# MEEIA Cycle III PY3:
# Residential & Demand Response
# Measurement and Verification Report
# Missouri Metro and Missouri West: Appendices

Prepared for:

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# Appendix A Net-to-Gross Approaches by Program

## A.1 Net-to-Gross: Heating, Cooling, and Home Comfort

This section provides a summary of the method to score the responses from the participant survey and a general population survey for the measure-level free ridership score, project-level free ridership score, and overall spillover score. Questions relating to the assessment of net-to-gross (NTG) address both free ridership and spillover (participant and non-participant). The methodologies, survey questions, and calculations are outlined in the sections below.

### A.1.1 Ability to Purchase the Measure Without the Rebate

The participant free ridership (PFR) questions addressed the following criteria to determine the likelihood that a customer is a free rider:

- Financial ability to install the energy efficiency measures without program rebate
- Prior plans regarding installation of the energy efficiency measures, including purchasing a more efficient measure
- Likelihood of implementing the measures in the absence of the program
- The program's impact on the timing of measure implementation

The first criterion was based on the response to a question regarding if a participant would have still purchased the efficient measure if they would not have received the program rebate. This was assessed with the following question:

> PFR1: Would you have still purchased the following without the Evergy discount/rebate?

Respondents who indicated that they would not have purchased the efficient measure without the program rebate were assigned a Plans Score of 0 (see Figure A-1). For all others, a Plans Score was assigned based on a combination of their reported prior plans to implement the measure, whether a more efficient measure was purchased due to the rebate, and the reported effect of the program on the likely timing of the installation (as described in following subsections). Figure A-1 outlines how a Plans Score was assigned in more detail.

### A.1.2 Prior Plans/Measure Efficiency

The presence of plans prior to involvement with the program was assessed through the following questions:

> PFR2: Did you plan to purchase the following energy-efficient equipment/upgrades before learning about the discounts/rebates offered by Evergy?

> PFR3: Did you purchase and install [a more efficient/more] [MEASURE] because of the Evergy rebate/discount?

Respondents who answered “Yes” to PFR2 and “No” to PFR3 were assigned a Plans Score of 1. All other respondents were assigned a Plans Score of 0.

### A.1.3 Program Impact on Timing

Program impact on timing is used to account for deferred free ridership. Conceptually, if a participant would have implemented the same measures but did so earlier than they would have without the program, it can be said that the program affected the timing of the savings by causing them to happen earlier than they would have otherwise happened. Here, the approach of using the timing score in the free-ridership calculation is to adjust the net first year savings.

The program effect on the timing was assessed with the following question:

> PFR8: If you had not received the Evergy discount/rebate, when might you have completed the following energy-efficient equipment/upgrades?

The information provided in the response to this question was used to assign a timing score based on when a participant would have installed the same measure. This is dependent on when the participant had the original measure installed (either the first 6 months of the program year or the last 6 months of the program year). This is consistent with the definition of a free rider as someone who would have implemented a program measure within the same year of when it was installed through a program. Timing scores were assigned using the following logic:

- If the respondent stated that they would have installed the measure at the same time (no impact on timing), the preliminary free ridership score was multiplied by 1 if the participant had the measure installed in January through June and was multiplied by 0.5 if the participant had the measure installed in July - December.
- If the respondent stated that they would have installed the measure within 6 months, the preliminary free ridership score was multiplied by 0.5 if the participant had the measure installed in January through June and was multiplied by 0.25 if the participant had the measure installed in July - December.
- If the respondent stated that they would have installed the measure in 6 months to one year, the preliminary free ridership score was multiplied by 0.25 if the participant had the measure installed in January through June and was multiplied by 0 if the participant had the measure installed in July - December.
- If the respondent stated that they would have installed the measure in more than one year, the preliminary free ridership score was multiplied by 0 for all participants.

### A.1.4 Likelihood of Implementing the Measure in the Absence of the Program

The respondents' stated likelihood of implementing the measure in the absence of the program rebate was assessed through the following question:

> PFR5: How likely is it that you would have purchased the following energy-efficient equipment/upgrades without the Evergy discount/rebate?

The respondents' stated likelihood of implementing the measure based on the recommendation from the service provider was assessed through the following questions:

> PFR6: Were any of the energy-efficient equipment/upgrades recommended by your contractor/energy auditor during an initial visit to your home?
>
> PFR7: [IF YES TO PFR6] How likely is it that you would have purchased the following energy efficient equipment and/or upgrades if your contractor/energy auditor had not recommended them?

Based on the responses to the likelihood questions, the following point values were assigned to each of the responses:

