I 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:

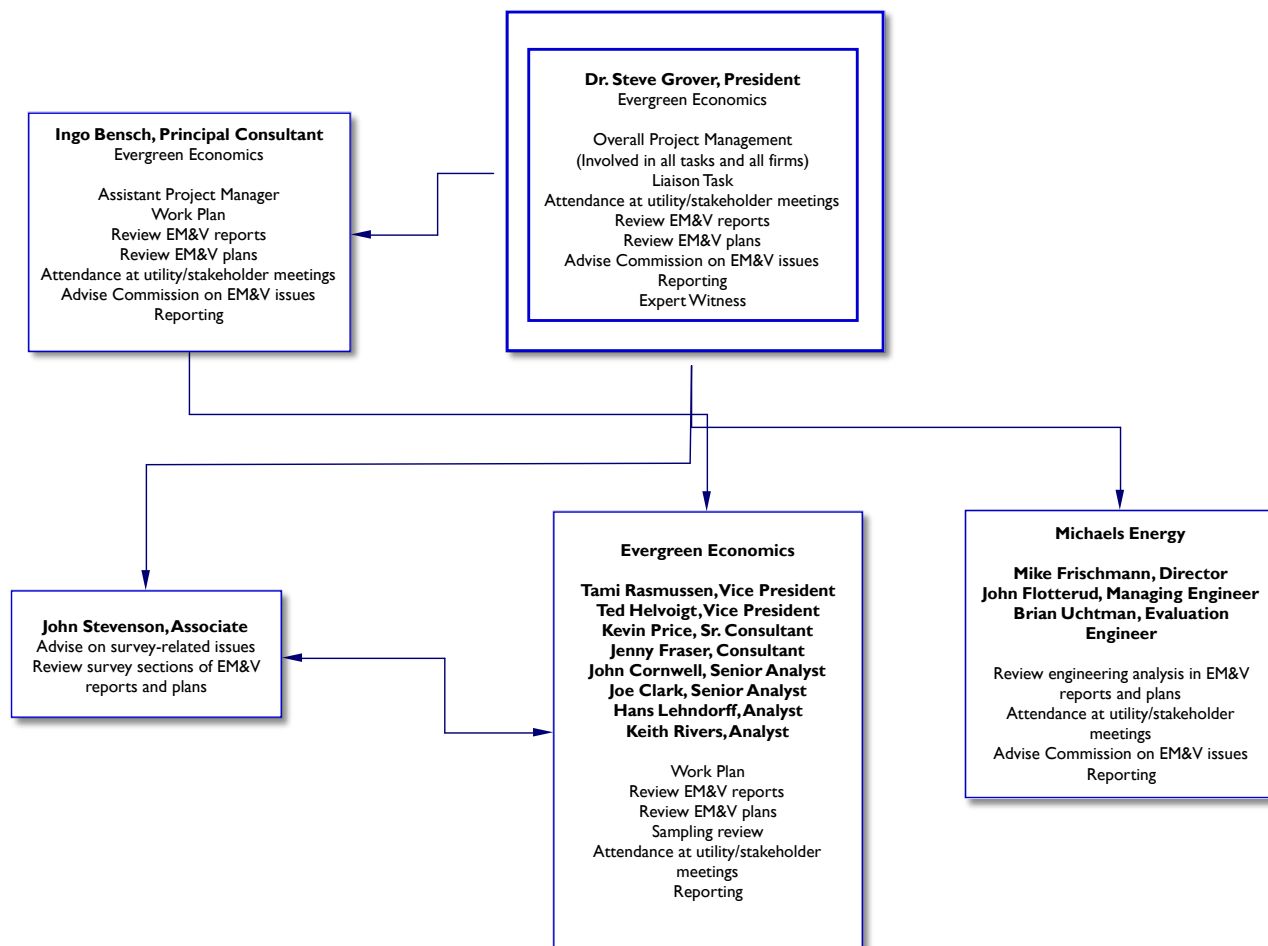
- **BizSavers** - Designed to help businesses identify and implement energy saving projects, the BizSavers Program includes the Custom, Standard, Energy Management System (EMS) Pilot, New Construction, Retro-Commissioning, and Small Business Direct Install programs.
- **Community Savers** - Provides 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) 2016. Cadmus conducted evaluations of the residential energy efficiency programs, and ADM conducted evaluations of the energy efficiency programs covering the non-residential sector.

In 2017, 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.

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*.

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. Key findings of the Evergreen team’s review are summarized below.

A review of PY2017 evaluation reports 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 throughout this report.

Cadmus and ADM provided a total of 33 recommendations on ways in which Ameren Missouri can improve its residential and commercial and industrial (C&I) programs going

forward. Seventeen of these recommendations were related to the impact evaluation, and sixteen recommendations were related to the program processes.

Cadmus and ADM also reviewed previous year recommendations and tracked if the recommendations have been adopted. Of 45 recommendations tracked from the previous year, 40 have been adopted or are in the process of being adopted.²

Our audit conclusions for the PY2017 Ameren Missouri program evaluations are presented below, along with recommendations where appropriate for future evaluation work. Most of these are reiterations of recommendations that we made as part of the PY2016 audit but were not adopted. We discuss several overarching issues first relating to mid-life savings adjustments and free ridership, followed by some program-specific recommendations that affect both PY2017 and future evaluation activities.

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. 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 TRM³ 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 The *Independent EM&V Audit of the Ameren Missouri PY2016 Program Evaluations* (July 31, 2017) listed 37 recommendations from the PY2016 evaluations. This amount did not include eight process related recommendations made by ADM for the CommunitySavers program. These recommendations and status are included in this year's audit.

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.
- Residential HVAC measures: Early retirement residential HVAC measures require a mid-life savings adjustment after six years in the cost effectiveness analysis that is consistent with the Ameren and Missouri TRMs. As we note below, the current assumed EUL of 18 years for the early retirement measures is too high.

These mid-life adjustments may also have significant impacts on the Earning Opportunity (EO) determinations, as the mid-life adjustments needed for the PY2017 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 PY2017 and future years.

1.2 Residential Free Ridership

In the previous audit, we raised the issue of how the “don’t know” survey responses were being used in the residential free ridership calculations. We recommended that there should be no changes to the free ridership score based on a “don’t know” response, as this answer is not providing any information that can be used to characterize free ridership.

In the PY2017 residential program evaluations, the “don’t know” responses are still being used to adjust the free ridership score, and we believe that these adjustments are lowering free ridership estimates. The Cadmus reports defend this approach by quoting the SEEAAction Impact Guide that says that a person should only be considered a free rider if they can say with certainty that they would have installed the measure without the program. The real issue here, however, is not *full free riders* (which is what the SEEAAction Guide is really referring to), but *partial free riders*, which is what the scoring method is intended to estimate and what impacts the majority of participants.

Moving forward, we recommend that the “don’t know” responses be omitted entirely from the free ridership calculations (i.e., coded as missing values), so that the free ridership scores are only calculated based on respondents that are able to provide a response to the question. From the discussions with Cadmus during the stakeholder meetings, it appears that there is a large enough sample to handle the removal of these responses. If the responses are to remain in the free ridership calculation, we reiterate our recommendation from last year – that the “don’t know” responses should be given a reduction value of 0 percent so that they do not end up improving the free ridership score.

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.

BizSavers Program

In the PY2016 audit, we discussed how the survey question “Would you have been financially able to install the equipment or measures without the financial incentive from the BizSavers Program?” was scored to estimate the free ridership rate. We believe that there is a possibility that the scoring for this question may be too restrictive, as customers that answer ‘no’ are automatically scored as a net participant based solely on their response to a single question. The rest of the respondents (i.e., those that answer ‘yes’ to the initial question) were then subjected to a battery of questions designed to provide a more nuanced estimate of free ridership, one that has a series of consistency checks.

From the final results of the PY2016 evaluation and in the discussion of the draft PY2017 evaluation results, it appears that this particular question is only removing a small number of participants from the longer free ridership question algorithm. Since this particular screen is having little impact on the overall free ridership score, we recommend that it not be used to automatically score customers as net participants (i.e., free ridership = 0). Instead, all customers would be scored based on the longer free ridership question battery. The initial financial ability question can then be used as a consistency check for the other responses.

Heating and Cooling Program

In the PY2016 audit report, we discussed the high early replacement rates in the program and identified areas where we believe that more research was needed. For the PY2017 program, the early replacement rate is still quite high (96 percent, for the initial *ex ante* savings values) but with no additional research provided to support these numbers. In 2017 the program did change its incentive structure so that the same rebate is paid for early replacement and replace on burnout, which is an important improvement to the program.

The Heating and Cooling Program evaluation reports an early replacement rate of approximately 96 percent based on program data. While this value is based on program data, it appears to be very high in comparison with the Missouri TRM recommended early replacement rate of 14 percent (or 40 percent if the CAC unit is a secondary unit in a CSR project). The high early replacement rate is potentially further problematic because annual savings for early replacement measures are as much as five times higher than replace-on-burnout measures.⁴

An additional area of concern is the EUL assumed for these measures. For the early HVAC replacements, the text of the Ameren TRM states that the incremental cost for early replacement measures is calculated “assuming the Standard/Code measure will be installed at the expiration of the remaining useful life of the existing equipment, typically after one third of the useful life of the new measure”⁵. However, the table of savings values in that section does not have a column for midlife adjustments, so the change in savings after the baseline change is not included.

The early replacement savings numbers need to account for the change in baseline from the existing equipment after the early replacement period has ended. This can be done either by setting the EUL to reflect just the acceleration in replacement (e.g., 6 years), or else adjust the average annual savings to reflect a blended baseline over the life of the measure (e.g., existing baseline for the first 6 years, standard efficiency for next 12 years). It appears that neither of these approaches is reflected in the Ameren TRM and the result is a significant overstatement of savings for these measures.

Although Ameren reports that the program is specifically targeting early replacements, there are some indications from the 2016 evaluation that the early replacement numbers

⁴ The larger number claimed for early replacements also increases the impact estimates substantially compared to a similar HVAC program offered by Ameren Illinois. When the claimed savings from Ameren Missouri CAC measures are compared with the same program in Ameren Illinois, for example, the average savings per measure type for the Missouri program is 2.03 times greater than for the same measures in Illinois. (1,779 kWh average per measure in Missouri versus 875 kWh in Illinois). See *Impact and Process Evaluation of 2015 (PY8) Ameren Illinois Company HVAC Program* by Opinion Dynamics (February 23, 2017).

⁵ Appendix F, page 9 of the Ameren TRM for MEEIA Cycle 2016-2018.

claimed from the program are too high. Of the ten contractors interviewed in 2016 evaluation, for example, only seven were familiar with the early replacement criteria used for the program. Of these, only one contractor said they used the correct criterion by measuring for a temperature drop across the coil. Similarly, when customers were asked about their reasons for contacting their contractor about their systems, responses such as “system stopped working” (33%) and “system had problems” (37%) are more suggestive of replace-on-burnout systems rather than early replacements. All of this suggests that the early replacement numbers are less than the 96 percent identified in the program tracking data. Note that some of this issue will likely be addressed starting in PY2018 when contractors will be required to report the results of the coil temperature tests when claiming an early retirement installation. Contractors were also interviewed in 2017, but these questions appear not to have been explored in the latest evaluation.

As was done in PY2016, Cadmus attempts to correct for some of these issues in the *ex post* impact analysis in PY2017 by re-categorizing some of the installations based on their responses to survey questions. This results in a split of 87 percent early replacement and 13 replace-on-burnout. While this is a step in the right direction, it still is much higher than the split assumed in the Ameren Missouri TRM. We also recommend that these types of adjustments be made during the gross impact analysis, rather than as part of the net impact calculations.

ASHP And Ductless Heating Savings For Electric Resistance Baseline Replacements

In the PY2016 audit, we recommended using a consistent value of the effective full load hours (EFLH) when calculating the heating savings for air-source heat pumps and ductless heat pumps. It appears that this was not incorporated into the savings calculations for PY2017, so we are repeating our earlier recommendation here.

For both measures, the savings were estimated using metered data collected on equipment installed during PY2017. The EFLH was also estimated using the operating efficiency observed during the equipment metering, and the operating efficiency value was lower than the nameplate efficiency of the units. To calculate the savings, Cadmus used the EFLH related to the lower operating efficiency to the nameplate efficiencies of the new units. Doing this under-estimated the savings for some measures, and increased them for others.

We estimate that correcting this issue in the savings calculations will decrease savings by approximately 2 percent for the entire program. A similar reduction was estimated for PY2016.

Home Energy Report Program

For last year’s audit, we made the recommendation that the comparison between the treatment and control groups in the pre-period should include a comparison of

participation rates in the other Ameren Missouri energy efficiency programs. This was not done for the PY2017 evaluation, so we are reiterating this issue again.

Differences between the groups in program participation in the pre-period could have affected the savings estimates in two ways. First, if there were differences in program participation rates, then some of the observed savings from the home energy reports in the post-period should have been attributed to the other efficiency programs. Second, the estimate of program uptake in the post-period may also be affected if there were already unequal levels of program participation in the pre-period (i.e., there was less opportunity for participation in the post-period if there were already unequal levels of participation in the pre-period).

Evergreen Economics evaluated a similar Opower program for Hawaii that utilized a randomized assignment for both the treatment and control groups. Despite the random assignment, there was a statistically significant difference in energy efficiency program participation in the pre-period across both groups. When this difference in participation was incorporated into the regression model used to estimate impacts, the original savings estimates were reduced by 29 percent.⁶ This demonstrates the potential significance of this issue and why it should be included in the comparison checks between the treatment and control groups.

This comparison is relatively simple to conduct and will not require a significant increase in evaluation time and effort. We had previously recommended that this be done beginning with the PY2017 evaluation.

Residential Lighting Program

Net impacts for the residential lighting program are calculated using the results of a lighting elasticity model that was estimated as part of the PY2016 evaluation of this program. Since the lighting programs is a significant contributor to overall savings, we recommend that the elasticity model be estimated each year, as this is a relatively simple exercise once the sales data are already compiled to calculate savings. Given that LEDs are continuing to grow in popularity and the market is changing quickly (as demonstrated by the general drop in LED prices and increased adoption), it is likely that the elasticity estimates are also changing from year to year.

The elasticity model Cadmus estimated for PY2016 contains two sets of four variables. The first set of variables is comprised of interactions between the natural logarithm of bulb price and an indicator variable representing the retail channel (small chain store, warehouse club, DIY, and mass market); the second set of variables is comprised of

⁶ A summary of this analysis can be found in the paper written by Evergreen staff: *Opower, Where Art Thou? Savings Estimates from a Pilot Program*, prepared for the 2013 International Energy Program Evaluation Conference (IEPEC). <https://www.iepec.org/wp-content/uploads/2018/02/077-1.pdf>.

interactions between the natural logarithm of price and an indicator variable representing the type of bulb (reflector, globe, A-line 43 watt, and reflector 50-watt). The model does not include price, retail channel, or bulb type represented as a main effect (i.e., without interaction with another variable).

Cadmus justifies this specification by asserting that their interest is in estimating a unique relationship between price and bulb sales for each retail channel and that because of this, price does not need to be represented in the model as a main effect. In addition, Cadmus asserts that the model was estimated as a fixed effects regression and, therefore, there is no need to include indicator variables for retail channel or bulb type because these variables are “fixed” across time. We found no mention of the fixed-effects specification in our review of the evaluation report, but accept Cadmus’ assertion that the model was specified as fixed-effect. Nevertheless, the specification used in this model does not support the Cadmus’ estimates of retail channel-level elasticities.

The estimated coefficients from a log-log regression model represent estimates of the elasticity between the dependent variable and the independent variable. In addition, when the regression model is specified properly and the elasticity formula is correctly defined, a linear combination of the coefficients may also represent an estimated elasticity. Due to an apparent misspecification in the Cadmus model, however, the elasticity estimates for each channel individually, each bulb type individually, and each channel-bulb type combination are likely incorrect. The misspecification is that Cadmus interacted price with both retail channel and bulb type in the regression model, but failed to interact retail channel with bulb type. Cadmus then erroneously adds together coefficients that are not additive given the specification of their model.

We would be happy to work with Cadmus to correct the model for future evaluations. For the reasons listed above, we believe that the current model is misspecified and therefore needs to be redone in PY2018 and updated for future program years.

Nonparticipant Spillover

The nonparticipant spillover for the Residential Lighting Program is estimated using the same approach as in PY2016. As we wrote in the last audit report, we believe that this method is fundamentally flawed. Specifically, it is not appropriate to go from asking respondents general questions about program influences and then using this information to calculate very specific market shares.

In general, the spillover survey questions are very complex and are focused on asking how the program is influencing **non-program** bulb sales. The survey assumes that the respondents will have put a significant amount of thought and possibly some research prior to answering the questions. Even with their knowledge of the lighting markets and

their own store sales, it is not reasonable to expect respondents to provide accurate enough information on non-program sales to calculate actual market shares for program influence.

Related to this, the issue of prefacing the questions by saying that you are only asking for an opinion on the program influence and then using the results later to calculate market shares is a serious flaw. It basically excuses the respondent from providing an accurate response (or from doing the background research that is required to provide an accurate answer), but then the responses are used to calculate a very specific market value.

Looking at the scores, the respondents also provide very different ratings for the influencing factors, which suggests that they are interpreting the questions differently. There is no reason, for example, why two different respondents from the same store chain should be providing vastly different answers on program influence if they had both understood the question correctly. The way the scores are eventually calculated assumes that each respondent is interpreting each question identically.

With the program influence factors, there is still no supporting justification provided (just speculation) as to why the program should be having a positive influence for the non-program sales. A good case can be made that the program efforts in displays, stocking, employee education, and promotions would/should focus on program bulbs at the expense of non-program bulbs (i.e., a negative effect). Cadmus has indicated that respondents could provide a negative influence response, but the way the question is actually worded (asking for a rating on a scale of 0 to 100) is essentially telling the respondent that the effect should be positive (or possibly zero). The survey design should not rely on the respondent to offer up a response outside the range to indicate a negative relationship.

The Cadmus report references the UMP and several other evaluation studies as support for using their approach. Contrary to what is stated in the report, however, the UMP does not provide an adequate justification for this particular method – the UMP only has a very general recommendation to interview supply side market actors for upstream programs. Similarly, none of the other evaluations provide examples of this type of survey used to calculate specific market shares.

To our knowledge, there are no other evaluation studies that use this specific method to estimate market shares for nonparticipant spillover. Cadmus cites several evaluation reports in support of their method, but they all differ significantly from the residential lighting market context. Three of the cited reports relate to either federal efficiency rulemaking processes or else building code compliance, both of which are vastly different applications than the retail lighting market. The remaining evaluation report is a NEEA study of a small retail products program. While this evaluation did involve some retailer interviews to determine NEEA's influence in the retail product market, the interview

results are not used to calculate a quantitative measure of either program influence or market share.

A separate issue is the estimate of the total nonparticipant LED bulbs that are credited to the program. Once the program sales bulbs are removed, the entire total of the remaining LEDs is used to calculate the spillover total. This provides too high of a starting point for calculating program spillover, as some of these non-program sales will be driven primarily by non-program factors. For example, the possibility of analogous 'free riders' for non-program bulbs should be considered, as at least some (if not all) of the non-program LEDs would have been purchased regardless of the program activity. It is important to note that the retailer interviews would not have addressed this issue, as none of the respondents will have a sense of this free ridership component without doing their own survey research with their customers addressing this very specific topic (i.e., the likely sale of non-program LED bulbs in absence of the program). In other words, there would be no issue of double counting the issue of free ridership by making this adjustment. If the program free ridership rate is applied to the non-program LED bulb sales, then the spillover estimate would be reduced by approximately half (46 percent).

In summary, we do not believe that this estimate of nonparticipant spillover should be accepted due to the serious problems with the survey methodology. We have set the nonparticipant spillover savings to zero in the tables below showing the audit-adjusted savings for PY2017.

1.3.1 Portfolio Level Findings

The recommended changes to the residential PY2017 program savings estimates are shown in the following tables. Table 1 shows the original energy savings reported by the evaluation while Table 2 shows the energy savings recommended by the audit for each program. Table 3 and Table 4 show similar information for the demand savings.

To summarize, these tables reflect the following changes to residential program savings:

- Nonparticipant spillover for the residential programs is evenly distributed across programs;
- The savings for the Heating and Cooling Program is reduced by 2 percent to adjust for the EFLH issue; and
- Spillover for the Residential Lighting Program is set to zero;

Table 1: Evaluation Reported Savings (MWh) - Residential Programs

Program	Ex Post Gross Savings (MWh/Yr)	Participant Net Savings (MWh/Yr)	NPSO (MWh/Yr)	Evaluated Total Net Savings (MWh/Yr)	NTG Ratio
Efficient Products	9,956	7,452	214	7,666	77%
Energy Efficiency Kits	5,367	4,983	22	5,004	93%
Heating and Cooling	44,089	37,093	5,547	42,640	97%
Lighting	22,733	21,828	428	22,256	98%

Table 2: Audit Recommended Savings (MWh) - Residential Programs

Program	Audit Ex Post Gross Savings (MWh/Yr)	Participant Net Savings (MWh/Yr)	NPSO (MWh/Yr)	Audit Total Net Savings (MWh/Yr)	NTG Ratio	% Change from Evaluated Net Savings
Efficient Products	9,956	7,452	1,553	9,005	90%	17%
Energy Efficiency Kits	5,367	4,983	1,553	6,536	122%	31%
Heating and Cooling	43,089	37,093	1,553	38,646	90%	-9%
Lighting	22,733	12,276	1,553	13,829	61%	-38%

Table 3: Evaluation Reported Savings (MW) - Residential Programs

Program	Ex Post Gross Savings (MW)	Evaluated Net Savings (MW)	NTG Ratio
Efficient Products	6.321	4.799	76%
Energy Efficiency Kits	1.044	1.017	97%
Heating and Cooling	30.436	29.324	96%
Lighting	3.421	3.618	106%

Table 4: Audit Recommended Savings (MW) - Residential Programs

Program	Audit Ex Post Gross Savings (MW)	Audit Net Savings (MW)	NTG Ratio	% Change from Evaluated Net Savings
Efficient Products	6.321	5.717	90%	19%
Energy Efficiency Kits	1.044	1.271	122%	25%
Heating and Cooling	29.746	26.678	90%	-9%
Lighting	3.421	2.081	61%	-42%

Finally, Table 5 and Table 6 show the overall effect of the audit recommendations on the entire PY2017 program portfolio. As there were no recommended changes for PY2017 for the BizSavers and CommunitySavers programs, the savings revisions are limited to the residential programs as discussed above. Overall, the recommended changes from the audit result in a reduction of 3 percent for the PY2017 portfolio-level energy savings and 3 percent for demand savings.

Table 5: Summary of Audit Recommended PY2017 Savings (MWh) – All Programs

Program	Ex Post Gross Savings (MWh/Yr)	Total Net Savings (MWh/Yr)	NTG Ratio	% Change from Evaluation Savings
Efficient Products	9,956	9,005	90%	17%
Energy Efficiency Kits	5,367	6,536	122%	31%
Home Energy Reports	9,021	9,021	100%	0%
Heating and Cooling	43,089	38,646	90%	-9%
Lighting	22,733	13,829	61%	-38%
Residential Total	90,166	77,036	85%	-11%
BizSavers	191,298	188,274	98%	0%
CommunitySavers	7,335	7,335	100%	0%
Non-residential Total	198,633	195,609	98%	0%
Portfolio Total	288,799	272,645	94%	-3%

Table 6: Summary of Audit Recommended PY2017 Savings (MW) – All Programs

Program	Audit Ex Post Gross Savings (MW)	Audit Total Net Savings (MW)	NTG Ratio	% Change from Evaluation Savings
Efficient Products	6.321	5.717	90%	19%
Energy Efficiency Kits	1.044	1.271	122%	25%
Home Energy Reports	4.205	4.205	100%	0%
Heating and Cooling	29.746	26.678	90%	-9%
Lighting	3.421	2.081	61%	-42%
Residential Total	44.737	39.953	89%	-7%
BizSavers	42.342	41.494	100%	0%
CommunitySavers	2.059	2.059	100%	0%
Non-residential Total	44.401	43.553	98%	0%
Portfolio Total	89.138	83.506	94%	-3%

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.⁷ 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, 2019.⁸ The MEEIA Cycle 2 programs are:

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- **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.

⁷ The PSC is currently in the process of revising the MEEIA rules.

⁸ 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.”⁹

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?

⁹ 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 2017, 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 2017 (PY2017).

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 PY2017 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 PY2017, 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 19,171 rebates were delivered to Ameren Missouri participants for the Efficient Products Program in PY2017.

Using the Vision database,¹⁰ 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 PY2017 Energy Efficiency Kits program, which provides energy efficiency kits through two separate delivery channels: schools and multifamily property managers. The school kits provide

¹⁰ 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 PY2017 energy efficiency program portfolio, as reported by the evaluation teams. Note that some audit recommendations for revising the PY2017 savings are discussed in Section 6 of this report.

Table 7 and Table 8 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 7: Ameren Missouri Portfolio Energy Savings in PY2017, MWh

Program	PSC – Approved Targets	Ex Ante Gross Savings	Ex Post Gross Savings	Ex Post Net Savings	NTG Ratio	% of Target Reached
Efficient Products*	6,847	9,855	9,956	7,666	77%	112%
Energy Efficiency Kits	6,214	6,032	5,367	5,004	93%	81%
Home Energy Report	33,750	NA	NA	9,021	NA	27%
Heating and Cooling	22,320	48,086	44,089	42,640	97%	191%
Lighting	10,266	21,806	22,733	22,256	98%	217%
Total Residential Portfolio	79,397	85,779	82,145	86,587	105%	109%
CommunitySavers	5,013	5,586	7,335	7,335	100%	146%
Total Multifamily Portfolio	5,013	5,586	7,335	7,335	100%	146%
BizSavers Custom*	89,061	67,068	65,490	63,894	98%	72%
BizSavers Standard	32,462	96,866	90,498	88,369	98%	272%
BizSavers New Construction	5,642	25,912	25,660	26,272	102%	466%
BizSavers RCx	7,639	3,413	3,494	3,494	100%	46%
BizSavers SBDI	11,400	5,891	6,155	6,245	101%	55%
Total C&I Portfolio	146,204	199,150	191,298	188,274	98%	129%
Total*	230,614	290,515	280,778	282,196	101%	122%

* Smart thermostat totals are included in the Efficient Products Program. Smart thermostats have an approved energy target of 2,087 MWh and have *ex post* gross savings of 5,224 MWh.

* EMS Pilot Program totals are included in the BizSavers Custom Program.

The residential portfolio surpassed the target savings goal, achieving 109 percent of the net savings target. The Lighting Program had the highest savings relative to its target, surpassing Ameren Missouri's savings target with 217 percent of its goal achieved. Both the Energy Efficiency Kits Program and Home Energy Report Program were unable to reach their targets, achieving 81 percent and 27 percent of their goals, respectively.

The 2017 C&I portfolio surpassed its approved targets, in contrast to the 2016 program year, in which one program exceeded its energy target. Of the five PY2017 program areas, the BizSavers New Construction Program significantly surpassed its energy savings target, achieving 466 percent of its goal. This is a large contrast compared to PY2016, where the New Construction Program significantly missed its energy savings target, achieving 28 percent of target savings. The BizSavers Standard Program also exceeded its energy savings target, achieving 272 percent of its goal in PY2017. All other BizSavers programs significantly missed their target goals, with the BizSavers Custom Program achieving 72 percent of its goal, the Small Business Direct Install (SBDI) Program achieving 55 percent, and the Retro-Commissioning (RCx) Program achieving the lowest, at 46 percent of its target savings.

Similar to Table 7, Table 8 displays approved targets for demand savings. The residential portfolio surpassed demand targets, achieving 119 percent of target savings. The Lighting Program performed best, achieving 236 percent of demand goals. Both the Heating and Cooling and Efficient Products Programs accomplished their goals, achieving 206 percent and 134 percent of their target savings, respectively. The Energy Efficiency Kits Program and Home Energy Report Program both fell short of their target savings, obtaining 97 percent and 27 percent of their goals, respectively.

The 2017 C&I portfolio over-performed compared to the 2016 program year, achieving 153 percent of its target demand savings. Similar to energy savings (MWh), the BizSavers Standard Program and New Construction Program performed the best, achieving 266 percent and 249 percent of their target savings, respectively. Additionally, the BizSavers Custom Program and Retro-Commissioning Program also surpassed their demand targets, achieving 113 percent and 111 percent of their goals, respectively. The Small Business Direct Install Program fell short of its target savings, obtaining 55 percent of its goal.

Table 8: Summary of PSC-Approved Targets for Demand Savings, MW

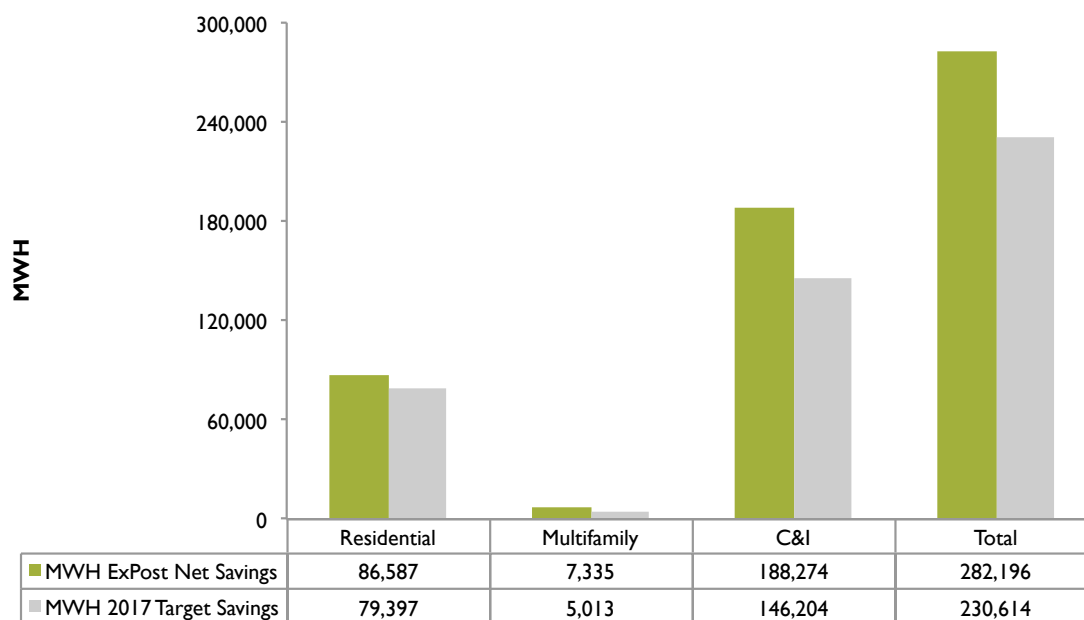
Program	PSC – Approved Targets	Ex Ante Gross Savings	Ex Post Gross Savings	Ex Post Net Savings	NTG Ratio	% of Target Reached
Efficient Products*	3.594	6.218	6.321	4.799	76%	134%
Energy Efficiency Kits	1.046	1.737	1.044	1.017	97%	97%
Home Energy Report	15.774	NA	NA	4.205	NA	27%
Heating and Cooling	14.245	32.050	30.436	29.324	96%	206%
Lighting	1.533	3.255	3.421	3.618	106%	236%
Total Residential Portfolio	36.192	43.260	41.222	42.963	104%	119%
CommunitySavers	1.155	1.350	2.059	2.059	100%	178%
Total Multifamily Portfolio	1.155	1.350	2.059	2.059	100%	178%
BizSavers Custom*	15.073	18.025	17.608	17.060	97%	113%
BizSavers Standard	6.279	18.282	17.076	16.677	98%	266%
BizSavers New Construction	1.861	4.601	4.552	4.635	102%	249%
BizSavers RCx	1.738	1.859	1.936	1.936	100%	111%
BizSavers SBDI	2.151	1.119	1.168	1.186	102%	55%
Total C&I Portfolio	27.102	43.886	42.342	41.494	98%	153%
Total	64.449	88.495	85.623	86.516	101%	134%

* Smart thermostat totals are included in the Efficient Products Program. The smart thermostat approved demand target is 1.982 MW and has *ex post* gross savings of 4.949 MW.

* EMS Pilot totals are included in the BizSavers Custom Program.

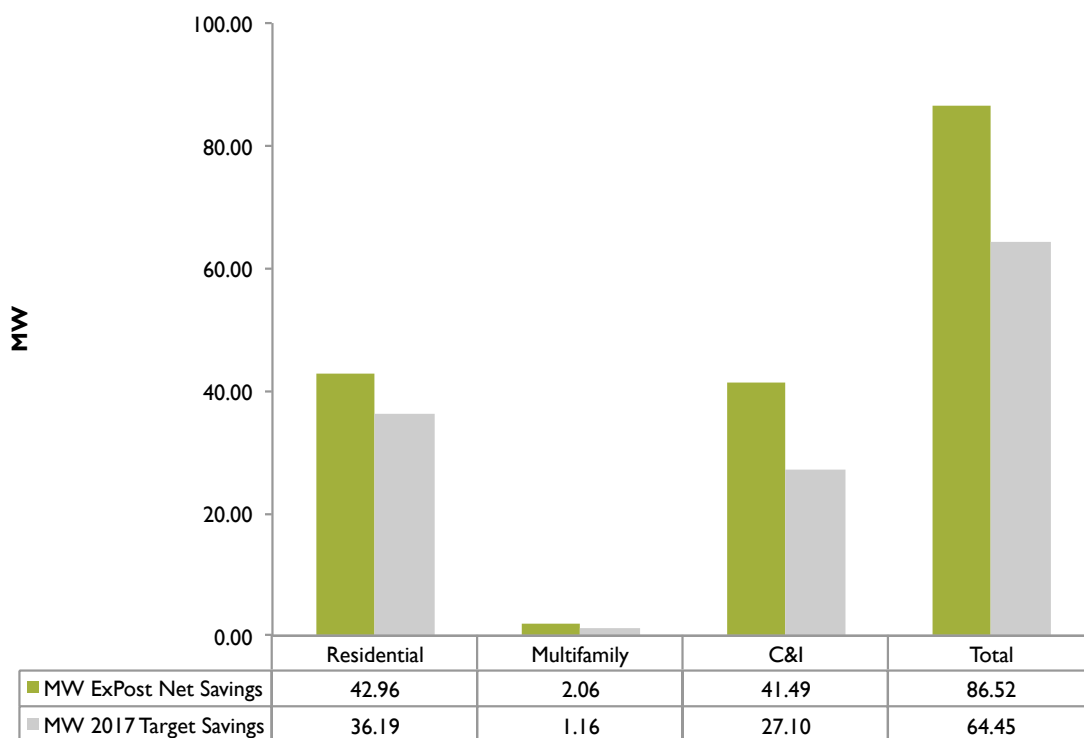
The following figures present summaries of program achievements in comparison with program goals. **Figure 2** and **Figure 3** display the PY2017 energy and demand savings targets and achievements by sector, as reported by evaluators.

Figure 2: Energy Savings and Achievements by Sector: PY2017 MWh



The PY2017 portfolio had a target energy savings goal of 230,614 MWh and actual net savings of 282,196 MWh, equating to approximately 122 percent of the program year energy goal. All three program portfolios outperformed their energy savings goals, with the Multifamily Residential portfolio achieving 146 percent of its energy savings target, the C&I portfolio reaching 129 percent of its energy savings target, and the Residential portfolio obtaining 109 percent of its 2017 energy savings goal.