1 (Not at all likely) = 0

2 = 0.25

3 = 0.5

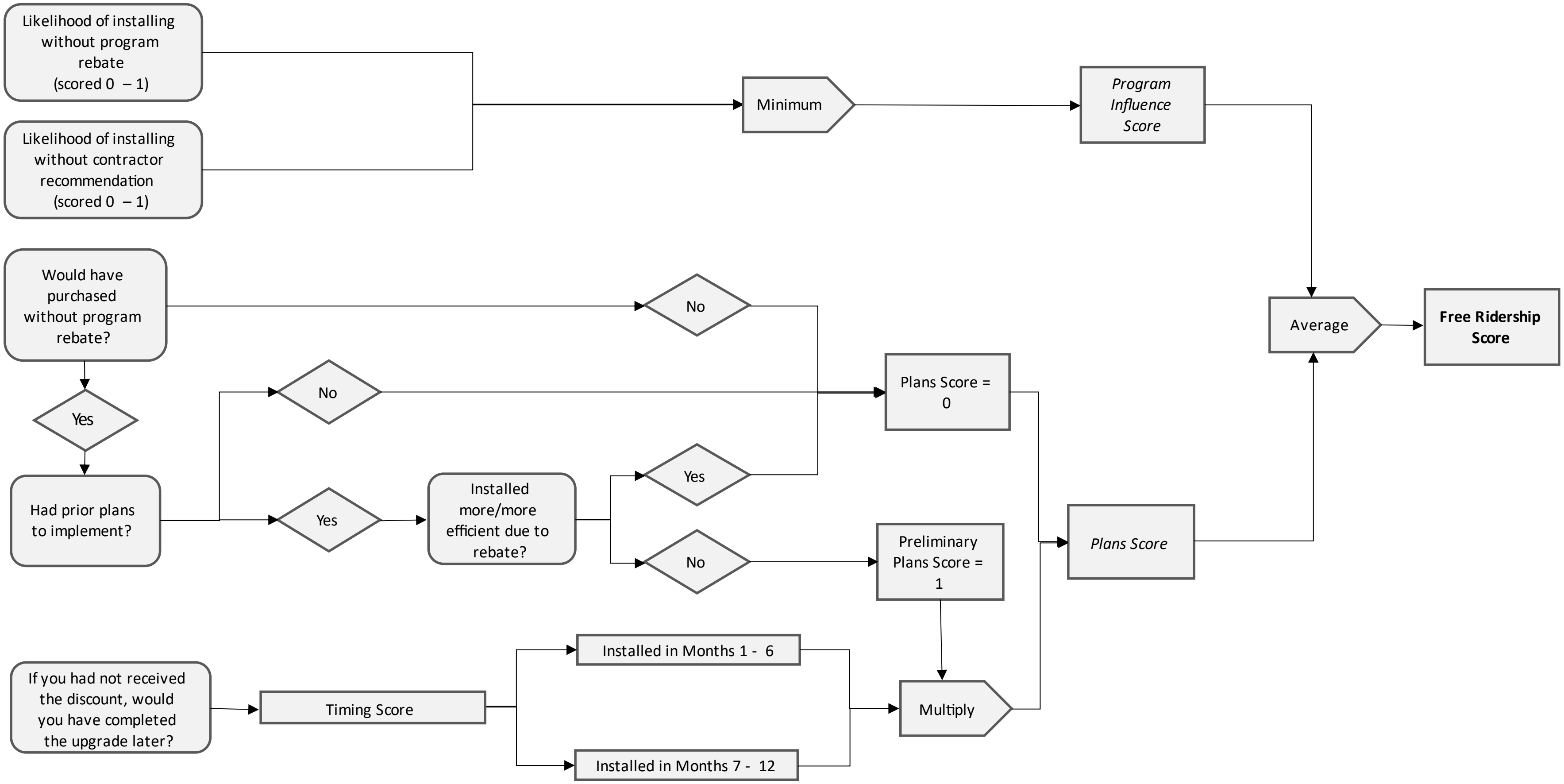
4 = 0.75

5 (Very likely) = 1

The likelihood score was based on the lowest rating provided on questions PFR5 and PFR7.

For any free ridership survey question that was answered with a "Do not recall" response, the calculations allowed for one "Do not recall" response per survey participant. If a survey participant answered one free-ridership survey question with a "Do not recall" response, the average Program Influence Score and Plans Score was taken. This way the survey question that was answered with a "Do not recall" response did not have a significant influence on the overall free-ridership score. If a survey participant answered more than one free-ridership survey question with a "Do not recall" response, that participant was dropped from the overall free-ridership calculations. For all program participants, the free-ridership score was based on the average of the plans score and the lowest likelihood of installing the measure without the program rebate or contractor recommendation. Figure A-1 illustrates the above process for generating the final free ridership score.

*Figure A-1: Free Ridership Scoring*



### A.1.5 Project-Level Free Ridership

ADM calculated the measure-level free ridership scores by taking the average free ridership score per measure for each survey participant.[1] The measure-level free ridership scores for each respondent were weighted by the gross kWh savings by measure using the following approach: 1) for each respondent, first multiplied the measure level free-ridership score (as noted above, a number from 0 to 1) for each installed measure by the kWh savings that measure represents; 2) sum the total measure level free-ridership kWh over the incentivized measures; 3) divided that sum by the total project kWh savings. The result is a value from 0 to 1, representing the respondent's project-level free ridership score. This means that if a respondent indicated free ridership for a low kWh impact measure, but no free ridership for a high kWh impact measure, the overall free ridership score is low, as it was more heavily weighted by the free ridership score for the high kWh impact measure. The savings-weighted measure-level score was then extrapolated to each program participant.

### A.1.6 Participant Spillover Scoring

Participant spillover (PSO) is defined as energy efficiency measures that respondents report installing in their home without receiving additional incentives but that were installed based on program influence. Potential participant spillover respondents were identified using the question below:

> PSO1: Have you installed any additional energy-efficient equipment or home improvements in 2022, with or without receiving a discount or rebate?

Participants indicating that they purchased and installed one or more energy efficiency projects in 2022 since participating in the Heating, Cooling, and Home Comfort Program were then asked two questions to determine whether the energy savings resulting from those measures attributed to the program:

> PSO2: How would you rate the importance of the discount/rebate and/or Energy Saving Kit from Evergy in your decision to install those additional energy-efficient equipment or home improvements?
>
> PSO3: How likely would you have been to install those additional energy-efficient equipment or home improvements if you had not received a discount/rebate and/or Energy Saving Kit from Evergy?

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[1] A free-ridership score of 0 was applied to all faucet aerators and low flow showerheads in the program as per the IL TRM v9 (Page 207, Page 217): "Average measured flow rates are used in the algorithm and are lower, reflecting the penetration of previously installed low flow fixtures (and therefore the free rider rate for this measure should be 0), use of the faucet/showerhead at less than full flow, debris buildup, and lower water system pressure than fixtures are rated at."

The responses to PSO2 were scored as following (on a scale of 0 to 10, where higher values indicated higher spillover):

0 (Not at all important) = 1

1 = 0.9

2 = 0.8

3 = 0.7

4 = 0.6

5 = 0.5

6 = 0.4

7 = 0.3

8 = 0.2

9 = 0.1

10 (Very important) = 0

The responses to PSO3 were scored as following (on a scale of 1 to 5, where higher values indicated higher spillover):

1 (Not at all likely) = 0

2 = 0.25

3 = 0.5

4 = 0.75

5 (Very likely) = 1

Participants responding to question PSO3 with a rating of 7 or higher and responding to question PSO3 with a rating of 3 or lower were considered to have been motivated by the program to make these additional purchases, and the energy savings from these items were attributed to the program. Furthermore, if a measure could not be determined to be energy efficient, then it was not included towards overall spillover savings. Spillover savings for measures similar to those offered through the program were calculated using deemed inputs and assumptions from the Illinois Technical References Manual (IL TRM), along with measure data collected through the survey and then extrapolated to the program population.

### A.1.7 Non-Participant Spillover Scoring

Non-participant spillover (NPSO) is defined as the additional energy savings achieved when a non-participant implements energy-efficiency measures and/or practices due to the program's influence through exposure to the program (for example, from a contractor/trade ally/energy auditor or some other source). but is not accounted for in program savings.

#### *Identifying Non-Participants*

ADM administered a general population survey to a random sample of Evergy residential customers. Respondents who answer "No" to the following question were considered non-participants:

> NPSO1: Have you received an incentive, discount, and/or rebate from Evergy or participated in a program through Evergy in the past 3 years?

#### *Identifying Non-Participant Spillover Measures*

Estimates of spillover were based on a series of questions answered by non-participant respondents. The questions are intended to:

- Identify efficiency measures implemented by program non-participants.
- Collect measure specific information for use in estimating saving due to the measure; and
- Collect information to substantiate attribution of the savings to the Evergy programs and marketing.

The survey administered to customers in Evergy's service territory asked if they implemented any of the following energy efficiency measures during 2022. There is value in understanding the scope of measures being purchased by Evergy customers, so a broad range of measure information was gathered. However, only the measures outlined below were considered for the non-participant spillover calculations. The following measures are all currently offered as part of the Heating, Cooling, and Home Comfort Program:

- Energy-efficient central air conditioner
- Energy-efficient air source heat pump
- Energy-efficient ground source heat pump
- Energy-efficient ductless mini-split heat pump
- Attic insulation
- Air sealing (e.g., weather stripping for doors/windows, door sweeps)
- Faucet aerators
- Low-flow shower heads
- Advanced power strips that control energy use

- Hot water pipe insulation

For each measure selected, the respondent was asked additional questions to 1) confirm that the measure implemented is an energy efficiency improvement, and 2) collect additional information to estimate the savings associated with the measure.

### *Assessing Program Attribution*

For each measure type respondents report implementing, respondents were asked a series of questions to determine if Evergy marketing/programs influenced the implementation of the measure. To count as spillover, the respondent needed to indicate that 1) they considered information from an Evergy source when deciding to implement the measure and 2) provide ratings that indicated that the Evergy information was important in their decision and that they would have been unlikely to implement the measure if they had not seen that information.

The questions asked of respondents are as follows:

> NPSO2: When you were deciding to install the [MEASURE], did you consider any of the following sources of information? (Answer Options: Yes or No)
>
> 1. Emails from Evergy about saving energy
> 2. Information on Evergy's website
> 3. Bill inserts or other mailings from Evergy
> 4. Information from Evergy social media sources
> 5. a contractor or retailer of Evergy's incentives
> 6. Information from people who received a rebate from Evergy for installing energy-efficient equipment/home upgrades

Respondents who answer "yes" to one or more of the above, were asked the following:

> NPSO3: How important was that information in your decision to install the [Measure]? (Answered on a 0 (Not at all important) to 10 (Very important) scale)
>
> NPSO4: How likely would you have been to install the [Measure] if you had not seen that information from Evergy? (Answered on a 0 (Not at all likely) to 10 (Very likely) scale)

A measure was considered spillover if the respondent answers "Yes" to one or more of the sources of information in NPSO2, if NPSO4 less than 7, and if the average of NPSO3 and 10-NPSO4 is greater than 7. For HVAC system replacements, respondents were also asked to describe in their own words how the information from Evergy influenced their decision to install efficient equipment. ADM reviewed these responses and only count as spillover those measures for which a credible explanation of program influence was provided.

### *Estimating Non-Participant Spillover Measure Savings*

ADM referenced the 2022 Evergy Technical Resource Manual (Evergy TRM)[2] when estimating the savings of the non-participant spillover measures. As part of the savings estimation, ADM confirmed that the reported measure resulted in electricity savings by collecting and reviewing data on the fuel type used by the measure or systems affected by the measure (e.g., that the respondent has an electric water heater or an electric heating system).

ADM extrapolated the sample reported non-participant spillover to the population of nonparticipants in Evergy's service territory. The steps to extrapolate the spillover are as follows:

- Sum the total savings associated with the non-participant spillover measures reported by respondents.
- Calculate the per non-participant spillover savings as equal to the sum of the program non-participant spillover savings divided by the total number of respondents who indicate they have not received an incentive, rebate, or discount in the past three years.
- Estimate the number of non-participants by calculating the percent of survey respondents who indicate they are non-participants and multiplying this value by the number of residential customers Evergy provides service to.
- Calculate the total spillover by multiplying the estimate of the number of non-participant Evergy customers by the per participant spillover value.

### A.1.8 Determination of Program-Level Net-to-Gross Ratio

The project level free ridership scores for each respondent were weighted by the verified kWh savings per project to determine the final weighted average free ridership estimate per customer in the sample. This estimate, along with the spillover estimate, was used to calculate the final net savings (see Equation A-1).

*Equation A-1: Net-to-Gross Calculation*

$$NTG=(1\text{-}Freeridership) + Spillover$$

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[2] Evergy MEEIA Cycle III Technical Reference Manual (2022-01-01).

## A.2 Net-to-Gross: Energy Saving Products

The following section details the free ridership, participant spillover, and leakage estimates used to determine net savings for the Energy Saving Products Program in 2022. Net savings were based on free ridership, participant spillover, and program leakage. Each effect is discussed in detail below.

### A.2.1 Survey Determined Free Ridership – Upstream Rebates

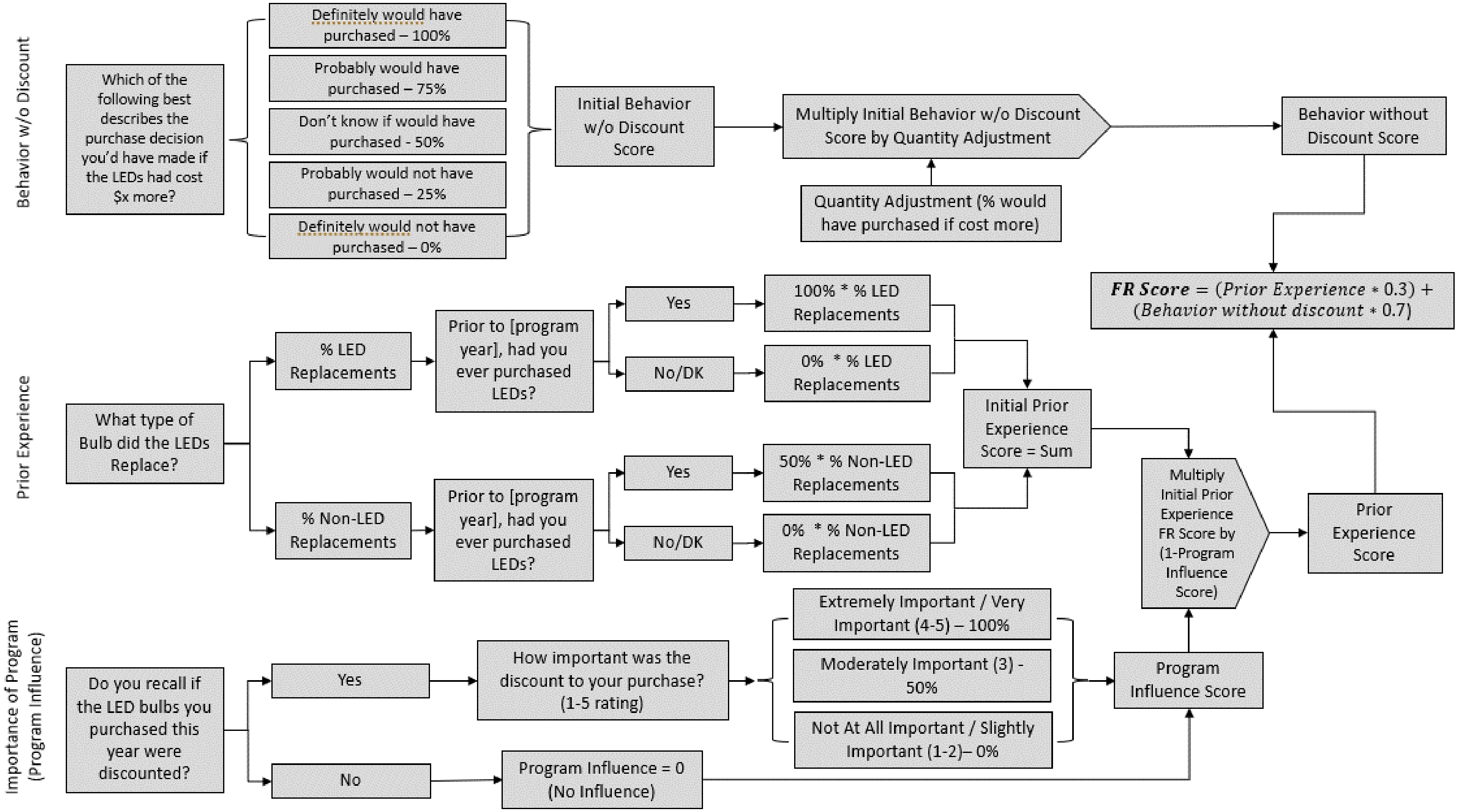
ADM conducted a general population survey of randomly selected residential customers. Three survey efforts were conducted to broaden the scope of the analysis and meet target survey complete quantities. The survey was conducted using email invitations to an online survey platform, and small gift card incentive to those who completed the questionnaire.