Figure 3: Demand Savings Targets and Achievements by Sector: PY2017 MW



PY2017 had a target demand savings goal of 64.45 MW and actual net savings of 86.52 MW, equating to approximately 134 percent of the year's demand goal. All three portfolios surpassed their demand goals, with the Multifamily Residential portfolio achieving 178 percent of the 2017 goal, the C&I portfolio reaching 153 percent of target savings, and the Residential portfolio achieving 119 percent of its goal.

Figure 4 and

Figure 5 present the findings for the 2017 energy target and demand savings goals and accomplishments across all five residential programs.

Figure 4: Residential Programs Planned and Evaluated Savings: PY2017 MWh

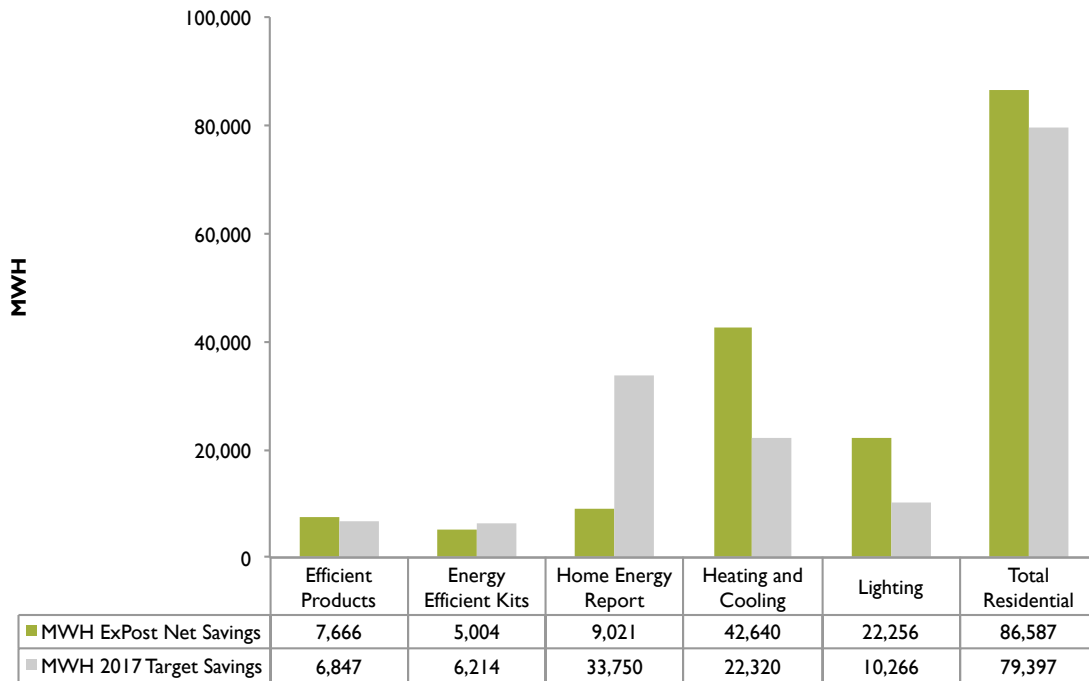
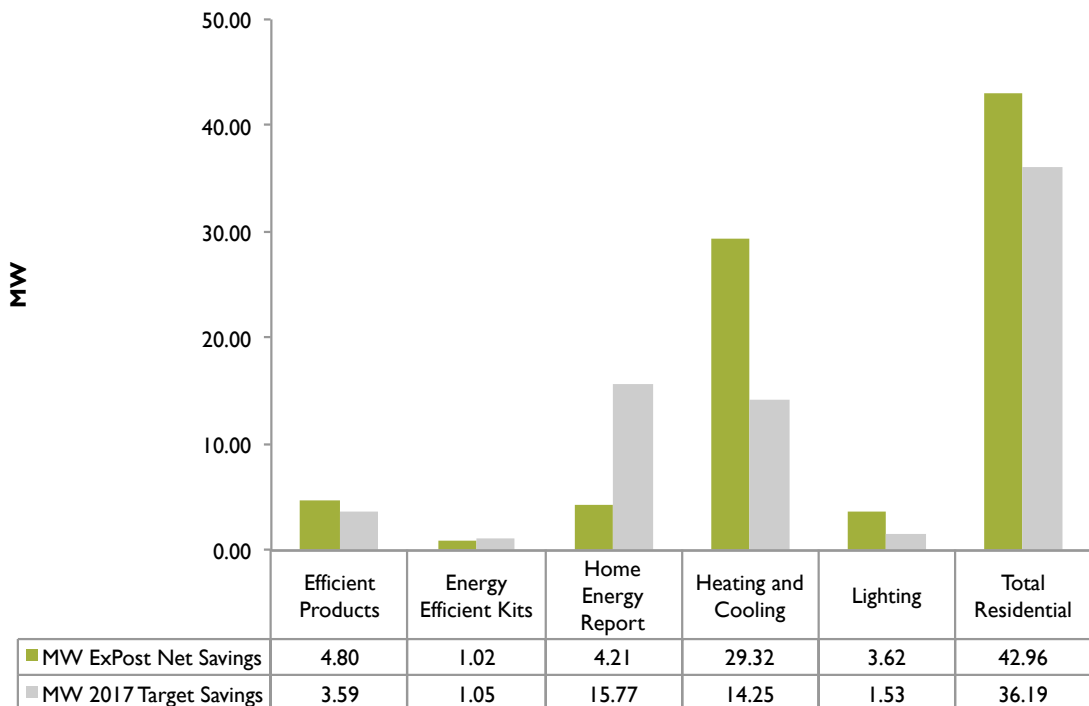


Figure 5: Residential Programs Planned and Evaluated Savings: PY2017 MW



At the portfolio level, the Residential sector surpassed energy and demand savings goals, achieving 109 percent of its net energy savings target of 79,397 MWh and 119 percent of its net demand savings target of 36.19 MW.

The 2017 Lighting Program significantly surpassed its energy savings goal of 10,266 MWh and demand target of 1.53 MW, achieving 217 percent and 236 percent of the goals, respectively. Additionally, all measures in the Lighting Program achieved realization rates below 90 percent, which compares the evaluated per-unit gross savings to the estimated per-unit gross savings in the Ameren Missouri 2017 TRM. The low realization rates are primarily due to the decrease in residential Hours of Use determined through the PY2017 evaluation.

The Heating and Cooling Program surpassed its 22,320 MWh net energy savings target as specified in Ameren Missouri's residential tariff, achieving 191 percent of its goal and 206 percent of its net demand savings target of 14.25 MW. Furthermore, the Heating and Cooling Program recorded a savings-weighted NTG ratio of 97 percent, which was an increase from PY2016, which had an overall weighted NTG of 90.6 percent.

The 2017 Efficient Products Program accomplished its net energy savings goal of 6,847 MWh per year as specified in Ameren Missouri's residential tariff, achieving 112 percent of the target. Additionally, the program exceeded its net demand savings goal of 3.59 MW per year, achieving 134 percent of the target.

Virtually all measures in the Efficient Products Program achieved gross realization rates close to 100 percent, with only one measure not meeting the 100 percent mark. The one measure was smart thermostats, which achieved a realization rate of 83 percent. Furthermore, for PY2017, the Efficient Products Program recorded a savings-weighted NTG of 75 percent, which was a decrease from PY2016, which had an overall weighted NTG of 76.1 percent.

The 2017 Energy Efficiency Kits Program missed its net energy and demand savings goals of 6,214 MWh and 1.05 MW, achieving 81 percent and 97 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 2017 program measures. For the Multifamily kit, energy-efficient showerheads and energy-efficient bathroom faucet aerators achieved high realization rates of 127 and 112 percent, respectively. For School kits, the furnace filter alarm and LEDs achieved the highest realization rates of 94 percent and 93 percent, respectively.

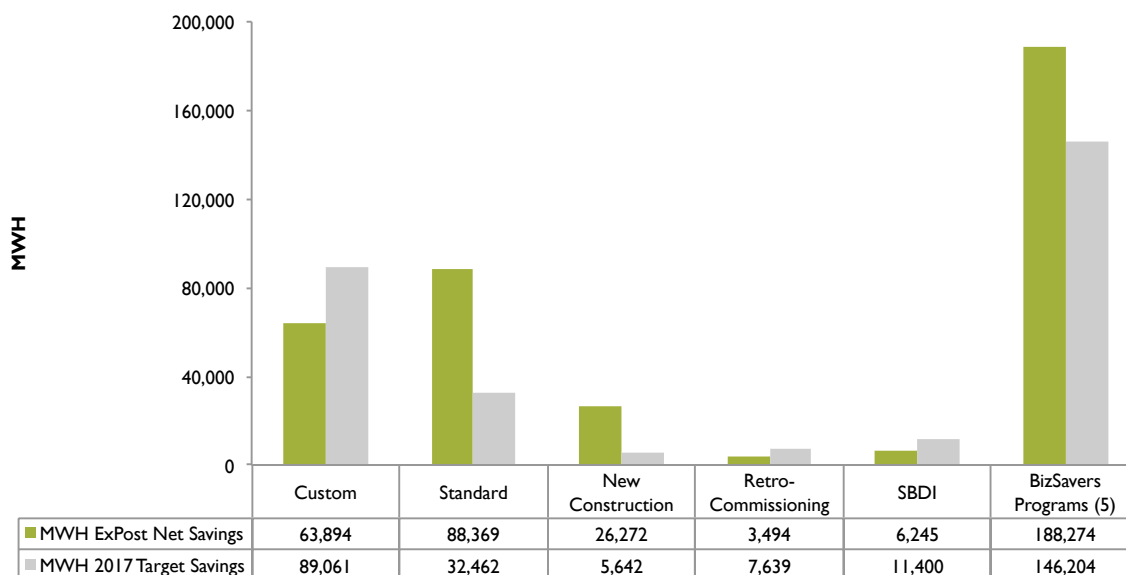
The 2017 Home Energy Reports Program significantly missed its net energy and demand savings goals of 33,750 MWh and 15.77 MW, achieving 27 percent of both its energy and demand goals. Based on the Ameren Missouri TRM assumptions, which assume a full

program year that includes all seasons, the program is expected to save 150 kWh per year per customer.

The PY2017 CommunitySavers Program surpassed its net energy and demand savings goals of 5,013 MWh and 1.115 MW, achieving 146 percent and 178 percent, respectively. Additionally, the overall CommunitySavers program kWh gross realization rate was 131 percent.

Figure 6 and Figure 7 summarize the planned and evaluated savings for each C&I sector program for PY2017.

Figure 6: Planned and Evaluated Savings: PY2017 MWh



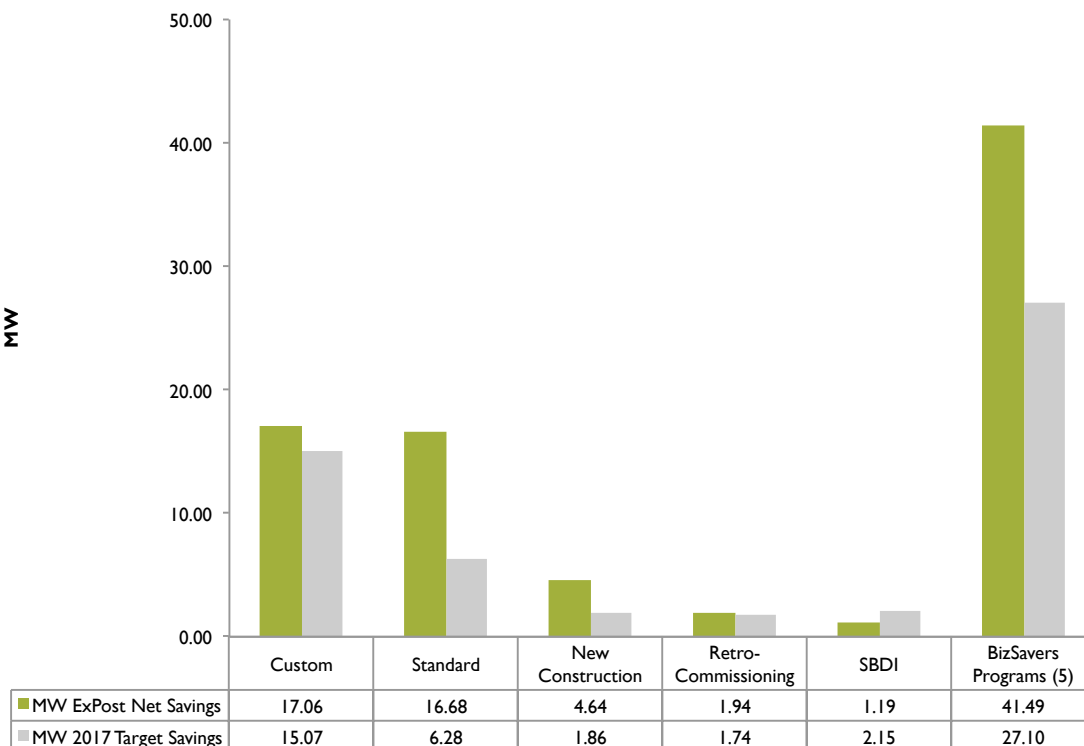
The BizSavers Program is comprised of five separate programs: the Custom Program, Standard Program, New Construction Program, Retro-commissioning Program, and the Small Business Direct Install (SBDI) Program.¹¹

Based on the five active programs, the C&I portfolio had a target savings goal of 188,274 MWh, of which 129 percent of the goal was achieved. The New Construction Program performed the best among the five programs, achieving 466 percent of its net energy target savings. The Standard Program had an energy savings target of 32,462 MWh and *ex post* net MWh savings of 88,369, accounting for 272 percent of its 2017 target. Three BizSavers programs significantly missed their targets: Custom, SBDI, and Retro-commissioning, which achieved 72 percent, 55 percent, and 46 percent of their goals, respectively.

¹¹ The EMS Pilot Program is included in the Custom Program.

The Standard Program accounts for the largest portion of the 2017 overall target savings, accounting for slightly less than one-half (47 percent) of the C&I portfolio savings, which was greater than its target of 22 percent. The Custom Program also accounts for a large portion (34 percent) of total savings, which was significantly less than its target of 61 percent.

Figure 7: BizSavers Planned and Evaluated Savings: PY2017 MW*



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 153 percent of the goal was achieved. The Standard Program performed the best among the BizSavers programs, achieving 266 percent of its net energy target savings.

The Custom Program accounts for the largest portion of the overall demand net savings, which fell short of the target of 56 percent. The Standard Program accounted for the second largest percentage of savings, at 40 percent, surpassing the goal of 23 percent.

3.2 Summary of Key Impact Evaluation Recommendations

3.2.1 Recommendation Adoption Tracking

A list of PY2016 recommendations and adoption status is included in Table 9.

Table 9: PY2016 Impact Evaluation Recommendation Tracking

EM&V PY2016 Recommendations	Program Response
<p>Include a customer-specific progress tracker in the HER reports.</p>	<p>Ameren Missouri included the Track Your Progress module starting with HER 4. Beginning with HER 6, it was included in all delivered HER reports.</p>
<p>The program implementer should consider adding more detail to the home energy report energy savings tips. Customers are interested in the specific return on investment for implementing an energy saving tip which would mean showing not only the savings but balancing the savings against the cost of implementation. This will provide the customer a tangible piece of information that they can track themselves.</p>	<p>Ameren Missouri updated the text associated with the tips to provide specific instructions on how to implement the tips.</p>
<p>Ameren Missouri should explore conducting a randomized control trial of select promotional activities, in order to determine the level of impact from these activities. A randomized control trial requires that certain participating locations do not engage in the target activity, so that sales can be compared across test and control stores. For some aspects of the program, such as available models and discount levels, it is difficult to construct the control due to retailers' preference to keep stores consistent. However, for promotional activities such as in-store events and product placement, there is the possibility to structure participation to allow for more rigorous analysis of overall impacts.</p>	<p>The PY17 program had a reduced budget relative to prior years, and this activity was not considered a priority. Based on the information in the evaluation that the in-store events were effective, the program continued to offer them in PY17.</p>
<p>Ameren Missouri should include fields in program tracking data for HVAC replacement unit Seasonal Energy Efficiency Rating (SEER) and capacity. Currently, information on SEER is built into the measure name, and capacity level is not recorded in the data. Staff reported that this information is being added to the program data.</p>	<p>This has been added.</p>
<p>To allow for more accurate estimation of energy savings of lighting implemented in lodging facilities, the program implementer should consider allowing applicants to distinguish between guest rooms and lodging common areas.</p>	<p>The program now distinguishes between the two areas of use by identifying the open text field "Location Detail" for each given measure and then applying a specific operating hour estimate per measure line item. There are no additional actions planned at this time.</p>

<p>The program implementer should consider reviewing the EISA adjustment factor to ensure that the adjustment factor is not incorrectly applied to EISA-exempt incandescent reflector lamps (e.g.: Lamp types ER/BR 30/40 50W or less; BR 30/40 65W and R20 45W or less). These lamps are both EISA 2007 exempt and also DOE 2009 exempt.</p>	<p>This recommendation was implemented during the 2016 program year. There are no additional actions planned at this time.</p>
<p>ADM recommended that <i>ex-ante</i> savings estimation for projects with multiple HVAC measures rely upon calibrated energy simulation.</p>	<p>The implementation contractor agrees with ADM's assessment and continues to balance the cost/benefit associated with project-specific energy modeling approaches. The implementation contractor reiterated they make every effort to obtain the most reliable data possible, without increasing customers' costs and increasing barriers to participation.</p>
<p>For small projects with a single HVAC measure and/or one or more non-HVAC, non-lighting measure, ADM recommends that <i>ex ante</i> energy savings estimation rely upon algorithms in secondary literature (e.g., Ameren Missouri TRM), with energy savings equation variable values determined by facility-specific and equipment-specific information, where appropriate.</p>	<p>The implementation contractor reiterated they make every effort to obtain the most reliable data possible, without increasing customer costs and increasing barriers to participation.</p>
<p>The Custom and Standard Incentive Application form should be revised to further direct applicants to provide unique lighting operating hours, where applicable.</p>	<p>The program has incorporated these points into trade ally training and will continue to incorporate into future training and program communication.</p>

3.2.2 PY2017 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

- Continue to offer smart thermostats through the Ameren Missouri online store and consider offering more products through this channel when practical to do so. The Efficient Products Program measures with the highest free ridership in PY2017 were RACs and air purifiers. Consider offering these measures for sale through the online store if the program can sell them at a cost-effective price point, including shipping costs (Efficient Products, PY2017, p.13).