The first and second survey waves were released in January 2023 to approximately 10,000 customers, while the third survey wave was released in February 2023 to approximately 5,000 customers. Total survey completes from the three waves equaled 749 responses.

The strength of a survey-based approach is the ability to obtain a large, random sample size cost-effectively. It also allows for further questioning regarding the quantity and location of installed bulbs and the motivation behind bulb purchases. In addition, it allows the evaluator to contact customers at a time when many retailers are restricting third parties from entering their premises and surveying customers in person. The biggest drawback to the approach is the potential for respondent recall bias. For example, it may be difficult to get accurate responses to questions about the number of bulbs the respondent recently purchased and whether they were discounted through the program. This problem is particularly prominent in upstream programs where the respondents may not be aware that the bulbs they purchased were discounted.

Survey respondents were asked a series of questions to elicit feedback regarding influences on their light bulb purchasing decisions. Each respondent was then assigned a free ridership score based on a consistent free ridership scoring algorithm. The free ridership scoring algorithm developed for the survey instruments is shown on the following page on Figure A-2.

*Figure A-2: Free Ridership Scoring for LEDs*



The free ridership score is determined as the combination of two scores, the Behavior without Discount Score based on the participants reported behavior, and the Prior Experience Score based on the participants experience with LEDs.

The Behavior without Discount Score is the primary determinant of respondents' free ridership scores, accounting for 70 percent of the total score. This section asked whether the respondent would have purchased the same light bulbs at the regular retail price. As this question is particularly prone to social desirability bias (the tendency to respond in a manner that might be viewed favorably by others), each respondent was asked what the most important characteristic was when purchasing bulbs. As a consistency check, if a respondent lists "price" as the most important characteristic, but then goes on to indicate that they would have still purchased efficient options at full retail price, their response was eliminated from the data population.

The Prior Experience Score accounts for the remaining 30 percent of the free ridership score. The prior experience score is based on the participants previous experience with LED bulbs (customers who had previously purchased LEDs are more likely to be free riders), and the reported importance of the discount on the customer's purchasing decisions.

The algorithm also considers the influence of the program in a customer's decision to purchase the LED bulbs, which is referred to as the Program Influence Score. The Prior Experience Score is adjusted by the Program Influence Score to account for if a customer could recall receiving a discount for purchasing LED bulbs and if so, the importance of the discount in the customer's purchasing decision.

ADM analyzed survey responses from 749 Evergy customers. Of these, 544 verified responses were used to calculate free ridership for standard LEDs, and 193 verified responses were used to calculate free ridership for specialty LEDs. Verified responses are fewer than total responses as some customers were eliminated if they did not answer relevant questions, failed the consistency check outlined above, or did not purchase bulbs at participating retailers. For program LEDs distributed through budget-retailers Dollar Tree, True Value, Habitat ReStore, and Goodwill, ADM applied an assumed Net-To-Gross Ratio of 1.0 as these retailers would likely not stock ENERGY STAR® LEDs in the absence of the program.

Finally, ADM estimated the average free-ridership score for each participating retailer. Overall Free Ridership scores for Standard and Specialty bulbs in the Missouri West (MO West) and Missouri Metro (MO Metro) jurisdictions were calculated based on the proportion of gross verified savings from bulb sales at the relevant retailer.

Final free ridership scores by bulb category are shown in Table A-1.

*Table A-1: General Population Survey Free Ridership Estimate*

| Bulb Type | Jurisdiction | 2022 Free Ridership Estimate | 2021 Free Ridership Estimate | 2020 Free Ridership Estimate[3] |
|---|---|---|---|---|
| Standard LED | MO West | 47% | 47% | 51% |
| | MO Metro | 56% | 47% | |
| Specialty LED | MO West | 47% | 44% | 45% |
| | MO Metro | 52% | 49% | |
| Budget Locations | | 0% | 0% | 0% |

### A.2.2 Survey Determined Free Ridership – Thank You Kits

The survey-based effort for calculating free ridership was conducted using survey responses from a sample of customers receiving Thank You Kits. Survey respondents were asked a series of questions to elicit feedback regarding influences on their light bulb purchasing decisions. Each respondent was then assigned a free ridership score based on a consistent free ridership scoring algorithm developed by ADM for the Thank You Kit channel.

The free ridership scoring algorithm developed for the survey instruments is shown in Figure A-3.

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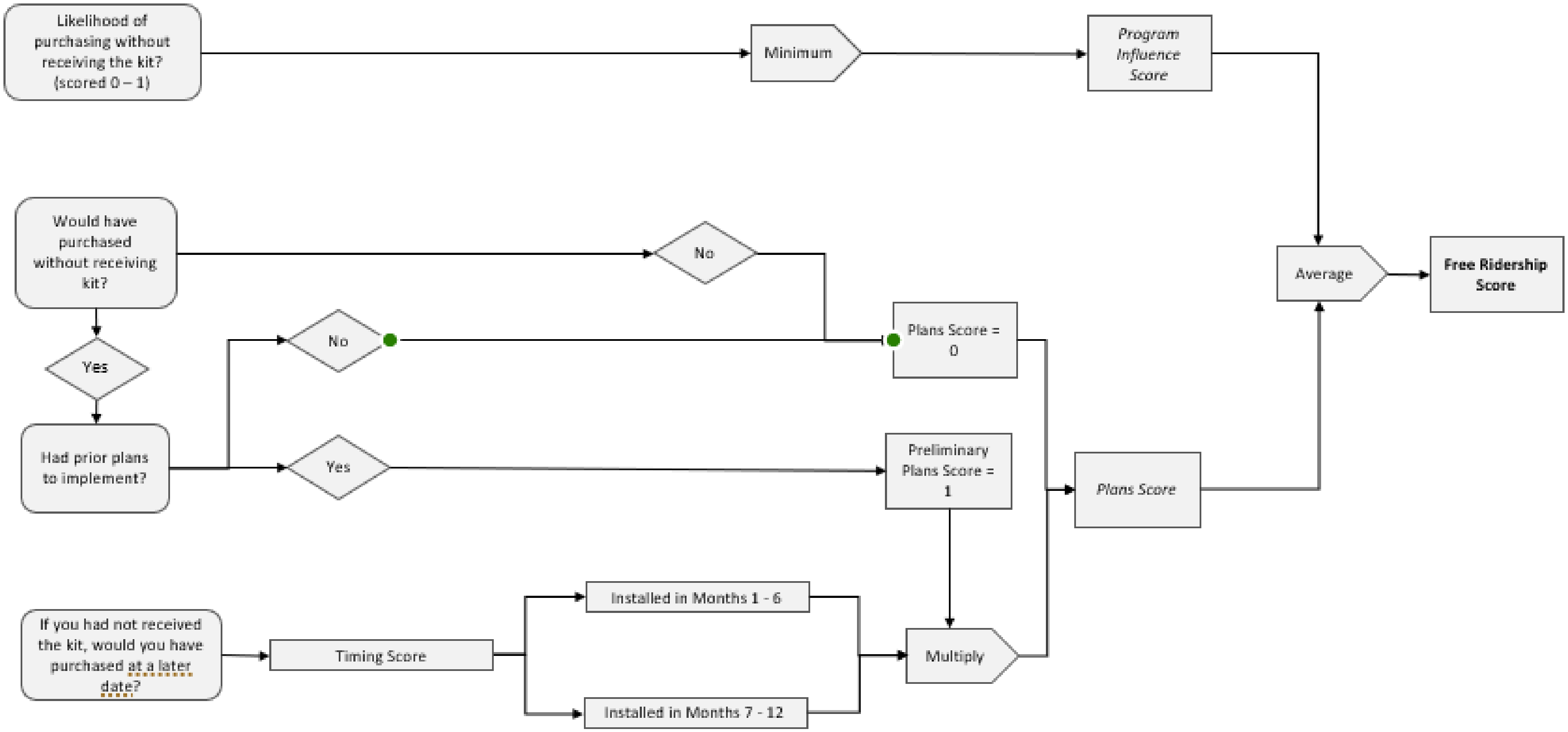
[3] Survey participants were unknown in the 2020 program survey. As such it was not possible to determine if a respondent was in the Missouri West or Missouri Metro jurisdictions, so a single score was calculated for each bulb type. Survey respondents in 2021 received a personalized survey link that allowed ADM to track details for respondents, including the service territory in which they were located.

*Figure A-3: Free Ridership Scoring for LEDs - Thank You Kits*



The free ridership score is determined as the combination of two scores, the “program influence” score based on the participants likelihood of purchasing without receiving the kit, and the “plans” score based on whether participants had prior plans to purchase the LEDs.

ADM determined free ridership for Thank You Kits from 350 survey responses.

*Table A-2: Free Ridership and Spillover - Thank You Kits*

| Measure | Spillover | Free Ridership | Net-To-Gross Ratio |
|---|---|---|---|
| LED-Standard | 0.00% | 61.35% | 38.7% |
| LED-Specialty | 0.00% | 39.93% | 60.1% |

### A.2.3 Survey Determined Free Ridership - Online Marketplace

For the Online Marketplace channel, ADM applied free ridership from the PY2 Online Marketplace survey. In 2021, ADM conducted a survey of a sample of randomly selected customers who participated in an online sales event. Nine hundred and seventy-nine participants were invited to participate in the survey, of which 274 qualified for and completed the survey.

The strength of a survey-based approach is the ability to obtain a large, random sample size cost-effectively. It also allows for further questioning regarding the quantity and location of installed bulbs and the motivation behind bulb purchases. The biggest drawback to the approach is the potential for respondent recall bias. For example, it may be difficult to get accurate responses to questions about the number of bulbs the respondent recently purchased and whether they were discounted through the program.

Survey respondents were asked a series of questions to elicit feedback regarding influences on their light bulb purchasing decisions. Each respondent was then assigned a free ridership score based on a consistent free ridership scoring algorithm. The free ridership scoring algorithm developed for the survey instruments is the same one used for Upstream Rebates (see Section A.2.1).

Free ridership scores were not disaggregated by jurisdiction as there were insufficient responses for the Missouri Metro jurisdiction for the scores in this jurisdiction to be statistically significant.

*Table A-3: Free Ridership and Spillover - Online Marketplace*

| Measure | Spillover | Free Ridership | Net-To-Gross Ratio |
|---|---|---|---|
| LED-Standard | 5.50% | 14.01% | 91.5% |
| LED-Specialty | 5.50% | 15.76% | 89.7% |

### A.2.4 Survey Determined Free Ridership - Giveaway Hub

For the Giveaway Hub channel, ADM verified that participants fell into low-income zip codes and applied a net-to-gross ratio (NTGR) of 100 percent.

*Table A-4: Free Ridership and Spillover - Giveaway Hub*

| Measure | Spillover | Free Ridership | Net-To-Gross Ratio |
|---|---|---|---|
| LED-Standard | 0.00% | 0.00% | 100.0% |
| LED-Specialty | 0.00% | 0.00% | 100.0% |

### A.2.5 Participant Spillover

Spillover refers to sales of energy efficient equipment that occur because of program influences on customers but for which an incentive or rebate is not given. For example, in the context of a program for LED price markdowns, participant spillover may result from a customer who purchases program discounted bulbs and is influenced to install additional (non-rebated) energy efficiency measures or change their energy usage behavior because of their program experience.

ADM conducted a benchmarking study of recent evaluations of upstream lighting programs to determine a participant spillover rate. The average participant spillover for the benchmarked studies was 5.5 percent, with a range from 2 percent to 7.4 percent. ADM used the average participant spillover from this benchmarking study for the evaluation of the Energy Saving Products program.

The benchmarking references are listed in the table below. All values have been pulled from final filed sources. It has been confirmed that no values referenced in the benchmarking table contain market effects. Spillover was applied to the upstream Rebate and the Online Marketplace channels.

*Table A-5 - Spillover Benchmarking References*

| Referenced Study | Program Year | Study Year | Method | CFLs Included? | Reported Spillover |
|---|---|---|---|---|---|
| ComEd Illinois[4] | 2015/16 | 2016 | In-store intercept | No | 5.6%[5] |
| Ameren Illinois[6] | 2015/16 | 2017 | In-store intercept | No | 7% |
| Ameren Missouri Lighting Impact and Process Evaluation for PY2019[7] | 2019 | 2020 | Participant survey | No | 7.4% |
| ComED Programs NTG Approach for CY2020[8] | 2020 | 2019 | In-store intercept | No | 2% |
| **Average** | | | | | **5.5%** |

### A.2.6 Leakage Adjustments

For PY3, ADM applied the leakage from PY2. The leakage methodology for PY2 is provided below. Leakage was applied to the upstream Rebate channel.

ADM conducted an analysis of leakage out of territory for the Energy Savings Products Program in PY2. Cross-territory sales, or "leakage," occurs when program-incented efficient products are installed outside of the Evergy's Missouri service territory. When this occurs, the energy and demand savings from the incentivized product are not realized within the territory that paid for, and is claiming savings for, the unit. Upstream programs are vulnerable to leakage as the rebate recipient is unknown and sales are not restricted based on utility.