- Consider initiating an RAC early retirement program that provides coupons for new units, when old, but operating, units are turned in (Efficient Products, PY2017, p.14).

Energy Efficiency Kits Program

- Ameren Missouri should review *ex ante* calculations for hot water heater pipe wrap (Energy Efficiency Kits, PY2017, p.11).
- Ameren Missouri should evaluate furnace filter alarm performance. Follow up with the implementer to investigate whether furnace filters were correctly installed, malfunctioned, or functioned but were not recognized. In the context of managed properties with routine filter checks, consider whether furnace filter alarms serve a redundant function (Energy Efficiency Kits, PY2017, p.12).

Home Energy Report Program

- Ameren Missouri should consider monitoring savings over time as the Home Energy Report Program matures and consider incorporating new strategies into the program (Home Energy Report, PY2017, pp.37-38).
- Ameren Missouri should consider revising Home Energy Report program savings targets and TRM savings in future program years (Home Energy Report, PY2017, p.7).
- Ameren Missouri should continue to deliver the HER reports every other month in PY18 to continue to increase savings (Home Energy Report, PY2017, p.6).
- Ameren Missouri should 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 (Home Energy Report, PY2017, p.6).

Heating and Cooling Program

- Monitor PY18 verification surveys to determine whether the program changes have minimized differences between verification surveys and reported early retirement classifications to assess whether additional early retirement criteria may be warranted (Heating and Cooling, PY2017, p.9).
- Ameren Missouri should explore incremental cost differences among the various tiers of system replacements to determine if incentives are aligned to those costs (Heating and Cooling, PY2017, p.10).

Lighting Program

- Going forward, the program implementer should be able to reduce free ridership of 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 (Lighting, PY2017, p.10).

CommunitySavers Program

- Ameren Missouri should clarify measure-naming conventions for business lighting measures. Review the measure name descriptions in the data to ensure that categories map to Ameren Missouri TRM measures (CommunitySavers, PY2017, p.1-4).
- Track additional data on lighting measures. Ideally, program-tracking data for lighting projects would include data on lamp type, lamp wattage, number of lamps, and space type for the lamps (CommunitySavers, PY2017, p.1-4).

BizSavers Program

- For projects that require energy use modeling, consider developing additional guidelines, including requiring that applicants provide model files in their native format and that assumptions associated with baseline models be clearly identified (BizSavers, PY2017, p.7-2).
- Consider expanding Standard incentives to include additional HVAC equipment (BizSavers, PY2017, p.7-2).
- The Custom and Standard Incentive Application form should be revised to further direct applicants to provide unique lighting operating hours, where applicable. ADM recommends that the application form prompt applicants to disaggregate single measures, where appropriate, such that quantities of measures are associated with the applicable annual hours of operation (BizSavers, PY2017, p.7-2).
- Update the Ameren Missouri TRM to account for impact evaluation results presented in Table 7-1 (BizSavers, PY2017, p.7-2).

4 Process Evaluation Summary

This section summarizes key methods and findings from the PY2017 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 PY2016 evaluations. Lastly, the final subsection summarizes the PY2017 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 10 below summarizes the process evaluation methods applied for each program.

Table 10: Process Evaluation Method Summary

Program	Methods	Description
Efficient Products	Tracking Data Review	Determined completeness of Vision database
	Stakeholder Interviews	Interviews with two program stakeholders, one from Ameren Missouri and one from ICF International
	Participant Surveys	Two online customer surveys. An email survey immediately after rebate (n=2,209), and an email survey six months after rebate (n=763)
	Program Benchmarking	Comparison of Ameren Missouri program offerings to 12 other utilities’ program offerings
	Key Performance Indicator Review	Update on key progress indicators developed in PY2016 to track progress in subsequent program years
	Marketing Material Review	Marketing material and strategy review
Energy Efficiency Kits	Stakeholder Interviews	Interviews with seven program stakeholders from Ameren Missouri, ICF International, and the National Energy Foundation (NEF)
	Property Manager Interviews	Phone survey with four property managers, 100 percent of population of participants
	Student Family Participant Surveys	Online surveys with 207 school kit participants (7.2% of population)

Program	Methods	Description
	Program Benchmarking	Analysis comparing Ameren Missouri's Energy Efficiency Kits Program with four multifamily kit programs and five school kit programs
	Key Performance Indicator Review	Update on key progress indicators developed in PY2016 to track progress in subsequent program years
	Marketing Material Review	Marketing material and strategy review
Heating and Cooling	Tracking Data Review	Determined completeness of Vision database
	Stakeholder Interviews	Interviews with two program stakeholders from Ameren and ICF International
	Participant Surveys	Two online surveys with 547 participants
	Key Performance Indicator Review	Update on key progress indicators developed in PY2016 to track progress in subsequent program years
	Contractor and Distributor Interviews	Interviews with 10 contractors and an unstated number of distributors
	Marketing Material Review	Marketing material and strategy review
Home Energy Report	Tracking Data Review	Determined completeness of Vision database
	Stakeholder Interviews	Interviews with two program stakeholders from Ameren and ICF International
	Customer Surveys	An online survey (n=249) with Ameren customers in treatment and control groups
Lighting	Tracking Data Review	Determined completeness of Vision database
	Stakeholder Interviews	Interviews with two program stakeholders from Ameren and ICF International
	Home Lighting Inventory	200 in-home lighting inventory site visits in PY2017
	Retailer / Manufacturer Interviews	Interviews with nine representatives of retailer-manufacturer partnerships that accounted for 56 percent of PY2016 sales
	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	In-depth interviews with two Ameren Missouri and six Lockheed Martin staff
	Program Document Review	Review of key program documentation and databases
	Participant Online Survey	Online survey with 378 Standard and 154 Custom Program participants and telephone survey with 93 non-participants
	Non-Participant Surveys	Online survey with 741 non-participants and telephone survey with 28 non-participants
	Trade Ally Survey	Online survey with 101 trade allies from 81

Program	Methods	Description
CommunitySavers	Tenant Survey	companies Mail survey of 83 tenants aimed at understanding program experiences and satisfaction
	Participant Online and Telephone Survey	Survey with 32 property managers to understand program experiences and satisfaction with the program
	Program Staff Interviews	In-depth interviews with one Ameren Missouri and two ICF International staff members
	Site Visits	28 site visits to verify baseline operating conditions
	Database Review	Review of program database for completeness and accuracy

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:

- **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 11 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:

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>

- **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 the five key questions. The Heating and Cooling Program responses to questions 1, 2, and 3 are identical to the previous year evaluations. The BizSavers Program evaluation provides comprehensive, substantive responses to all five key questions.

Table 11: 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	2	1	2	2	1
Energy Efficiency Kits	1	1	2	2	1
Home Energy Report	1	1	1	2	1
Heating and Cooling	2	2	2	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 2017 Process Evaluation Findings and Recommendations

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

4.2.1 Efficient Products Program

Program Design

In 2017, 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 2017, the following changes were made to the program design.

- The RAC rebate increased from \$20 to \$50;
- Qualified smart thermostats were updated to include new manufacturers and models;
- Ameren Missouri's online store began selling smart thermostats, offering an immediate discount instead of a mailed check rebate; and
- In January 2018, the smart thermostats rebate decreased from \$100 to \$50.

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 2016, customers reported high satisfaction with the Efficient Products Program. Across all survey respondents, the Efficient Products Program received very high ratings; 99 percent said they were "very satisfied" or "somewhat satisfied" with the performance of measures that they purchased; 98 percent gave similar satisfaction ratings for the program overall, and 99 percent said they would recommend the program to others. These ratings remained consistent between participants surveyed immediately after receiving rebates and participants surveyed six months later. These ratings are almost identical to

2016, with the only difference in ratings being for the program overall, falling from 99 percent to 98 percent.

Program Participation

In 2016, the Efficient Products Program delivered 19,171 rebates to Ameren Missouri participants, which included 13,693 smart thermostat instant discounts. Program stakeholders noted that program participation significantly exceeded the program targets. In particular, smart thermostats more than doubled the program goal of 5,400 units per year. As a result, Ameren Missouri reduced the program incentives for smart thermostats to manage the budgeted incentive caps. Program managers also expressed some concern over high free ridership levels, particularly for RACs, air purifiers, and smart thermostats.

Program participants' motivations for purchasing program measures varied by measure type, as it did in PY2016. Some key participation findings included:

- Smart thermostats were again the most popular measure in the program in 2016, and awareness of smart thermostats arose from the broadest variety of sources.
- A majority of participants purchasing smart thermostats cited saving energy as their primary motivation (the exact number is not provided in the evaluation). One third of pool pump and HPWH respondents cited savings energy as their primary purchasing motivation.
- Sixty-three percent of smart thermostat purchasers knew which brand or model they wanted before they made their purchase, down from 74 percent in 2016. Nest continued to be the most commonly purchased thermostat (61%) followed by Honeywell (15%) and Ecobee (14%).
- The majority of participants purchasing HPWHs also knew which model they wanted before making their purchase or contacting a contractor (the exact number was not specific in the evaluation). In contrast, RAC, air purifier, and pool pump purchasers were less likely to know which brand or model they wanted to purchase.

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. The evaluator reported that program management credited effective marketing campaigns for good program outcomes.

Program Delivery

The evaluator reported that the program was delivered according to program design. The program manager reported that ICF International's Vision database continued to perform well with no systematic issues. The launch of the smart thermostat measure was integrated with no significant problems.

Program Implementation Challenges

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

- Program management continues to express concerns over high free ridership levels for certain measures, in particular smart thermostats, RACs, and air purifiers.
- The evaluators noted that the program has limited offerings, and attempts to include new measures have not been successful. In particular, the program explored adding ENERGY STAR kitchen and laundry equipment to the program but did not find any of these measures to be cost effective at the current time.

4.2.2 Energy Efficiency Kits Program

Program Design

The Energy Efficiency Kits Program was implemented for its second 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. Starting in PY2017, the program is co-delivered with a gas provider, Spire.
- **Multifamily Delivery Channel.** This delivery channel provides energy saving kits to property managers of eligible multifamily homes. To become eligible, properties must have three or more rental units with electric water heaters. The property manager (or staff) installs multifamily kit items in each of the property's units. Each multifamily kit contains one energy-efficient showerhead, one energy-efficient kitchen faucet aerator, one energy-efficient bathroom faucet aerator, one furnace filter alarm, six feet of water heater pipe wrap, and six LEDs (two more LEDs than were included in the PY2016 kit).

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.

Customer Satisfaction

The evaluation reported that both teachers and participating families expressed enthusiasm about the school-based delivery channel, with 98 percent of surveyed families reporting they were very satisfied or somewhat satisfied. Forty-nine percent of teachers who participated in PY2016 participated again in PY2017.

Participating property managers reported positively about their experiences with the multifamily delivery channel. Site-level property managers gave the lowest ratings to the furnace filter alarm out of all kit measures.

Program Participation

The program exceeded the participation goal of 16,000 kits for the school-based delivery channel, providing 16,117 school kits. This was similar to the number of kits delivered in PY2016, 16,245. The multifamily kit distribution goal of 3,600 kits was not met, with the program delivering 862 kits to three properties. The three participating properties shared one corporate-level property manager, who conveyed the program to the three site-level property managers.

Program Marketing

The evaluator found that marketing materials for both school-based and multifamily delivery channels follow best practices. While stakeholders agreed that the school kits delivery channel continued to perform well, they offered suggestions for improving communication, in particular suggesting further extending the gas partnership with Spire.

The multifamily kit program did not reach its program targets despite marketing and recruitment efforts including distribution of marketing materials, attending apartment association events, and building relationships with property management companies. The major challenge stakeholders noted was the electric hot water heating requirement that ruled out a large portion of the market. Stakeholders suggested that the program partner with a gas utility to broaden the pool of eligible multifamily properties. The evaluation also reported a lack of program awareness among property managers despite distribution of program materials. None of the four property managers interviewed recalled receiving the informational material and reported drafting their own letters to tenants. As a suggestion for improving the program, one program manager asked for materials to explain the program to tenants.

Program Implementation Challenges

The evaluation identified three challenges to program implementation.

1. **Low enrollment in the multifamily kit delivery channel.** The multifamily program did not reach program targets. According to the implementer, enrollment was limited by the electric hot water heating requirement. ICF International implementation staff indicated that partnering with a gas utility would increase the number of eligible multifamily properties.
2. **Clear communication with participating teachers.** The implementer noted that providing clear instructions for participating teachers in the absence of face-to-face contact could be challenging. NEF implementers felt that program delivery could benefit from further refining the materials to communicate details with fewer words. NEF also supported emphasizing online resources, particularly for

collecting teacher evaluations, HEW submissions, and providing additional energy efficiency education.

4.2.3 Home Energy Report Program

Program Design

The Home Energy Report Program continued in 2017. As in 2016, the program provides mailed home energy reports encouraging customers to reduce their energy consumption through behavioral changes and comparing energy consumption in customers' homes to energy consumption in similar houses. 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 PY2016, Ameren Missouri made some changes to the design of the home energy reports. The home energy report in 2017 included additional detail on the home energy report tips and updated photos that are more relevant to the tips they accompany. Ameren Missouri also included new components including a do-it-yourself lighting audit and instructions on how to read the home energy report.

Customer Satisfaction

The evaluator's customer surveys indicated that customer satisfaction with the Home Energy Report program remained high and is expected to remain positive. While the specific proportion of customers satisfied with the program was not reported in the evaluation, the report stated that customer satisfaction was similar to 2016 (85%). Customers continued to express high satisfaction with Ameren Missouri in general (90%).

Program Delivery

In PY2017, the Home Energy Report program distributed home energy reports in two waves to a total of 308,986 customers.

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

- The PY2017 Ameren Missouri customer survey results indicated a 9 percent increase from 48 percent (n=465) in PY2016 to 57 percent in PY2017 (n=219), in familiarity with other energy efficiency programs, indicating that the home energy reports continued to cross promote other Ameren Missouri energy efficiency programs in PY2017.
- Fewer customers agreed that the information in the home energy reports is useful, decreasing from 94 percent (n=428) in PY2016 to 85 percent (n=234) in PY2017.
- Ninety-two percent (n=232) of customers recalled the customer energy tracker, and 63 percent (n=195) agreed that their energy use was different than they expected,

compared to the previous year. A majority of customers, 87 percent (n=188), believed their energy use was accurate, and 91 percent (n=201) agreed that it helps them understand their household energy use.

Program Implementation Challenges

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

- Understanding customer preferences continues to be challenging. Ameren Missouri would like to better understand the most effective modes of communication with its customers so that it could consider increasing the types of messaging (e.g., emails, text alerts). Ameren Missouri is undertaking efforts to understand customer preferences.
- Leveraging existing online tools may present challenges as Ameren Missouri begins to implement online eHER reports. They anticipate challenges with the limited number of web tools available on the existing Ameren Missouri website, which uses an older database (Aclara).
- Time is required to adjust the HER report design and delivery. Ameren Missouri noted that most of PY2017 was spent developing and designing the improvements to subsequent home energy reports and that, although they think the improvements have helped, the time lag between delivering the reports and observing increases in savings that result from changes is a challenge.

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 PY2017, the program reintroduced air-conditioner tune-ups, which it last offered in PY2015. In PY2017, the Heating and Cooling program provided rebates for the following:

- Central Air Conditioners (CACs)
- Air Source Heat Pumps (ASHPs) (including ductless heat pumps)
- Geothermal or 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 PY2016, the evaluator reported that the Heating and Cooling Program was well received by participants and contractors. Ninety-five percent of participants were either very satisfied (77%) or somewhat satisfied (18%) with the equipment tune-ups through the program. The evaluators stated that participants continued to express very high satisfaction levels with their measures, with almost all participants responding “very satisfied” or “somewhat satisfied,” although the specific proportion was not specified. The evaluation team found that participants’ satisfaction had not diminished at the time of the Follow-up Participant Survey, approximately six months after participation. Similarly, with the program as a whole, participants expressed very high satisfaction levels that also appeared to persist over time. All 10 contractors interviewed said they were very satisfied with the program.

Program Participation

The evaluation states that PY2017 participants heard about the program primarily from their contractors or from a store, and also heard about the program from Ameren Missouri. The evaluation does not provide specific proportions of customers that became aware through each source.

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.

Program Delivery

The evaluator found that Ameren Missouri’s pool of registered contractors effectively promoted and delivered the Heating and Cooling Program to participants.

Program Implementation Challenges

The evaluation noted only one challenge to implementing the Heating and Cooling Program; the evaluation found that the tune-up data provided by contractors was inconsistent, and often included conflicting information on the energy analysis form.

4.2.5 Lighting Program

Program Design

The Lighting Program had no major changes to the program design in PY2017. The total participation in PY2017 was lower than in the previous year, but the proportion of participation by measure category was largely the same. Nearly all retail partners from PY2016 continued in PY2017, and ICF International did not recruit new partners.

Customer Satisfaction

The evaluation did not report on retailer satisfaction in PY2017.

Program Marketing

In-store signage, product placement, and promotional events were the primary marketing activities in 2017 for the Lighting Program. The overall marketing budget decreased from PY2016 to PY2017, from \$0.05 to \$0.03 per bulb.

Program Delivery

In PY2017, ICF International recruited 14 retail chains and franchise retailers and 15 manufacturers. Across the 14 retail chains, the retailers offered program incented bulbs through 198 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.

While no new measures were added to the program design, there were changes to the program and the policy environment that impacted the program in PY2017, specifically:

- A legislative change allowed the program to enroll properties that received the Low Income Housing Tax Credit in the common area rebates. Staff indicated that this was a significant benefit to the program and contributed to the increase in common area improvements.

- The program expanded to include exterior lighting in spaces that did not operate for 24 hours a day. In PY2016, incentives were limited to 24-hour lighting because of a focus on demand savings.
- CommunitySavers partnered with Spire (which provides natural gas in Ameren Missouri's service territory) to deliver efficiency improvements to properties with natural gas water and space heating.

Program Participation

The evaluation reported that the program served 62 properties (up from 36 properties in PY2016) and 4,486 tenant units (up from 3,462 tenant units in PY2016). Direct Install efficiency measures in residential units accounted for 57 percent of program saving, down from 98 percent in PY2016. Common area installations increased substantially; in PY2016, common area installations made up 0.4 percent of program savings, while in PY2017, common area installations increased to 31 percent. The increase in common area installations was largely due to the program building a separate common area project pipeline in PY2017, in response to recommendations from the PY2016 evaluation.

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; 18 percent of property manager respondents were dissatisfied with the time required to install the measures. Most survey respondents were satisfied with the steps required to complete the program project and the program overall, and nearly all were satisfied with the efficiency improvements made through the program.

Surveyed tenants reported generally high satisfaction. More than 80 percent of tenants were satisfied with the installation process and less than 10 percent were dissatisfied with it. The aspect that tenants were most likely to report dissatisfaction with was the energy efficiency improvements made. Most of this dissatisfaction was due to a dislike of the programmable thermostats. Nearly three-quarters of tenants reported that the energy efficiency measures resulted in non-energy benefits – most frequently, improved home comfort and reliability of appliances or heating and cooling equipment.

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 the program account manager was the source of awareness (cited by 35%), and 24 percent of respondents stated they learned of the program from internal management staff.

Program Delivery

The program subcontracts with three firms to complete direct install measures and HVAC tune-ups. Firms received program training that covered measure installation requirements, program processes, customer satisfaction issues, and safety. The program also works with members of the Ameren Missouri trade ally network for common area improvements and will solicit bids from this network on behalf of multifamily property managers and owners if the participant does not have a preferred trade ally.

Program Implementation Challenges

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

- Properties that receive the state LIHTC are ineligible for common area measure incentives under state law.
- Property managers and owners face financial constraints that limit investments in energy efficiency.
- The program has not re-established its partnership with Laclede Gas, which limits the program budget.
- The program started late and as a result, outreach was not well timed vis-à-vis property budgeting cycles.

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: One respondent noted that they manage a few old buildings and do not have a lot of income available to improve the properties.
- Lack of staffing resources: A respondent stated that it was difficult to have staff involved in the improvements.
- Residents not cooperating with the process.
- State law that prevents recipients of LIHTC to receive incentives: One respondent noted that they could not receive the incentives for the common area improvements because of the LIHTC.

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 are made available for purchasing and installing efficient equipment.

- **Custom Program:** Incentives are determined by a custom savings calculation comparing the base case to the efficient case, paid at a rate by technology.
- **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 up to 100 percent of the program-approved study cost.
- **Small Business Direct Install (SBDI) Program:** Launched in August of 2016, 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, Standard, and SBDI 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, participants reported not being clear on the rules governing Fast Track applications. Participants, however, generally know how to get application assistance, which promotes satisfaction with the process.

Program Participation

Overall, the evaluation reported that the BizSavers program is doing well with total *ex post* energy savings at 129 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 Custom Program (together with the EMS pilot) achieved somewhat less than three-quarters of its goal, and the SBDI and Retro-Commissioning programs both attained about half of their goals.

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 they were moving away from the development and distribution of printed case studies and fact sheets and toward greater use of online distribution of program information.

4.3 Summary of Key Process Evaluation Recommendations

Based on the evaluation findings, Cadmus and ADM provided overall evaluation conclusions and recommendations. Table 12 below presents the conclusions and associated recommendations by program.



Table 12: 2017 Program Conclusions and Recommendations

Program	Conclusions	Recommendations
Efficient Products	<p>The Efficient Products program currently has limited offerings. The program offered rebates for five types of equipment during PY17. Ameren Missouri explored adding ENERGY STAR kitchen and laundry equipment to the program but did not find any of these measures to be cost effective at the current time.</p>	<p>Monitor new product offerings in the “smart” and “interactive” technology space that offer the potential to save energy through occupancy sensing, programmable schedules, remote access, and interconnectivity with other devices and systems. These technologies have proven popular with customers, as seen with the rapid adoption of smart thermostats, in part because of their energy-saving potential, but also because customers are enthusiastic about the interactive features of these devices.</p>
Energy Efficiency Kits	<p>School kits’ showerhead performance may have affected installation rates. The evaluation team attributed the lower installation rate for showerheads in PY17 to slightly higher removals. PY17 school kit participants were less satisfied with showerheads than in the prior program year, and survey respondents more frequently cited low water pressure as the source for their dissatisfaction.</p>	<p>Evaluate school kit showerhead performance and increase education on measure benefits.</p>
	<p>Low installation rates could also be related to repeat participation, with some households potentially participating in previous years through older children.</p>	<p>Modify PY18 Home Energy Worksheets to gauge repeat participation. To monitor potential repeat participation, the team suggests adding a question to the PY18 Home Energy Worksheet to ask participating families about participation in prior years.</p>
	<p>While stakeholders agreed that the school kits delivery channel continued to perform well, they also offered suggestions for improving communication, increasing the level of HEW submissions, and further extending the gas partnership.</p>	<p>Reassess efforts to communicate with teachers, particularly through developing online resources. Extend gas co-delivery partnerships.</p>
	<p>Electric hot water heating requirements limited participation in the multifamily delivery channel.</p>	<p>Establish a gas company partnership to co-deliver multifamily kits or have a kit version with only light bulbs.</p>
	<p>Multifamily property managers were not aware of available informational materials for communicating about the program with their tenants.</p>	<p>Promote available informational materials for property managers to use. Consider how to provide the materials so that property managers are more likely to utilize them.</p>

<p>Home Energy Report</p>	<p>Ameren Missouri plans to add an email channel in PY18. Ameren Missouri, like other programs, used paper mailed reports to deliver their HER programs. However, other utility programs supplement the paper HER reports with emailed HER reports and web portals. Multiple channels serve as opportunities to engage the customer more often and in more depth, which may result in deeper savings.</p>	<p>Launch an email channel to deliver HER reports in addition to the mailed version.</p>
<p>Heating and Cooling</p>	<p>Contractor provided tune up data was inconsistent. Contractors must submit an efficiency analysis form on tuned systems. Cadmus found conflicting information in the energy analysis form and variation among the core provided services.</p>	<p>Encourage additional contractor training and requirements for minimum service offerings and documentation for the tune-ups.</p>
<p>Lighting</p>	<p>While the LED market is maturing rapidly, there are still opportunities for savings, especially among lower-income customers and renters.</p> <hr/> <p>Despite higher free ridership, specialty bulbs are likely the best opportunity to achieve savings in the general market, while general purpose bulbs are likely well suited for small chain stores.</p> <hr/> <p>Although near-term opportunity remains, the next program cycle is likely to witness several changes to the lighting market that limit the opportunity for savings.</p>	<p>Cadmus 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.</p> <hr/> <p>Given the lower penetration of LEDs in the low-income and renter markets, general-purpose bulbs are appropriate for discount stores. Ameren Missouri should reduce the bulb price floor specifically for channels expected to target hard-to-reach markets.</p> <hr/> <p>Planning for the next program cycle should anticipate that savings from lighting will decline rapidly up to 2021, due to falling prices, reduced elasticity, reduced demand for lighting, and falling HOU. 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, then 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 have the most market opportunity as well as individual bulb types.</p>

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.

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.

The program should consider identifying itself as a potential resource for property managers and PACE administrators for estimation of project energy savings. The program should provide links to PACE and other financing opportunities on the program website along with brief information about the key benefits of PACE financing.

Reviewed literature indicates that the inability of property managers and PACE administrators to estimate project energy savings may be a factor that limits PACE participation.

Ameren Missouri should consider adding customer type information to its customer database to make it easier for programs to identify any under-served segments and improve reach into those segments and improve assessments of program reach to various business and building types.

BizSavers

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.

Engage more effectively with design firms. Interviewed design professionals reported low-to-moderate program engagement and said they would like greater engagement.

The SBDI program relies on a few providers for most of the program savings.

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.

4.4 Status Of 2016 Process Evaluation Recommendations

The evaluators tracked and reported Ameren Missouri’s response to process evaluation recommendations made in the 2016 evaluation reports. During the audit review, we found that ten of eleven recommendations across all programs have been adopted. Table 13 below presents the PY2016 process evaluation recommendations by project and the evaluators’ assessment of Ameren Missouri’s response.

Table 13: PY2016 Process Evaluation Recommendation Tracking

Program	Recommendation	Adopted	Comments
Efficient Products	As already planned by Ameren Missouri, we recommend increasing the incentive for RACs. Additional marketing should also be considered. Program management reported they plan to increase the RAC incentive to \$50 for PY17; this higher incentive may drive sales, lower free ridership, and affect retailer stocking practices. In particular, the program implementers should try to leverage the raised incentive to encourage retailers to stock more ENERGY STAR models, and fewer non-qualifying models. Further recommendations suggest increasing emphasis on marketing.	Yes	Ameren Missouri increased the RAC incentive to \$50 prior to the cooling season.
	Track residential pool companies in Ameren Missouri territory, and prioritize developing and nurturing relationships with these companies. The program implementer should identify the population of pool equipment companies operating in the territory and set annual goals for recruiting retailer participation. Ameren Missouri should also consider further research into the residential pool market to identify barrier to participation, such as interviews or focus groups with pool equipment sales staff. Other initiatives could include contests with prizes for companies or sales staff who sell the most rebated equipment during a season.	Yes	Program field reps continued to educate pool pump companies and distributors on the benefits of ENERGY STAR participation. This was aided through a full cycle to engage and nurture relationships in PY17.
	Marketing materials can be improved. Incorporating targeted media and engagement tactics to spur program	Yes - Ongoing	Marketing materials for efficient products were enhanced during PY17, with a more targeted

Program	Recommendation	Adopted	Comments
	<p>interest and activity could enhance the marketing strategy. Communications should emphasize important information (i.e., use of strategic call-outs through bolding/highlighting of important text), which can be tailored for different equipment (e.g., improved comfort and health were the primary motivations for room air purifier purchases, so materials should reference this benefit). The free-standing Information Insert should be used as a model for other materials. Cadmus also recommends all materials include a strong set of next participation steps to encourage customers' conversion and to drive their actions upon exposure to materials.</p>		<p>marketing strategy utilized. Ongoing efforts to improve marketing and outreach.</p>
	<p>Try to increase awareness of rebates through online retailers (including the websites of local retail stores). The online retail channel accounted for a significant amount of equipment sales (for smart thermostats in particular), though very few participants learned of Ameren Missouri rebates from retailer websites. This indicates there may be customers making purchases online who may choose different equipment if aware of the rebates. Program implementers should contact major online retailers (as identified through program application records) and suggest that adding information about rebates for Ameren Missouri customers can help drive sales. Ideally, this information would appear based on the customer's zip code or other geolocation information.</p>	Yes	<p>The implementation contractor works with online store retailers to help promote efficient product rebates. Ameren Missouri added smart thermostats to the company's online store in June 2017, and completed a Limited Time Offer special promotion on air purifiers.</p>
	<p>Explore adding rebates for residential kitchen or laundry equipment, if cost effective. The Efficient Products program is an effective platform for driving retail sales of efficient equipment, which could be expanded to include measures that are not currently covered by program rebates. The program does not currently</p>	Yes - Ongoing	<p>Ameren Missouri evaluated efficient products, including kitchen equipment, and found some measures were not cost-effective or the market had transformed. Ameren Missouri will continue to evaluate new efficient product measures in</p>

Program	Recommendation	Adopted	Comments
	offer rebates on any kitchen equipment (ENERGY STAR refrigerators, freezers, and dishwashers) or laundry equipment (ENERGY STAR clothes washers and dryers).		the future.
Energy Efficiency Kits	Encourage teachers to integrate completion of the HEW into their curriculum. Providing examples of how other teachers have successfully encouraged completion of the HEW may be helpful to other teachers.	Yes	The teacher's folder includes "Rewarding Results," a sheet that encourages the teacher to give children a plastic wrist band as a reward for turning in completed HEW surveys. The folder also suggests potentially giving students a completion grade or extra credit, and the folder discusses the classroom's potential to receive a \$50 gift card with 80 percent survey participation.
	Include clearer instructions on how to install showerheads, furnace filter alarms, and pipe insulation wrap. One parent requested a video walkthrough of how to install the items that they could watch prior to installing the measures.	Yes	A measure "Installation Instructions" sheet is included in each school kit. It lists each measure and specifically instructs how to install the measures. "Installation Videos" are located at AmerenMissouri.com/education , providing video instructions on installing the measures.
	Consider options for allowing teachers to choose between fall or spring participation. In PY17, consider fall and spring kit shipments and the opportunity for schools to participate more than once.	Yes - Ongoing	Feedback from teachers suggests that spring participation becomes challenging due to testing schedules.
	Allow schools to return unused kit items, and publicize this option to them. Track the number of items and kits returned per school. Extra kits could effectively be redistributed later in fall or spring. Potentially make it easy for participating families and schools to return unused items by providing a box with a return shipping label for each school that could be kept at a central location.	Yes	Measure installations continue beyond the due date for teacher data collection. The program will explore the role of continued education and encouragement with teachers, regarding measure installation rates among students.

Program	Recommendation	Adopted	Comments
	Consider partnering with a gas or water utility to distribute school kit costs. Partnering with another utility would help mitigate costs of school kits, which are inevitably distributed to non-Ameren Missouri customers.	Yes	Ameren Missouri partnered with Spire, a local gas company, starting late July 2017.
	Ensure all marketing material match Ameren Missouri branding.	Yes	Confirmed that marketing materials match Ameren Missouri branding.
Heating and Cooling	In addition to highlighting rebates, the Heating and Cooling program should emphasize the benefits of efficient equipment and encourage customers to take advantage of the program by calling contractors. The program could highlight that energy-efficient heating and cooling equipment saves energy in comparison to less-efficient equipment and can save money on utility bills.	Partial	"Since it's difficult to cover all scenarios regarding what system the customer is replacing, we hesitate to claim specific dollar savings in the marketing materials. We're also limited on space in a lot of the channels like social, energy statement messaging, postcard, etc. However, in nearly all communications, we do tell customers that by installing a high-efficiency system, they can save energy and money. We provide a guideline for recommending a new system by mentioning that if it's 10 years or older, they should consider replacing it. We also used our marketing materials to remind customers that heating and cooling accounts for nearly half the home's energy costs and reinforcing that upgrading their system can help them save energy and money. Our call-to-action on nearly all marketing is to visit our find-a-contractor page.
	Educate customers about the advantages of operating their heat pumps at the lowest possible temperature. While a tradeoff exists regarding comfort, high-efficiency HPs operate twice as efficiently as electric resistance heating, even during	Yes	The program engaged the Contractor Advisory Group, distributors, and manufacturers to better understand this issue. Guidance and training were provided through program

Program	Recommendation	Adopted	Comments
	cold outdoor conditions. Helping customers understand the energy impacts of their systems' operation can drive customers to demand their systems' most efficient operation. Contractors should be encouraged to explain to customers that limiting compressor operations to improve comfort uses significant additional energy. This may help avoid return visits to address customers' complaints about comfort.		communications and as a part of the annual required refresher training.
	Clarify measure qualifications and provide comprehensive measure mapping. With many contractors in the program, and with many possible replaced equipment types and installed measures, contractors must quickly understand program requirements and incentives available to their customers. Cadmus recommended several options for addressing this challenge.	Yes	The updated program rebate chart that was released on March 1, 2018, contained several simplifications of naming conventions where possible while still maintaining clarity. The existing matrix showing what rebates are available based on existing system type was updated to outline the available incentives as well.
	Engage with contractors to understand the reasons for their problems with AHRI numbers and take further steps to make the process easier for contractors. Cadmus recommends that ICF engage with contractors (possibly through the contractor advisory group) to explore what difficulties contractors face when looking up AHRI numbers and to take steps to ease the process.	Ongoing	The program engaged the contractor advisory group and individual contractors who did and did not have issues with AHRI. Those identified as having issues participate at a low rate, and others identify limited issues with AHRI ratings. The program does engage distributors to assist their contractors. Best practices from these discussions will be incorporated into training.
Home Energy Reports	Update the HER report schedule.	Yes	Ameren Missouri sent five HER reports in PY17: one in the spring, two in the summer, one in the fall, and one in the winter.
	Include a customer-specific progress tracker in the HER reports.	Yes	Ameren Missouri included the Track Your Progress module starting with HER 4. Beginning with HER 6, it was included in

Program	Recommendation	Adopted	Comments
			all delivered HER reports.
	Launch an email channel to deliver HER reports in addition to the mailed version.	No. Planned in 2018	Ameren Missouri plans to launch the email HER reports in spring PY18 using the same report design as the paper HER reports.
	Add more detail to the HER report energy savings tips.	Yes	Ameren Missouri updated the text associated with the tips to provide specific instructions on how to implement the tips.
	Ameren Missouri should consider updating the photos to align with the tip more closely and studying the impact of the HER report design on customer satisfaction and energy savings.	Yes	Ameren Missouri updated the visual content associated with energy savings tips to better align with the specific action in the tip.
Lighting	Cadmus supports the program manager's intention to prioritize faster invoicing in the coming year and notes that the implementer has planned system improvement to streamline invoicing.	Yes	The program included language in the Memorandum of Understanding that states that "Manufacturer must submit invoices, at a minimum, monthly during the Promotion Period, and payment is due from Sponsor to Manufacturer net thirty (30) days from the date of Manufacturer's invoice."
	We appreciate the need to adopt a more cost-conscious approach than in previous years, as the potential for savings from lighting diminishes. We suggest an emphasis on targeted engagement with retailers to prioritize the aspects of in-store marketing and placement that can have the most impact. The most important in-store marketing elements are most likely the shelf signage that calls attention to the discounted price and the promotional events that appear to have significant impact on consumer behavior.	Yes	Ameren Missouri Program Manager met with CrossMark field representatives to emphasize the importance of building relationships with the store lighting managers to aid in getting preferential placement of incentivized LEDs. Ameren Missouri also shared past best practices and examples of creative POP marketing material.
	Make the minor adjustments to savings forecasts needed to account for continued near-zero participation from nonresidential purchasers.	Yes - Ongoing	Ameren Missouri savings projections do not anticipate nonresidential savings beyond what is included in the evaluated per-unit savings. In