Estimates of leakage were assessed using an approach that combined responses from the general population survey with a geo-mapping analysis using the following methodology:

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[4] ComEd Residential Lighting Discounts Program Evaluation Report, completed by Navigant, page 40. https://ilsag.s3.amazonaws.com/ComEd_Residential_Lighting_Discounts_PY8_Evaluation_Report_2016-11-10_Final.pdf

[5] 5.6%= weighted average from PY2 Evergy ESP gross verified kWh. (Standard LED spillover 7%, Specialty 3%)

[6] Impact and Process Evaluation of the 2015 Illinois Power Agency Residential Lighting Program, completed by Opinion Dynamics, page 46. https://ilsag.s3.amazonaws.com/AIC-IPA_PY8_Residential_Lighting_Evaluation_Report_REVISED_FINAL_2017-09-12.pdf

[7] Ameren Missouri Program Year 2019 Annual EM&V Report Volume 2: Residential Portfolio Report, completed by Opinion Dynamics, page 62. https://www.efis.psc.mo.gov/mpsc/commoncomponents/viewdocument.asp?DocId=936298055

[8] COMED PROGRAMS NTG APPROACH FOR CY2020, page 20. https://ilsag.s3.amazonaws.com/ComEd_NTG_History_and_CY2020_Recs_2019-10-01.pdf

- First, ADM developed a mapping of concentric circles (drive times) surrounding each participating retailer. The initial modeling assumed the “reach” of a retailer is a 60-minute drive, which is then modified by the presence of an alternative sponsoring retailer (i.e., if a customer is within a 60-minute drive of two sponsoring retailers, it is assumed they purchased from the closest one). Non-participating retailers are also included as directly competing alternative retailers with the construction of the drive times.
- Second, ADM used 2010 Census block data from Environmental System Research Institute (ESRI) to determine the proportion of the population that falls within each drive time circle (from Step 1), as well as the proportion of the population that falls within the Evergy service territory and within the state of Missouri. Thus, for each drive time circle for each retail location, ADM determined the proportion of the population within the Evergy Missouri service territory, outside of the Evergy Missouri service territory, and outside the state of Missouri.
- Third, a general population survey was used to assess the shopping habits of customers within the radius of participating retailers. This was used to assess the total and maximum drive time that Evergy consumers would accept when shopping for products incentivized by the program. This was used in modifying the initial 60-minute drive assumption established in the first step. This approach uses a log transformation of the drive times to smooth the survey data and estimates the cumulative percent via a second order polynomial regression.
- Fourth, for each drive time, the propensity to drive is calculated based on the predicted cumulative percent. The propensity to drive is equal to 1 minus the predicted cumulative percent, such that customers with shorter drive times have a high propensity to drive (because cumulative percent from the survey is lower for shorter drive times), while customers with longer drive times have lower propensity to drive (because predicted cumulative percent is higher for longer drive times). Customers with a propensity to drive represent the estimated population for a given drive time (i.e., estimated population willing to drive = propensity to drive (%)*total population).
- Lastly, the percentage of bulbs that leaked out of the Evergy service territory (but still within Missouri) and the percent that leaked out of state were calculated.

For PY2, ADM updated steps three through five using the drive times reported in the 2021 general population survey.

Leakage was estimated for Mass Merchants (Big Box retailers), DIY stores, and Member channels (e.g., Costco). Together, these three program channels represented more than 90 percent of program savings. A savings-weighted leakage rate was applied to the remaining retailer types. ADM found that Evergy's overall leakage rate in 2021 was 1.35 percent, compared to the leakage rate of 1.60 percent found in 2020. Given the large and contiguous size of Evergy's service territory, the low leakage rate is to be expected.

### A.2.7 Market Effects and Non-Participant Spillover

Market effects refer to the non-incentivized adoption of energy efficiency measures due to the influence of the program on the market structure or market actor behavior. Non-participant spillover refers to program spillover which occurs in customers who were not program participants.

It is likely that some combination of these effects increases the savings attributable to the lighting portion of the Energy Savings Products Program. However, there is also reason to believe these effects may be small overall. Non-participant spillover typically occurs through customer education. The ESP Program component includes regular in-store promotional/educational events, but the number of customers reached relative to overall program sales is likely small. Additionally, the promotional events usually provide information designed to encourage customers to participate in one of Evergy's other energy efficiency programs, which would not constitute spillover if these customers ultimately did participate and receive a rebate. The implementor's field team educates customers regarding the incentives provided in the Energy Savings Products Program; however, these are not explicitly quantified and therefore cannot provide reliable estimates of spillover. In addition, many retailers have restricted implementer's educational efforts due to the health implications associated with the Coronavirus pandemic.

Market effects may exist to some extent but disaggregating other Evergy program influences from influences such as technological advances and other lighting discount programs across the country is difficult. The current Energy Savings Products Program component covers a substantial share of the bulbs sold in the Evergy Missouri service territory, with no immediate plans for discontinuing the price markdowns.

Therefore, due to the difficulty of accurately estimating market effects and non-participant spillover, and the small savings expected to be attributable to these influences, neither effect was included in the net-to-gross ratio estimated for the 2022 Energy Savings Products Program. The net-to-gross estimate developed in this evaluation should be considered with these omitted effects in mind.

### A.2.8 Final Net-to-Gross Ratio

The measure level net-to-gross ratio for discounted LEDs were calculated using the following equation:

*Equation A-2: Net-to-Gross Ratio*

$$NTGR = 1 - Free\ Ridership + Participant\ Spillover - Leakage\ (if\ applicable)^{9}$$

Using this formula, ADM calculated final net-to-gross ratios for each LED type in the 2021 program, as well as for the program overall. The results are shown in Table A-6 below.

*Table A-6: Verified Gross and Net Impacts*

| Jurisdiction | Channel | Measure | Spillover | Free Ridership | Leakage | Net-To-Gross Ratio |
|---|---|---|---|---|---|---|
| MO West | Rebate | LED-Standard | 5.50% | 46.81% | 1.35% | 57.3% |
| MO West | Rebate | LED-Specialty | 5.50% | 47.15% | 1.35% | 57.0% |
| MO Metro | Rebate | LED-Standard | 5.50% | 56.28% | 1.35% | 47.9% |
| MO Metro | Rebate | LED-Specialty | 5.50% | 51.65% | 1.35% | 52.5% |
| MO West | Rebate | Budget Retailer | 0.00% | 0.00% | 0.00% | 100.0% |
| All | Thank You Kits | LED-Standard | 0.00% | 61.35% | 0.00% | 38.7% |
| All | Thank You Kits | LED-Specialty | 0.00% | 39.93% | 0.00% | 60.1% |
| All | Online Marketplace | LED-Standard | 5.50% | 14.01% | 0.00% | 91.5% |
| All | Online Marketplace | LED-Specialty | 5.50% | 15.76% | 0.00% | 89.7% |
| All | Giveaway Hub | LED-Standard | 0.00% | 0.00% | 0.00% | 100.0% |
| All | Giveaway Hub | LED-Specialty | 0.00% | 0.00% | 0.00% | 100.0% |

***** For program LEDs distributed through budget-retailers Dollar Tree, True Value, Habitat Restores, and Goodwill, ADM applied an assumed a NTGR of 100%.

## A.3 Income Eligible Multifamily

The NTGR for the Income-Eligible Multi-Family Program is stipulated at 1.00, due to (1) the specific targeting of the low-income sector; and (2) the small contributions of the program to the overall portfolio saving, which do not justify the cost of conducting primary research needed to adjust the NTGR from stipulated values.

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[9] Leakage only occurs for the Rebate channel. The other channels do not have leakage because the measure is only provided or available to customers in the utility jurisdiction.

## A.4 Home Energy Report

For the Home Energy Report (HER) Program, the net savings estimates are equivalent to the gross savings estimates, as the net-to-gross ratio for behavioral programs is 1.0.

## A.5 Demand Response: Custom Business & Smart Thermostats

In demand response programs, it is typically assumed that there are neither spillover effects (customers are not expected to curtail without participating), nor free ridership. Although customers can find workarounds to make up for lost productivity due to demand response events, they are compensated only if they reduce their load during the peak demand window, the primary program goal. As such, the net-to-gross ratio for this program is assumed to be 1.0.

## A.6 Pay As You Save

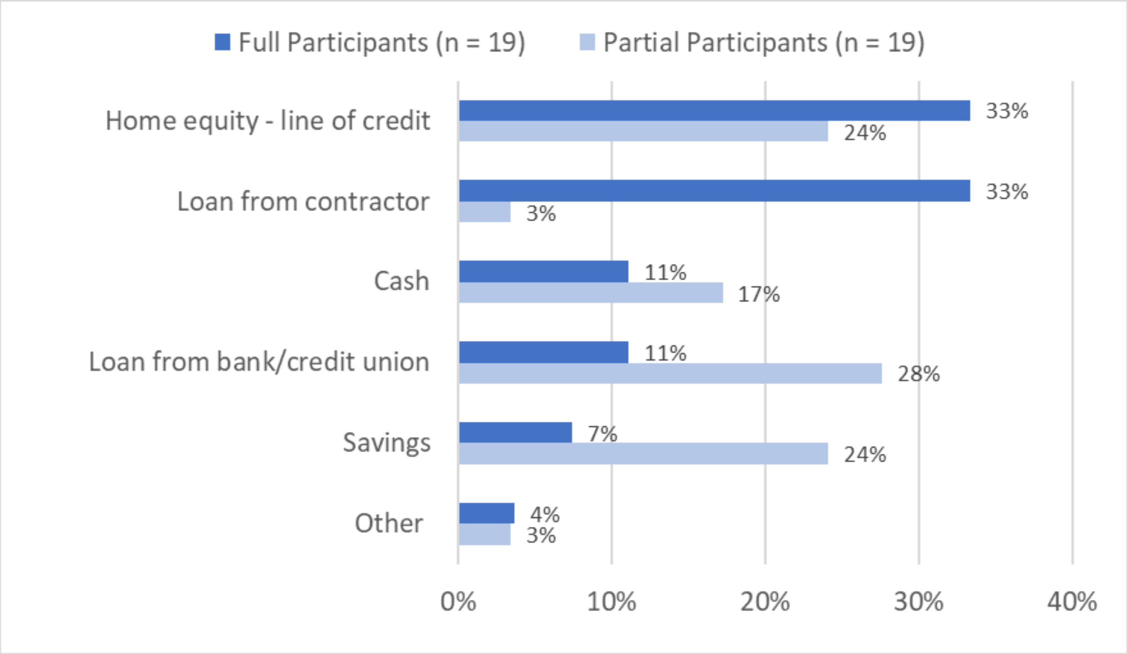
To determine NTG for the Pay As You Save (PAYS) Program, ADM included a battery of survey questions designed to evaluate free ridership as well as spillover in the participant survey. Both full participants (customers who received financed measures) as well as partial participants (customers who received only direct install measures and did not participate in additional measure financing) were surveyed. A total of 124 program participants completed the online survey, 68 partial participants and 56 full participants. Although ADM intends to develop distinct free ridership estimates for each category of measures, program enrollment is still too low to enable statistically robust free ridership estimates to be made at the measure level. The methodology used for calculating NTG and ADM's findings are summarized in the following sections.

### A.6.1 Free Ridership

All survey respondents were asked about their purchase intentions prior to enrolling in the PAYS program. Nearly one-third (31 percent) indicated they had considered other financing options prior to enrolling in PAYS; however, the majority (62 percent) did not and 7 percent were unsure. Partial and full participants answered similarly.

The 38 respondents who had considered other financing options were asked to identify the other types of financing options considered. Note this is a multiple-response question so the totals did not add to 100 percent (see Figure A-4). Of those survey respondents who considered other financing options, the most commonly mentioned across both full and partial participants were a home equity line of credit (29 percent) or a bank loan (20 percent).

*Figure A-4: Other Financing Options Considered*

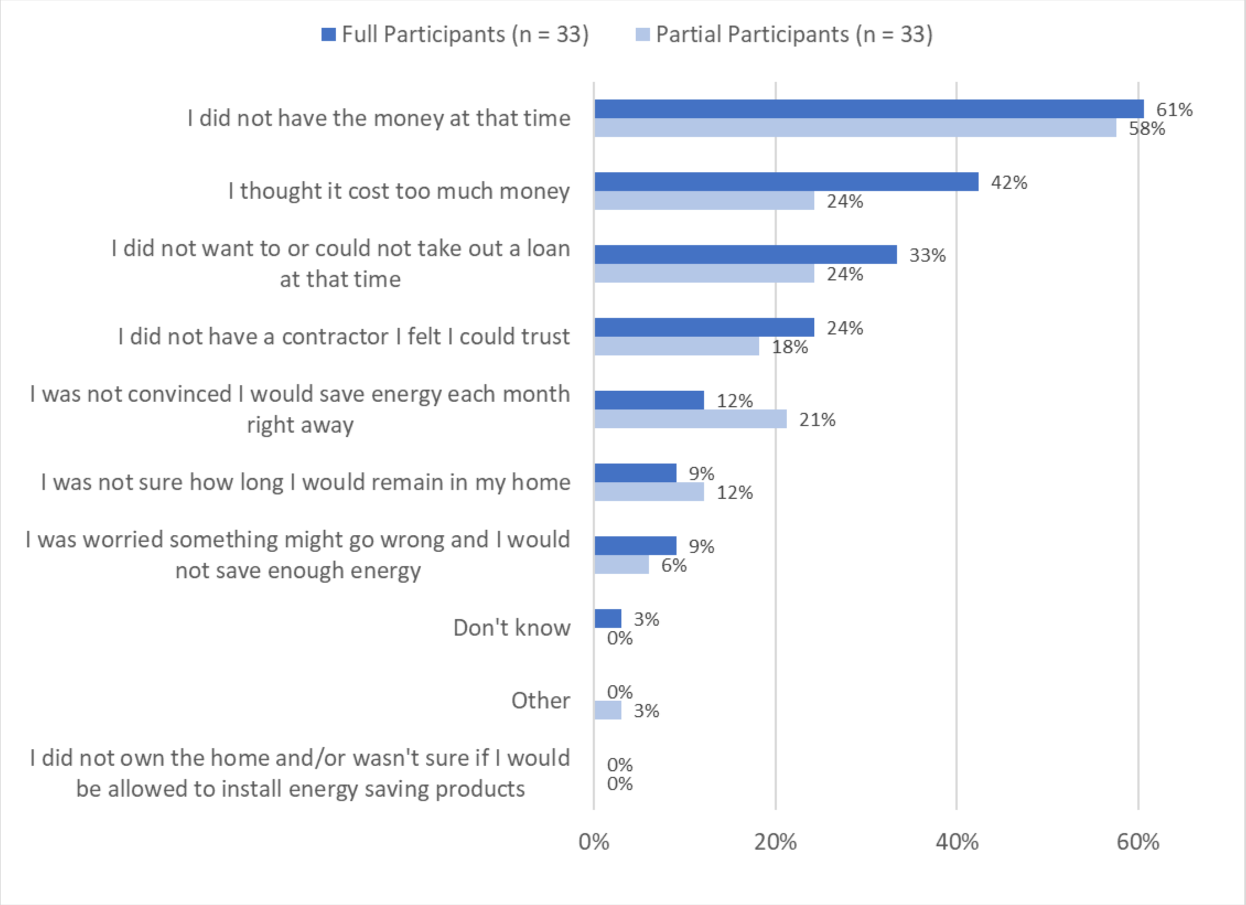


*Note: Percentages do not sum to 100 because surveyed customers could choose more than one option.*