Program	Recommendation	Adopted	Comments
			<p>addition, Ameren Missouri continued to educate store managers and sales clerks to the 12 bulb limit on LED purchases to restrict non-residential bulk purchases.</p>
	<p>Focusing on retail channels and bulbs that face less direct competition from non-ENERGY STAR LEDs may help reduce free ridership.</p>	<p>Yes - Ongoing</p>	<p>Ameren Missouri focused more on specialty LEDs in PY17, in addition to continuing to offer LEDs in non-traditional stores (Goodwill, Habitat, St. Vincent Depaul, etc.) that would not sell LEDs absent the program. These retailers target customers that might be less likely to purchase LEDs. In addition, selling through retailers that do not offer other lighting products reduces free ridership by eliminating direct competition from ineligible LED products.</p>
Community Savers	<p>Include fields in program tracking data for HVAC replacement unit SEER and capacity. Currently, information on SEER is built into the measure name and capacity level is not recorded in the data. Staff reported that this information is being added to the program data.</p>	<p>Yes</p>	<p>This recommendation has been addressed.</p>
	<p>Provide information on unit space heating and cooling type for LED projects. Space conditioning equipment information is used to appropriately apply heating and cooling interactive factors in the estimate of lighting savings. Space heating and cooling type was available from project applications but some applications indicated that the properties had multiple heating types.</p>	<p>Yes</p>	<p>For properties with multiple heating types, program staff can provide additional data as requested.</p>
	<p>To improve average savings for refrigerator replacements, consider limiting year of manufacture to 2000 or earlier, as was the case in PY2015. ADM recognizes that multiple factors should be</p>	<p>Yes</p>	<p>Revised to limit manufacture to June 2001 or earlier.</p>

Program	Recommendation	Adopted	Comments
	<p>considered when setting the year of manufacture, including the value of refrigerator replacements as a measure that may be entice property managers to complete a program project that includes additional efficiency measures.</p>		
	<p>Improve screening of refrigerator replacements. Although the three refrigerators replaced that were manufactured after 2001 comprise less than 1% of refrigerator replacements, staff should review screening protocols to prevent additional units not qualified for the program from being replaced in the future.</p>	Yes	<p>Revised screening to include data provided directly from each manufacturer in addition to appliance data code search.</p>
	<p>Provide tenants and building maintenance staff with instructions on how to correctly install the dirty filter alarm. ADM observed instances where the filter alarms were oriented incorrectly by the installing subcontractor and tenants or maintenance technicians may have similar difficulty installing the device correctly.</p>	Yes	<p>Maintenance staff is present during installs and observes the installation of the dirty filter alarm.</p>
	<p>Continue to develop relationships with financing institutions. Staff recognizes that facilitating financing is key to developing common area improvement projects that require properties to fund a portion of the measure cost. Additionally, financial organizations may also be an important source of referrals and may direct property managers and owners to the program when they are in the process of seeking financing for building improvements.</p>	Yes	<p>Program staff attended PACE meetings and Missouri Housing Development Corp. events, to gain information about these programs and connect with property managers who are applying for these programs to encourage them to participate in CommunitySavers as well.</p>
	<p>Develop marketing materials focused on common area improvements. The program brochure focuses on direct install measures, although it does reference the availability of other incentives. Staff should consider developing marketing materials that focus on common area improvements such as SBDI lighting projects that can be</p>	Yes	<p>Program collateral and website has been updated to cover the program from an overarching multifamily approach so it also references the common area improvement opportunities</p>

Program	Recommendation	Adopted	Comments
	completed at no cost to the owner.		
	Develop case studies based on common area projects. A few common area projects have been completed in PY2016 and early PY2017. Staff should look to these successes to develop case studies to promote these projects with other property managers and owners. Case studies that illustrate the cost savings, ease of participation, and service provided by program staff should be effective at addressing concerns related to project costs and time commitments. Other important messages include the financial benefits of reduced maintenance and equipment longevity (i.e., for LED lighting in particular).	Yes	Two case studies have been developed, which include both direct install and common area measures.
	Focus trade ally outreach on HVAC suppliers and contractors. Split-incentives between owners and occupants are most likely to adversely impact decisions to install efficient air conditioner and heat pump replacement projects. For this reason, replacements are most likely to occur when units burn out. HVAC contractors and suppliers are positioned to effectively intercede on behalf of the program to encourage multifamily properties to install efficient equipment when systems are replaced.	Yes	A summer 2017 event provided program training to contractors, with an emphasis on HVAC contractors. A second event is planned for March 2018. In addition, a program account manager attended the HVAC trade ally training events to share information about the CommunitySavers program.
BizSavers	The program implementer should work to increase awareness of the new construction program rules among contractors and vendors. In particular, increasing the awareness of the importance of involving the program staff early in the design phase is important for maximizing savings. One thing to consider may be to include providing some form of recognition to contractors who attend specific training on, and demonstrate knowledge of, new construction program rules and processes—for example, identifying such contractors as “new	No	The implementation contractor does not disagree with opportunities to educate the market on New Construction. However, the New Construction Program has run well ahead of expectations and there is concern that further market awareness/education would increase participation, applying risk toward goal achievement. Currently, there are no plans for further action.

Program	Recommendation	Adopted	Comments
	<p>construction program specialists” on the trade ally website and providing special new construction program co-branding.</p>		
	<p>The program implementer should more strongly emphasize the requirement to provide supporting documentation, including invoices, with applications. The evaluation team recommends placing a statement about that requirement on the “Welcome” tab of the standard/custom incentive application, together with a reference to the section of the application that spells out the details of the requirement. This may also help draw attention to the availability of standard incentives.</p>	<p>No</p>	<p>The “Submit Application” lists the required and recommended documentation to submit with the application. Fast Track applications do have required fields, while custom applications do not. The program implementation contractor is open to adding something to the Welcome page; however, there are no plans for further action at this time.</p>
	<p>The program implementer should consider increasing the size of the trade ally network and re-introduce distribution of printed collateral to trade allies for use in marketing the program to customers. As part of that effort, the implementer should emphasize the availability of both standard and custom incentives.</p>	<p>No</p>	<p>The implementation contractor does not disagree with opportunities to provide additional collateral. However, the BizSavers Program has run well ahead of expectations and there is concern that further market awareness/education would increase participation, applying risk toward goal achievement.</p>

5 Review of Cost-Effectiveness Calculations

The Evergreen team reviewed residential and commercial summary findings from the final portfolio reports and the appropriate DSMore output files. The Evergreen team reviewed the residential and commercial program DSMore aggregate files to confirm that calculations were performed correctly. Input files were subject to random spot checks of inputs; however, due to the complexity of the inputs, a thorough review was not feasible. This review was similar to those conducted in prior audits, with specific tasks including the following:

- Confirm that the reported summary values matched those in the DSMore results file;
- Confirm values reported for the portfolio matched the sum of the values reported individually by program;
- Confirm that the reported costs matched the costs included in the DSMore input files (both incentive and overhead);
- Confirm that a sample of measures received appropriate cost-effectiveness input values from the Ameren Missouri TRM (i.e., kWh savings, EUL, incremental cost), and;
- Report current (PY2017) program results and compare against previous year results (PY2016).

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 and DSMore files for the residential portfolio. The Evergreen team did not find 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.

Confirm a Random Selection of Measures Received Appropriate Cost-effectiveness Input Values from the Ameren Missouri TRM

The Evergreen team reviewed the Lighting, Efficient Products, and Heating and Cooling programs to validate that the correct TRM values were applied. No discrepancies for the residential or commercial programs were found.

The following tables present the PY2017 cost effectiveness results against the PY2016 values. Table 14 presents the reported cost of conserved energy values. The BizSavers Programs had low Cost of Conserved energy (CCE) - all approximately \$0.01 per kWh, showing approximately the same results as the PY2016 program results. Similarly, residential CCE across programs performed similarly between PY2016 and PY2017 with the exception of the Home Energy Report program, which saw an increase in CCE from \$0.02 per kWh to \$0.09 per kWh.

Table 14: Cost of Conserved Energy

Program	Cost of Conserved Energy (\$/kWh) 2016	Cost of Conserved Energy (\$/kWh) 2017
Efficient Products	0.03	0.02
Efficient Products – Smart Thermostats	0.03	0.04
Energy Efficiency Kits	0.01	0.01
Home Energy Report	0.02	0.09
Heating and Cooling	0.01	0.02
Lighting	0.01	0.01
BizSavers Custom	0.01	0.01
BizSavers Standard	0.01	0.01
BizSavers New Construction	0.01	0.01
BizSavers RCx	0.01	0.01
BizSavers SBDI	0.51	0.01
BizSavers EMS	N/A	0.02
CommunitySavers	N/A	0.02

Table 15 presents the total net lifetime benefits from residential and commercial programs reported in the PY2017 EM&V reports and compares the current (PY2017) net benefits to previously reported PY2016 net benefits totals. Residential programs generally showed a

marginal decrease in the total net benefits, with the Heating and Cooling program and the Home Energy Report program showing the largest decrease. Business programs showed large increases in total net benefits, with both the Custom and Standard program reporting substantial improvement. New programs such as the EMS program and CommunitySavers program have no prior data to compare with but show positive net lifetime benefits for PY2017.

As noted earlier in the report, we believe that mid-life adjustments are needed for some measures, and consequently the net lifetime benefits are over stated, particularly for the lighting and HVAC programs.

Table 15: Net Lifetime Benefits per Program

Program	Net UCT Lifetime Benefit (Reported) 2016	Net UCT Lifetime Benefit (Reported) 2017
Efficient Products	\$1,314,304	\$1,803,102
Efficient Products – Smart Thermostats	\$3,957,191	\$3,925,755
Energy Efficiency Kits	\$3,114,420	\$2,711,473
Home Energy Report	\$1,622,880	\$478,584
Heating and Cooling	\$84,742,921	\$62,106,479
Lighting	\$23,090,820	\$17,901,507
BizSavers Custom	\$1,656,108	\$44,477,760
BizSavers Standard	\$27,240,745	\$52,574,160
BizSavers New Construction	\$16,267,313	\$16,992,849
BizSavers RCx	\$627,625	\$2,740,284
BizSavers SBDI	-\$157,723	\$3,478,391
BizSavers EMS	N/A	\$762,890
CommunitySavers	N/A	\$4,439,405

Table 16 compares the results of the five cost effectiveness tests between PY2016 and PY2017. The most significant change from 2016 is that the Home Energy Report program is not cost-effective across all tests.

Table 16: Cost Effectiveness Test Results

Program	UCT		TRC		RIM		PCT		SCT	
	2016	2017	2016	2017	2016	2017	2016	2017	2016	2017
Efficient Products	1.41	1.82	1	1.48	0.44	0.44	3.66	4.19	1.36	1.76
Efficient Products – Smart Thermostats	3.42	2.08	1.98	1.51	0.8	0.61	2.92	2.57	2.55	1.78
Energy Efficiency Kits	3.57	3.65	5.73	9.27	0.52	0.43	N/A	N/A	11.14	12.26
Home Energy Report	2.68	0.59	2.68	0.59	0.48	0.3	N/A	N/A	2.68	0.59
Heating and Cooling	7.47	5.11	4.01	3.09	0.86	0.81	5.74	4.46	5.56	4.09
Lighting	5.91	6.22	5.91	6.22	0.49	0.47	N/A	N/A	8.83	9.25
CommunitySavers	1.11	2.09	1.96	3.66	0.43	0.48	176.6	41.3	2.46	4.66
BizSavers Custom	5.18	5.23	2.42	1.78	0.7	0.71	4.23	2.73	3.12	2.28
BizSavers Standard	5.3	4.72	3.19	2.3	0.78	0.56	3.52	4.67	2.94	2.95
BizSavers New Construction	2.78	6.14	0.84	1.36	0.56	0.63	1.59	2.28	1.08	1.73
BizSavers RCx	0.06	3.89	0.06	3.34	0.06	0.91	2.6	5.41	0.07	4.35
BizSavers SBDI	2.43	3.24	2.08	2.28	0.53	0.53	5.57	4.8	2.53	2.85
BizSavers EMS	N/A	2.88	N/A	1.75	N/A	0.93	N/A	2.03	N/A	2.25

6 Conclusions

Our audit conclusions for the PY2017 Ameren Missouri program evaluations are presented below, along with recommendations where appropriate for future evaluation work. Most of these are reiterations of recommendations that we made as part of the PY2016 audit but were not adopted. We discuss several overarching issues first relating to mid-life savings adjustments and free ridership, followed by some program-specific recommendations that affect both PY2017 and future evaluation activities.

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. 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 TRM¹³ 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 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.

¹³ *The Missouri Technical Reference Manual Volume 2: Commercial and Industrial Measures* (March 31, 2017), p 188.

- 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.
- Residential HVAC measures: Early retirement residential HVAC measures require a mid-life savings adjustment after six years in the cost effectiveness analysis that is consistent with the Ameren and Missouri TRMs. As we note below, the current assumed EUL of 18 years for the early retirement measures is too high.

These mid-life adjustments may also have significant impacts on the Earning Opportunity (EO) determinations, as the mid-life adjustments needed for the PY2017 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 which 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 PY2017 and future years.

6.2 Residential Free Ridership

In the previous audit, we raised the issue of how the “don’t know” survey responses were being used in the residential free ridership calculations. We recommended that there should be no changes to the free ridership score based on a “don’t know” response, as this answer is not providing any information that can be used to characterize free ridership.

In the PY2017 residential program evaluations, the “don’t know” responses are still being used to adjust the free ridership score, and we believe that these adjustments are lowering free ridership estimates. The Cadmus reports defend this approach by quoting the SEEAAction Impact Guide that says that a person should only be considered a free rider if they can say with certainty that they would have installed the measure without the program. The real issue here, however, is not *full free riders* (which is what the SEEAAction

Guide is really referring to), but *partial free riders*, which is what the scoring method is intended to estimate and what impacts the majority of participants.

Moving forward, we recommend that the “don’t know” responses be omitted entirely from the free ridership calculations (i.e., coded as missing values), so that the free ridership scores are only calculated based on respondents that are able to provide a response to the question. From the discussions with Cadmus during the stakeholder meetings, it appears that there is a large enough sample to handle the removal of these responses. If the responses are to remain in the free ridership calculation, we reiterate our recommendation from last year – that the “don’t know” responses should be given a reduction value of 0 percent so that they do not end up improving the free ridership score.

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.

BizSavers Program

In the PY2016 audit, we discussed how the survey question “Would you have been financially able to install the equipment or measures without the financial incentive from the BizSavers Program?” was scored to estimate the free ridership rate. We believe that there is a possibility that the scoring for this question may be too restrictive, as customers that answer ‘no’ are automatically scored as a net participant based solely on their response to a single question. The rest of the respondents (i.e., those that answer ‘yes’ to the initial question) were then subjected to a battery of questions designed to provide a more nuanced estimate of free ridership, one that has a series of consistency checks.

From the final results of the PY2016 evaluation and in the discussion of the draft PY2017 evaluation results, it appears that this particular question is only removing a small number of participants from the longer free ridership question algorithm. Since this particular screen is having little impact on the overall free ridership score, we recommend that it not be used to automatically score customers as net participants (i.e., free ridership = 0). Instead, all customers would be scored based on the longer free ridership question battery. The initial financial ability question can then be used as a consistency check for the other responses.

Heating and Cooling Program

In the PY2016 audit report, we discussed the high early replacement rates in the program and identified areas where we believe that more research was needed. For the PY2017 program, the early replacement rate is still quite high (96 percent, for the initial *ex ante* savings values) but with no additional research provided to support these numbers. In 2017 the program did change its incentive structure so that the same rebate is paid for

early replacement and replace on burnout, which is an important improvement to the program.

The Heating and Cooling Program evaluation reports an early replacement rate of approximately 96 percent based on program data. While this value is based on program data, it appears to be very high in comparison with the Missouri TRM recommended early replacement rate of 14 percent (or 40 percent if the CAC unit is a secondary unit in a CSR project). The high early replacement rate is potentially further problematic because annual savings for early replacement measures are as much as five times higher than replace-on-burnout measures.¹⁴

An additional area of concern is the EUL assumed for these measures. For the early HVAC replacements, the text of the Ameren TRM states that the incremental cost for early replacement measures is calculated “assuming the Standard/Code measure will be installed at the expiration of the remaining useful life of the existing equipment, typically after one third of the useful life of the new measure”¹⁵. However, the table of savings values in that section does not have a column for midlife adjustments, so the change in savings after the baseline change is not included.

The early replacement savings numbers need to account for the change in baseline from the existing equipment after the early replacement period has ended. This can be done either by setting the EUL to reflect just the acceleration in replacement (e.g., 6 years), or else adjust the average annual savings to reflect a blended baseline over the life of the measure (e.g., existing baseline for the first 6 years, standard efficiency for next 12 years). It appears that neither of these approaches is reflected in the Ameren TRM and the result is a significant overstatement of savings for these measures.

Although Ameren reports that the program is specifically targeting early replacements, there are some indications from the 2016 evaluation that the early replacement numbers claimed from the program are too high. Of the ten contractors interviewed in 2016 evaluation, for example, only seven were familiar with the early replacement criteria used for the program. Of these, only one contractor said they used the correct criterion by measuring for a temperature drop across the coil. Similarly, when customers were asked about their reasons for contacting their contractor about their systems, responses such as “system stopped working” (33%) and “system had problems” (37%) are more suggestive

¹⁴ The larger number claimed for early replacements also increases the impact estimates substantially compared to a similar HVAC program offered by Ameren Illinois. When the claimed savings from Ameren Missouri CAC measures are compared with the same program in Ameren Illinois, for example, the average savings per measure type for the Missouri program is 2.03 times greater than for the same measures in Illinois. (1,779 kWh average per measure in Missouri versus 875 kWh in Illinois). See *Impact and Process Evaluation of 2015 (PY8) Ameren Illinois Company HVAC Program* by Opinion Dynamics (February 23, 2017).

¹⁵ Appendix F, page 9 of the Ameren TRM for MEEIA Cycle 2016-2018.

of replace-on-burnout systems rather than early replacements. All of this suggests that the early replacement numbers are less than the 96 percent identified in the program tracking data. Note that some of this issue will likely be addressed starting in PY2018 when contractors will be required to report the results of the coil temperature tests when claiming an early retirement installation. Contractors were also interviewed in 2017, but these questions appear not to have been explored in the latest evaluation.

As was done in PY2016, Cadmus attempts to correct for some of these issues in the *ex post* impact analysis in PY2017 by re-categorizing some of the installations based on their responses to survey questions. This results in a split of 87 percent early replacement and 13 replace-on-burnout. While this is a step in the right direction, it still is much higher than the split assumed in the Ameren Missouri TRM. We also recommend that these types of adjustments be made during the gross impact analysis, rather than as part of the net impact calculations.

ASHP And Ductless Heating Savings For Electric Resistance Baseline Replacements

In the PY2016 audit, we recommended using a consistent value of the effective full load hours (EFLH) when calculating the heating savings for air-source heat pumps and ductless heat pumps. It appears that this was not incorporated into the savings calculations for PY2017, so we are repeating our earlier recommendation here.

For both measures, the savings were estimated using metered data collected on equipment installed during PY2017. The EFLH was also estimated using the operating efficiency observed during the equipment metering, and the operating efficiency value was lower than the nameplate efficiency of the units. To calculate the savings, Cadmus used the EFLH related to the lower operating efficiency to the nameplate efficiencies of the new units. Doing this under-estimated the savings for some measures, and increased them for others.

We estimate that correcting this issue in the savings calculations will decrease savings by approximately 2 percent for the entire program. A similar reduction was estimated for PY2016.

Home Energy Report Program

For last year's audit, we made the recommendation that the comparison between the treatment and control groups in the pre-period should include a comparison of participation rates in the other Ameren Missouri energy efficiency programs. This was not done for the PY2017 evaluation, so we are reiterating this issue again.

Differences between the groups in program participation in the pre-period could have affected the savings estimates in two ways. First, if there were differences in program participation rates, then some of the observed savings from the home energy reports in the

post-period should have been attributed to the other efficiency programs. Second, the estimate of program uptake in the post-period may also be affected if there were already unequal levels of program participation in the pre-period (i.e., there was less opportunity for participation in the post-period if there were already unequal levels of participation in the pre-period).

Evergreen Economics evaluated a similar Opower program for Hawaii that utilized a randomized assignment for both the treatment and control groups. Despite the random assignment, there was a statistically significant difference in energy efficiency program participation in the pre-period across both groups. When this difference in participation was incorporated into the regression model used to estimate impacts, the original savings estimates were reduced by 29 percent.¹⁶ This demonstrates the potential significance of this issue and why it should be included in the comparison checks between the treatment and control groups.

This comparison is relatively simple to conduct and will not require a significant increase in evaluation time and effort. We had previously recommended that this be done beginning with the PY2017 evaluation.

Residential Lighting Program

Net impacts for the residential lighting program are calculated using the results of a lighting elasticity model that was estimated as part of the PY2016 evaluation of this program. Since the lighting programs is a significant contributor to overall savings, we recommend that the elasticity model be estimated each year, as this is a relatively simple exercise once the sales data are already compiled to calculate savings. Given that LEDs are continuing to grow in popularity and the market is changing quickly (as demonstrated by the general drop in LED prices and increased adoption), it is likely that the elasticity estimates are also changing from year to year.

The elasticity model Cadmus estimated for PY2016 contains two sets of four variables. The first set of variables is comprised of interactions between the natural logarithm of bulb price and an indicator variable representing the retail channel (small chain store, warehouse club, DIY, and mass market); the second set of variables is comprised of interactions between the natural logarithm of price and an indicator variable representing the type of bulb (reflector, globe, A-line 43 watt, and reflector 50-watt). The model does not include price, retail channel, or bulb type represented as a main effect (i.e., without interaction with another variable).

¹⁶ A summary of this analysis can be found in the paper written by Evergreen staff: *Opower, Where Art Thou? Savings Estimates from a Pilot Program*, prepared for the 2013 International Energy Program Evaluation Conference (IEPEC). <https://www.iepec.org/wp-content/uploads/2018/02/077-1.pdf>.

Cadmus justifies this specification by asserting that their interest is in estimating a unique relationship between price and bulb sales for each retail channel and that because of this, price does not need to be represented in the model as a main effect. In addition, Cadmus asserts that the model was estimated as a fixed effects regression and, therefore, there is no need to include indicator variables for retail channel or bulb type because these variables are “fixed” across time. We found no mention of the fixed-effects specification in our review of the evaluation report, but accept Cadmus’ assertion that the model was specified as fixed-effect. Nevertheless, the specification used in this model does not support the Cadmus’ estimates of retail channel-level elasticities.

The estimated coefficients from a log-log regression model represent estimates of the elasticity between the dependent variable and the independent variable. In addition, when the regression model is specified properly and the elasticity formula is correctly defined, a linear combination of the coefficients may also represent an estimated elasticity. Due to an apparent misspecification in the Cadmus model, however, the elasticity estimates for each channel individually, each bulb type individually, and each channel-bulb type combination are likely incorrect. The misspecification is that Cadmus interacted price with both retail channel and bulb type in the regression model, but failed to interact retail channel with bulb type. Cadmus then erroneously adds together coefficients that are not additive given the specification of their model.

We would be happy to work with Cadmus to correct the model for future evaluations. For the reasons listed above, we believe that the current model is misspecified and therefore needs to be redone in PY2018 and updated for future program years.

Nonparticipant Spillover

The nonparticipant spillover for the Residential Lighting Program is estimated using the same approach as in PY2016. As we wrote in the last audit report, we believe that this method is fundamentally flawed. Specifically, it is not appropriate to go from asking respondents general questions about program influences and then using this information to calculate very specific market shares.

In general, the spillover survey questions are very complex and are focused on asking how the program is influencing **non-program** bulb sales. The survey assumes that the respondents will have put a significant amount of thought and possibly some research prior to answering the questions. Even with their knowledge of the lighting markets and their own store sales, it is not reasonable to expect respondents to provide accurate enough information on non-program sales to calculate actual market shares for program influence.

Related to this, the issue of prefacing the questions by saying that you are only asking for an opinion on the program influence and then using the results later to calculate market shares is a serious flaw. It basically excuses the respondent from providing an accurate

response (or from doing the background research that is required to provide an accurate answer), but then the responses are used to calculate a very specific market value.

Looking at the scores, the respondents also provide very different ratings for the influencing factors, which suggests that they are interpreting the questions differently. There is no reason, for example, why two different respondents from the same store chain should be providing vastly different answers on program influence if they had both understood the question correctly. The way the scores are eventually calculated assumes that each respondent is interpreting each question identically.

With the program influence factors, there is still no supporting justification provided (just speculation) as to why the program should be having a positive influence for the non-program sales. A good case can be made that the program efforts in displays, stocking, employee education, and promotions would/should focus on program bulbs at the expense of non-program bulbs (i.e., a negative effect). Cadmus has indicated that respondents could provide a negative influence response, but the way the question is actually worded (asking for a rating on a scale of 0 to 100) is essentially telling the respondent that the effect should be positive (or possibly zero). The survey design should not rely on the respondent to offer up a response outside the range to indicate a negative relationship.

The Cadmus report references the UMP and several other evaluation studies as support for using their approach. Contrary to what is stated in the report, however, the UMP does not provide an adequate justification for this particular method – the UMP only has a very general recommendation to interview supply side market actors for upstream programs. Similarly, none of the other evaluations provide examples of this type of survey used to calculate specific market shares.

To our knowledge, there are no other evaluation studies that use this specific method to estimate market shares for nonparticipant spillover. Cadmus cites several evaluation reports in support of their method, but they all differ significantly from the residential lighting market context. Three of the cited reports relate to either federal efficiency rulemaking processes or else building code compliance, both of which are vastly different applications than the retail lighting market. The remaining evaluation report is a NEEA study of a small retail products program. While this evaluation did involve some retailer interviews to determine NEEA's influence in the retail product market, the interview results are not used to calculate a quantitative measure of either program influence or market share.

A separate issue is the estimate of the total nonparticipant LED bulbs that are credited to the program. Once the program sales bulbs are removed, the entire total of the remaining LEDs is used to calculate the spillover total. This provides too high of a starting point for calculating program spillover, as some of these non-program sales will be driven primarily

by non-program factors. For example, the possibility of analogous ‘free riders’ for non-program bulbs should be considered, as at least some (if not all) of the non-program LEDs would have been purchased regardless of the program activity. It is important to note that the retailer interviews would not have addressed this issue, as none of the respondents will have a sense of this free ridership component without doing their own survey research with their customers addressing this very specific topic (i.e., the likely sale of non-program LED bulbs in absence of the program). In other words, there would be no issue of double counting the issue of free ridership by making this adjustment. If the program free ridership rate is applied to the non-program LED bulb sales, then the spillover estimate would be reduced by approximately half (46 percent).

In summary, we do not believe that this estimate of nonparticipant spillover should be accepted due to the serious problems with the survey methodology. We have set the nonparticipant spillover savings to zero in the tables below showing the audit-adjusted savings for PY2017.

6.3.1 Portfolio Level Findings

The recommended changes to the residential PY2017 program savings estimates are shown in the following tables. Table 17 shows the original energy savings reported by the evaluation while Table 18 shows the energy savings recommended by the audit for each program. Table 19 and Table 20 show similar information for the demand savings.

To summarize, these tables reflect the following changes to residential program savings:

- Nonparticipant spillover for the residential programs is evenly distributed across programs;
- The savings for the Heating and Cooling Program is reduced by 2 percent to adjust for the EFLH issue; and
- Spillover for the Residential Lighting Program is set to zero;

Table 17: Evaluation Reported Savings (MWh) – Residential Programs

Program	Ex Post Gross Savings (MWh/Yr)	Participant Net Savings (MWh/Yr)	NPSO (MWh/Yr)	Evaluated Total Net Savings (MWh/Yr)	NTG Ratio
Efficient Products	9,956	7,452	214	7,666	77%
Energy Efficiency Kits	5,367	4,983	22	5,004	93%
Heating and Cooling	44,089	37,093	5,547	42,640	97%
Lighting	22,733	21,828	428	22,256	98%

Table 18: Audit Recommended Savings (MWh) - Residential Programs

Program	Audit Ex Post Gross Savings (MWh/Yr)	Participant Net Savings (MWh/Yr)	NPSO (MWh/Yr)	Audit Total Net Savings (MWh/Yr)	NTG Ratio	% Change from Evaluated Net Savings
Efficient Products	9,956	7,452	1,553	9,005	90%	17%
Energy Efficiency Kits	5,367	4,983	1,553	6,536	122%	31%
Heating and Cooling	43,089	37,093	1,553	38,646	90%	-9%
Lighting	22,733	12,276	1,553	13,829	61%	-38%

Table 19: Evaluation Reported Savings (MW) – Residential Programs

Program	Ex Post Gross Savings (MW)	Evaluated Net Savings (MW)	NTG Ratio
Efficient Products	6.321	4.799	76%
Energy Efficiency Kits	1.044	1.017	97%
Heating and Cooling	30.436	29.324	96%
Lighting	3.421	3.618	106%

Table 20: Audit Recommended Savings (MW) - Residential Programs

Program	Audit Ex Post Gross Savings (MW)	Audit Net Savings (MW)	NTG Ratio	% Change from Evaluated Net Savings
Efficient Products	6.321	5.717	90%	19%
Energy Efficiency Kits	1.044	1.271	122%	25%
Heating and Cooling	29.746	26.678	90%	-9%
Lighting	3.421	2.081	61%	-42%

Finally, Table 21 and Table 22 show the overall effect of the audit recommendations on the entire PY2017 program portfolio. As there were no recommended changes for PY2017 for the BizSavers and CommunitySavers programs, the savings revisions are limited to the residential programs as discussed above. Overall, the recommended changes from the audit result in a reduction of 3 percent for the PY2017 portfolio-level energy savings and 3 percent for demand savings.

Table 21: Summary of Audit Recommended PY2017 Savings (MWh) – All Programs

Program	Ex Post Gross Savings (MWh/Yr)	Total Net Savings (MWh/Yr)	NTG Ratio	% Change from Evaluation Savings
Efficient Products	9,956	9,005	90%	17%
Energy Efficiency Kits	5,367	6,536	122%	31%
Home Energy Reports	9,021	9,021	100%	0%
Heating and Cooling	43,089	38,646	90%	-9%
Lighting	22,733	13,829	61%	-38%
Residential Total	90,166	77,036	85%	-11%
BizSavers	191,298	188,274	98%	0%
CommunitySavers	7,335	7,335	100%	0%
Non-residential Total	198,633	195,609	98%	0%
Portfolio Total	288,799	272,645	94%	-3%

Table 22: Summary of Audit Recommended PY2017 Savings (MW) – All Programs

Program	Audit Ex Post Gross Savings (MW)	Audit Total Net Savings (MW)	NTG Ratio	% Change from Evaluation Savings
Efficient Products	6.321	5.717	90%	19%
Energy Efficiency Kits	1.044	1.271	122%	25%
Home Energy Reports	4.205	4.205	100%	0%
Heating and Cooling	29.746	26.678	90%	-9%
Lighting	3.421	2.081	61%	-42%
Residential Total	44.737	39.953	89%	-7%
BizSavers	42.342	41.494	100%	0%
CommunitySavers	2.059	2.059	100%	0%
Non-residential Total	44.401	43.553	98%	0%
Portfolio Total	89.138	83.506	94%	-3%

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 23: 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 24: Issue 1 - What are the primary market imperfections common to the target market segment?

Program	2016 Summary Response	2017 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.	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.
Energy Efficiency Kits	<p>For the school-based kit delivery channel, the primary market imperfection common to the target market was inadequate information and/or knowledge regarding the energy saving benefits of high-efficiency household items provided through the school kits.</p> <p>For the multifamily kit delivery channel the market imperfection is the possible disconnect between the person paying the electricity bill and the person receiving the energy savings benefit from installing high-efficiency household items provided through the multifamily kit. For example, if a multifamily property resident doesn't pay their own electricity bill, they have less incentive to install the high-efficiency household items because they don't realize the energy savings. For another example, if a resident pays their own electricity bills, the property manager has less incentive to install high-efficiency household items (again, as they do not realize the energy savings).</p>	<p>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.</p>
Home Energy Report	<p>The HER program's target market segment is randomly sampled from the population of residential Ameren Missouri customers. Primary market imperfections that behavioral programs address include varied human responses to education, engagement, and motivation to perform household energy savings actions.</p>	<p>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 consumption prior to receiving HER reports.</p>
Heating and Cooling	<p>The primary market imperfection common to the target market was inadequate information and/or knowledge regarding the energy saving benefits of high-efficiency HVAC systems for cooling and electric heating, and the use of electric resistance heating.</p>	<p>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</p>

	<p>Additionally, the investment/cost of installing a new HVAC unit can deter customers from ultimately making the decision to purchase until absolutely necessary. Further, when customers replaced a system, the greater upfront costs of high-efficiency systems could cause them to purchase lower-efficiency units, even if system incurred greater lifetime operating costs.</p>	<p>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.</p>
<p>Lighting</p>	<p>The market continues to transition rapidly. CFLs—an innovative new product but a few years ago—are being phased out. The swift pace of change creates an information barrier for consumers. Most consumers do not understand the differences between the incandescent bulbs that they were used to (and are no longer available as general-purpose bulbs) and the halogens and LEDs now widely available. Most LEDs remain far more expensive than other, less-efficient bulb types. LEDs remain cost-effective due to their much longer lifespans than normal bulbs, but consumers do not always know of this long life or do not value it.</p>	<p>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.</p>
<p>BizSavers</p>	<p>Findings from previous evaluations pointed to three types of “market imperfections” or structural factors that may affect the ability of Ameren Missouri customers to undertake energy efficiency upgrades on their own or through the BizSavers programs: cost, lack of program awareness, business size, and geography. The current evaluation suggest that low program awareness may constitute the primary market imperfection, or barrier, while business size and geography do not appear to be major barriers.</p> <p>Awareness. The level of program awareness among nonparticipants is less than half the level identified three years ago, a finding that cannot be attributed to differences in the make-up of the surveyed nonparticipants. One possible factor is that awareness previously was assessed in the middle of the program cycle while the current evaluation assessed it nine months after the program started up again following a three-month suspension. Another possible factor is that fewer customers are learning about the program from contractors and vendors, which conceivably could be related to a reduction in the size of the trade ally network and the program’s movement away from distribution of printed collateral to trade allies and toward downloadable online material.</p> <p>Awareness of the new EMS pilot program was low among interviewed trade allies who reported doing relevant work and among surveyed program-eligible nonparticipants.</p> <p>Cost. Even though energy efficient equipment pays for itself in the long term, the first cost must compete with other priorities and so the higher upfront cost of energy efficient equipment may be a barrier. The high</p>	<p>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.</p> <p>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.</p> <p>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.</p>

NTG ratios for the BizSavers Program, together with feedback from participants about the value of the incentives, emphasized the importance of incentives in driving the efficiency upgrades.

Business size. While businesses in the small rate class comprise a lower percentage of program participants and projects than of Ameren Missouri business customers as a whole, their share of energy savings is slightly higher than their share of annual kWh usage.

Geography. Similarly, the St. Louis metro area and outer suburban areas comprise a higher percentage of BizSavers participants and projects than of business customers, but the share of energy savings across parts of the Ameren Missouri service territory is consistent with the distribution of total energy consumption across those areas. This reflects a greater concentration of larger businesses in the St. Louis metro areas and suburban areas compared to the rest of the service territory.

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, state policy, multifamily property budgeting cycles, 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 significant barrier to efficiency improvements in the properties managed. This sentiment was echoed by a survey respondent who noted that the properties generate limited income from which efficiency improvements could be financed. Additionally, securing financing for property improvements can be challenging for low-income multifamily property owners and program staff recognize that assistance in securing financing is an important service that the program can provide.³

State Policy. Missouri state law disallows properties that receive Missouri state Low-Income Housing Tax Credits (LIHTC) from receiving incentives for energy efficiency improvements made to common areas of the properties.⁴ Program staff stated that this is a significant barrier to common area projects and historical data on program participation indicates that a significant share of prior participants received the LIHTC. Staff appeared to have made progress in reaching properties that do not receive the LIHTC in PY7PY2016, as approximately one-fifth of the participating properties were identified as LIHTC recipients. Additionally, review of the National Housing Preservation database on subsidized housing indicates that approximately 40% of subsidized properties in Ameren Missouri's service territory do not receive the LIHTC, suggesting that there is a sizable market of low-income properties that are qualified to receive common area measures. That said, the prohibition against ³ Energy Efficiency for All (2015). Program design guide: Energy efficiency programs in multifamily affordable housing. Energy Efficiency for All Project. ⁴ Although it is likely less impactful, buildings that receive Historic Tax Credits are also ineligible for common area incentives.

Budget Cycle. Budgeting cycles create barriers to participation to the extent that program outreach efforts are misaligned with these cycles. Program staff indicated that this misalignment was an issue during PY7PY2016 because of the program's late start. Future years should not be impacted by this issue so long as outreach efforts take these budget planning

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.

processes into consideration.

Geography. Analysis of the program activity in comparison to 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. One survey respondent stated that they did not have the staff available to implement efficiency improvements at the property.⁵ 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 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. The program measure that is likely most affected by the impact of split incentives between owners and occupants are HVAC replacements that are metered under I(M) residential rate class. Split incentives are not a factor common area improvements for which the building operator is responsible for the cost of the equipment and the cost of electricity service.

Table 25: Issue 2 - Is the target market segment appropriately defined, or should it be further subdivided or merged with other market segments?

Program	2016 Summary Response	2017 Summary Response
Efficient Products	<p>The program appropriately targets all residential customers who purchase qualified energy-saving items for use in their homes.</p>	<p>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.</p>
Energy Efficiency Kits	<p>The school-based delivery channel and the multifamily delivery channel's target market segments are appropriately defined. The target market segment for school-based delivery channel is schools within Ameren Missouri's service territory. The target market segment for multifamily delivery channel is Ameren Missouri customers living in multifamily units with electric water heating.</p> <p>The educational component of the school-based delivery channel is designed to lessen the market imperfection of inadequate information or knowledge regarding the energy savings benefits of high-efficiency household items. This added benefit of the school-based delivery channel outweighs the fact that school kits cannot be limited to customers of Ameren Missouri with electric water heating.</p>	<p>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.</p>
Home Energy Report	<p>The target market is appropriate because the majority of residential customers should be able to change energy usage behaviors to decrease energy consumption.</p>	<p>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 customers.</p>
Heating and Cooling	<p>The target market segment was appropriately defined and comprehensively served for the single-family residential market. The target market included: customers living in single-family homes; multifamily buildings of four units or fewer; or in row houses. Specifically, the Heating and Cooling Program offered tiered incentives for customers replacing a failed but functional heating and cooling system (i.e., early retirement).</p>	<p>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.</p>

Lighting	<p>The program appropriately targets the entire residential lighting market, given the low saturation of LEDs in the territory.</p>	<p>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.</p>
BizSavers	<p>For most building end uses, the distribution of program participants matches relatively well with the distribution of businesses in the population. The offices and healthcare segments appear to be somewhat underrepresented in the program population, while the retail, food & beverage service, and lodging segments appear to be overrepresented, but this may in part be a function of the method used to estimate the population proportions.</p> <p>Evaluation findings support the establishment of the SBDI Program to serve small businesses. Feedback from program participants indicated that they would do relatively few energy efficiency upgrades without the program, and just more than half of nonparticipants indicated they likely would participate in the program if approached by an SBDI contractor.</p> <p>So far, the evaluation findings do not strongly support the need for special EMS incentives targeting tax-exempt entities. Even after being told about the Ameren EMS incentives, fewer than one in six program-eligible nonparticipants said they were likely to apply for the incentives. However, this pilot program is still young and awareness is still low. Two-third of interviewed trade allies who do pertinent work said they would likely do program-incented EMS projects in the coming year, generally five or fewer such projects.</p>	<p>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.</p> <p>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.</p> <p>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.</p> <p>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 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</p>

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. 5 Prior evaluations of CommunitySavers also identified staffing issues as a barrier to program participation. Ameren Missouri Low Income and Process Evaluation: program Year 2015. The current evaluation found that the PY2016 participating properties included both subsidized housing and low-income market rate housing. Within the subsidizing housing properties, the program reached HUD housing, LIHTC housing, and USDA properties. Moreover, staff discussions of outreach approaches and challenges demonstrated a recognition that subsidized housing and fair market affordable housing are different sub-segments of the low-income multifamily housing market.

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 is likely preferable to expanding the program to target single family low-income housing or mass-market multifamily housing.

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.

Table 26: 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	2016 Summary Response	2017 Summary Response
Efficient Products	<p>Yes. 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 currently offer rebates for kitchen or laundry appliances. Other cost-effective end-use technologies are targeted through other programs.</p>	<p>Yes. 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. Ameren Missouri greatly expanded the list of qualified smart thermostats in PY17, in response to new models coming to 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.</p>
Energy Efficiency Kits	<p>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.</p> <p>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 not typically offered by other similar programs (e.g., LED light bulbs, pipe wrap). The measures not offered by Ameren Missouri but offered by the other programs included CFL lightbulbs and showerheads.</p> <p>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.</p>	<p>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 be working in a way to meet the needs of property managers.</p>

<p>Home Energy Report</p>	<p>This program does not incent end-use measures directly but does promote measures, as well as other Ameren Missouri programs, using tips in the HER reports. The tips include measures that are short term and easy to implement as well as measures that are more complex or longer term investments. They included information on LEDs, programmable and smart thermostats, efficient equipment replacements, and weatherization –all applicable to the residential customer segment.</p>	<p>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.</p>
<p>Heating and Cooling</p>	<p>The program targeted primary end-use technologies within the targeted market segment, offering incentives for all broad measure categories (note: the Efficient Products program offered smart thermostats via the Efficient Products program). For customers who have/or plan to install GSHPs and have electric water heaters, the program could offer de-super heaters in conjunction with GSHPs, if determined to be cost-effective.</p>	<p>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.</p>
<p>Lighting</p>	<p>Yes. The program continues to offer a diverse array of bulb models that meet most household lighting needs.</p>	<p>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.</p>
<p>BizSavers</p>	<p>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 standard incentive application covered the equipment needs of most participants who used that option, although a notable minority of interviewed trade allies suggested the program did not provide a wide enough range of standard incentive options.</p> <p>The primary concern with measures related to the elimination of incentives for exterior lighting, which reportedly had a largely adverse impact on trade allies. The adverse effects came not just from the loss of the exterior lighting sales themselves, but because inability to include exterior lighting in projects affected overall project cost-effectiveness, resulting in the loss of entire projects. The evaluation team understands that Ameren Missouri and the program implementer have decided to re-introduce exterior lighting to the list of incented measures for the new program year.</p>	<p>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.</p> <p>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.</p>
<p>CommunitySavers</p>	<p>The program offers measures that cover all major multifamily in-unit end-use needs: lighting, appliances, space cooling and heating, and water</p>	<p>The program offers measures that cover all major multifamily in-unit end-use needs: lighting, appliances,</p>

heating. Additionally, the Standard and SBDI incentives available for common areas cover lighting, commercial refrigeration and kitchen improvements are eligible for Custom incentives equipment, and pool pumps. Building envelope

Survey respondents did not identify any additional measures that should be included in the program. Two-thirds of participant survey respondents aware of the common area incentives stated that these incentives completely met their needs for efficiency improvements (the remaining one-third did not elaborate on why their needs were not met). Additionally, 94% of property managers were satisfied with the equipment installed through the program.

One potential opportunity is the addition of standard incentives for clothes washers. Review of the participant applications found that several of the participating properties had laundry rooms on the premises. A limitation on effectively targeting washing machines is that many multifamily properties lease laundry equipment from a third party.⁶ Targeting equipment leasers would require the development of additional outreach approaches and require additional resources. Moreover, split incentives between leasers that own the equipment and properties that pay for the energy costs would need to be addressed. As such, targeting this measure may not be worth the cost required to do it effectively.

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.

Table 27: Issue 4 - Are the communication channels and delivery mechanisms appropriate for the target market segment?

Program	2016 Summary Response	2017 Summary Response
Efficient Products	<p>Yes. Customers may purchase qualified items from any retailer, within or outside of Ameren Missouri's service territory, including online purchases.</p> <p>Ameren Missouri markets the program directly through a variety of channels and also 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.</p>	<p>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.</p>
Energy Efficiency Kits	<p>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.</p> <p>For the multifamily kits communication flowed to and from Ameren Missouri, the implementer ICF, the property managers, and their tenants. Cadmus did not assess this communication channel in PY16, due to the later program startup.</p>	<p>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 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.</p>

Home Energy Report	<p>The communication channel for HER reports is mailing paper reports. Surveyed customers read (89%) and either somewhat or strongly agreed that they were satisfied with the HER reports (95%), indicating that the mailed HER reports functioned as intended and were appropriate for the target market segment. Benchmarking, however, suggests that HER reports should be sent with higher frequency and in combination with an email channel and/or web portal where participants could access their customer-specific information.</p>	<p>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.</p>
Heating and Cooling	<p>Current communication channels proved appropriate. The program benefitted from a broad marketing campaign, which sought to raise customer awareness about the Heating and Cooling program. The campaign included mailings, television, and radio advertisements. Contractors served as the primary driver of customer awareness about incentives for upgrading to efficient equipment, and served as the program's primary "ambassador" to the public.</p>	<p>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.</p>
Lighting	<p>Yes. The program operates in several large national retail chains that serve differing, broad, cross-sections of the population. The program also operates in smaller, local discount stores that serve customers that might not frequent large chains. The online store serves customers that do not live in easy driving range of a participating brick-and-mortar location. A review of program marketing materials found that Ameren Missouri follows marketing best practices.</p>	<p>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.</p>
BizSavers	<p>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). The implementer continued to conduct targeted outreach to decision makers representing customer account aggregates or "towers." This appears to be an effective approach, as one-third of projects were completed by customer accounts identified as "towers," who completed twice as many projects per customer, on average, as those not in towers.</p> <p>As indicated above, there is evidence of decreased awareness of BizSavers incentives in general and of EMS incentives targeting tax-exempt entities in particular. Moreover, there continues to be poor awareness of the new construction program requirement to apply for incentives before</p>	<p>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."</p> <p>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 about ten times as effective at generating projects as are other means: specifically, as much as one-third of</p>

incorporating equipment into a project's plan.

While surveyed program participants were largely satisfied with program processes, a large minority of interviewed trade allies suggested the application process was overly burdensome, requiring information that sometimes was hard to obtain, and more than one-quarter of surveyed participants with custom projects had to resubmit or provide supporting documentation for their applications.

One potential program delivery concern is the fact that the new SBDI Program has relied so far on a single contractor to deliver three-quarters of the projects. This may be particularly a concern given a significant decline in the number of project starts from December to February, although program staff have reported that project starts have since increased again, partly as a result of increased program incentives.

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

CommunitySavers The program uses three strategies for reaching the target market: direct outreach; outreach to building management groups (e.g., HUD, Public Housing Authorities), and other multifamily housing groups such as Community Development Corporations and neighborhood associations; and earned media. Direct outreach and repeated contact is important for this market segment because this segment is typically viewed as unresponsive and difficult to reach. The outreach performed and staff's activities in working with building management groups and other stake holders is also a recommended practice for reaching multifamily property decision makers.⁸ Earned media may be effective at generating broader awareness of the program but the program did not focus on this outreach tactic during PY7PY2016.

Program messaging focuses on the availability of incentives and no-cost measures and secondarily on the assistance provided by knowledgeable program staff and the benefits to tenants are likely. These messages are likely to resonate with property managers as they address barriers to energy efficiency improvements, such as insufficient financial and staff resources, and are consistent with motivations for participating noted by participant survey respondents.

There may be an opportunity to improve the awareness of common area incentives. Survey responses suggest that some qualified direct install participants may not be aware of common area incentives, although program staff stated that they discuss the program incentives for common area improvements with eligible participants. It may be the case that while the information is presented to the participants, it has not garnered their interest.

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 program implementation contractor 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 28: 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	2016 Summary Response	2017 Summary Response
Efficient Products	<p>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. Higher incentives and additional marketing for RAC's may improve participation and lower free ridership.</p>	<p>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.</p>
Energy Efficiency Kits	<p>For the school delivery channel, the evaluation analysis found that while Ameren Missouri's kit installation rates were among the highest of benchmarked peer programs, some households need additional installation instructions, the opportunity to return unused products, and suggestions for alternative options if the product doesn't fit the household's equipment.</p> <p>For the multifamily delivery channel the team did not perform this assessment in PY16, due to the later program startup.</p>	<p>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.</p>
Home Energy Report	<p>Ameren Missouri should continue to monitor savings over time as the HER program matures, and should consider strategies that have worked for similar programs (e.g., increasing the number of reports sent; adding a customer-specific progress tracker to the HER report, adding email and web-portal channels; and improving the format of their HER reports).</p>	<p>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.</p>
Heating and Cooling	<p>Marketing messages primarily focused on rebates available to target market customers when upgrading to efficient heating and cooling equipment. Expanding messaging to highlight the</p>	<p>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</p>

	additional benefits of efficient heating and cooling equipment could further motivate customers to upgrade to efficient equipment.	incentives or providing financing options.
Lighting	LED prices continue to present major barriers, as consumers do not understand LED bulbs' added value. Store intercept results found in-store promotions highly effective at driving sales and at producing more comments about understanding LED bulbs' energy savings benefits and long life. Ameren Missouri and its implementer should continue emphasizing in-store promotions, and should consider placing greater emphasis on the online store and increasing educational marketing online.	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.
BizSavers	<p>The program implementer should work to increase awareness of the new construction program rules among contractors and vendors. In particular, increasing the awareness of the importance of involving the program staff early in the design phase is important for maximizing savings. One thing to consider may be to include providing some form of recognition to contractors who attend specific training on, and demonstrate knowledge of, new construction program rules and processes—for example, identifying such contractors as “new construction program specialists” on the trade ally website and providing special new construction program co-branding.</p> <p>The program implementer should consider increasing the size of the trade ally network and re-introduce distribution of printed collateral to trade allies for use in marketing the program to customers.</p> <p>The program implementer should continue to monitor the project delivery of all SBDI service providers and, if necessary, attempt to recruit more SBDI service providers capable of delivering reasonably large numbers of projects and/or 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.</p> <p>Ameren Missouri should consider adding customer type information to its customer database to make it easier for programs to identify any under-served segments and improve reach into those segments and improve assessments of program reach to various business and building types.</p>	<p>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.</p> <p>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.</p> <p>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.</p>
CommunitySavers	Additional staffing resources to identify qualified unsubsidized housing, cultivate relationships with potential participants, financiers, multifamily	Continued engagement with PACE may provide additional opportunities to finance higher cost measures with longer measure lives. Reviewed

property groups, and trade allies should assist with customer recruitment.

Continue to develop relationships with financing institutions. Staff recognizes that facilitating financing is key to developing common area improvement projects that 7 Energy Efficiency for All (2015). Program design guide: Energy efficiency programs in multifamily affordable housing. Energy Efficiency for All Project. 8 CNTenergy and American Council for an Energy-Efficient Economy (2013). Engaging as partners in energy efficiency: A primer for utilities on the energy efficiency needs of multifamily buildings and their owners. require properties to fund a portion of the measure cost. Additionally, financial organizations may also be an important source of referrals and may direct property managers and owners to the program when they are in the process of seeking financing for building improvements.

Develop marketing materials focused on common area improvements. The program brochure focuses on direct install measures, although it does reference the availability of other incentives. Staff should consider developing marketing materials that focus on common area improvements such as SBDI lighting projects that can be completed at no cost to the owner.

Develop case studies based on common area projects. A few common area projects have been completed in PY7/PY2016 and early PY8. Staff should look to these successes to develop case studies to promote these projects with other property managers and owners. Case studies that illustrate the cost savings, ease of participation, and service provided by program staff should be effective at addressing concerns related to project costs and time commitments. Other important messages include the financial benefits of reduced maintenance and equipment longevity (i.e., for LED lighting in particular).

Focus trade ally outreach on HVAC suppliers and contractors. Split-incentives between owners and occupants are most likely to adversely impact decisions to install efficient air conditioner and heat pump replacement projects. For this reason, replacements are most likely to occur when units burn out. HVAC contractors and suppliers are positioned to effectively intercede on behalf of the program to encourage multifamily properties to install efficient equipment when systems are replaced.

literature indicates that the inability of property managers and PACE administrators to estimate 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.