As a way to further indicate the participants' intentions, 66 respondents (53 percent) indicated that had considered installing energy efficiency savings products previously but decided against it while 56 respondents (45 percent) did not. The other two respondents reported being unsure.

As Figure A-5 shows, the biggest barriers were the lack of money (59 percent) or the concern about the overall cost (33 percent).

*Figure A-5: Reasons Preventing Purchasing Energy-Saving Products*



*Note: Percentages do not sum to 100 because surveyed customers could choose more than one option.*

A total of 56 respondents (all of whom were full program participants) rated their likelihood of purchasing energy-saving equipment on their own if Evergy did not offer the PAYS Program. Using a five-point scale, where “1” means “Not at all Likely” and “5” means “Very Likely,” a total of seven respondents indicated they were very likely to have purchased the equipment on their own (see Table A-7).

*Table A-7: Likelihood of Purchasing Energy-Saving Equipment Without PAYS Program*

| Response | Count of Respondents (n = 56) | Percentage of Respondents |
|---|---|---|
| Very Unlikely - 1 | 13 | 23% |
| 2 | 18 | 32% |
| 3 | 15 | 27% |
| 4 | 1 | 2% |
| Very Likely - 5 | 7 | 13% |
| Don't know | 2 | 4% |

To calculate the free ridership rates, the responses from these three separate questions were tracked:

> *Did you consider other financing options before enrolling in the PAYS program?*
>
> *Prior to participating in the PAYS program, had you ever considered installing energy-savings products but then decided not to?*
>
> *How likely is it that you would have purchased and installed these energy-saving products on your own if Evergy had not offered the PAYS financing program?*

Cross tabulating these results yield the following FR estimates:

- A total of 13 full participants who responded to the survey both considered other financing options and prior to participating considered installing energy efficiency equipment on their own. This suggests a free ridership rate of 23 percent (13 out of 56).
- However, comparing these responses to those respondents who indicated they were “Likely” to install measures on their own, drops the estimated free ridership rate to 5 percent (3 out of 56).

To account for the differences in these two estimates, calculating the average between 23 percent and 5 percent leads to an FR estimate of 14 percent. This estimate is likely the best estimate given the contradictory responses of these respondents to these three questions.

### *Faucet Aerator and Showerhead Free Ridership*

For bathroom faucet aerators, kitchen faucet aerators, and low-flow showerheads, a free ridership score of 0 percent was applied when using the default baseline flowrate.[10]

### A.6.2 Spillover

The participants also reported the types of measures they installed on their own without the PAYS Program. Overall, 33 participants reported installing additional energy-saving measures on their own (see Table A-8).

*Table A-8: Additional Measures Participants Installed on Their Own*

| Types of Measures Installed | Number of Mentions by Partial Participants | Number of Mentions by Full Participants |
|---|---|---|
| Energy efficient dishwasher | 5 | 2 |
| Energy efficient clothes washer | 4 | 4 |
| Energy efficient clothes dryer | 2 | 2 |
| Energy efficient dehumidifier | 2 | 0 |
| Energy efficient heater/furnace | 8 | 2 |
| Energy efficient air conditioner* | 3 | 2 |
| Energy efficient refrigerator | 5 | 1 |
| Other | 6 | 6 |
| Other (Finance)* | 1 | 2 |

**Measures available through PAYS Program financing*

However, ADM neglected to ask relevant follow-up questions in the original participant survey to explore the influence of Evergy's program on these upgrades. To justify spillover from any of the energy-saving measures that would have been financed through the PAYS Program (i.e., furnaces, air conditioners, etc.), ADM sent follow-up emails to customers that reported installing these measures outside of the program. The survey asked:

> *Was the [equipment the customer reported installing in the survey] recommended during the PAYS program audit?*

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[10] A free-ridership score of 0 was applied to all faucet aerators and low flow showerheads in the program as per the IL TRM v9 (Page 207, Page 217): "Average measured flow rates are used in the algorithm and are lower, reflecting the penetration of previously installed low flow fixtures (and therefore the free rider rate for this measure should be 0), use of the faucet/showerhead at less than full flow, debris buildup, and lower water system pressure than fixtures are rated at."

> *On a scale from 1 to 5, with 1 meaning "not at all important" and 5 meaning "very important", please rate how important your experience with Evergy's PAYS Program was in your decision to install this/these energy-efficient products(s).*

Spillover was calculated for the purchased measures if customers responded that the measure was recommended to them during the PAYS Program audit and scored their experience with the PAYS Program as a 5 or "very important" to their decision to install the energy efficient product. The Evergy TRM was used to calculate savings for the spillover measures, along with home specifications provided in the program tracking data.

ADM reached out to a total of 18 customers (6 full participants and 12 partial participants) who had originally reported installing measures available through the PAYS Program on their own after interacting with the program. Of the contacted customers, 10 customers answered the questions they were emailed, and 1 customer's response qualified for spillover savings. Overall spillover was determined to be 0.5 percent.

### A.6.3 Calculating Net-to-Gross

Net-to-gross is calculated using the following equation:

$$1\text{-}\ FR\ (Free\ Ridership) + SO\ (Spillover) = NTG$$

Examining the cross-tabulations of the responses to the three FR questions (see Section A.6.1) indicated that free ridership rates are 5 percent and 23 percent. The average of these two results is 14 percent.

The free ridership was found to be slightly offset by participant spillover. Accounting for measures that would be offered or financed through the PAYS Program, participant spillover was 0.5 percent.

Therefore, the overall NTG estimate for PAYS Program measures (excluding faucet aerators and showerheads) is as follows:

$$1 - 0.14 + 0.005 = 86.5\%$$

Considering that this program targets customers who are already interested in installing energy efficiency equipment and have demonstrated a willingness to install additional measures on their own, suggests the program is reaching its intended customer targets.

# Appendix B Missouri Requirements for Impact Evaluation

In accordance with the Missouri Energy Efficiency Investment Act (MEEIA) Rules and the Stipulation and Agreement, Evergy Services, Inc. (ESI) (hereafter referred to as Evergy) on behalf of its affiliates Evergy Missouri West and Evergy Metro, has contracted with ADM Associates to evaluate, measure, and verify the information tracked by Evergy Missouri West and Evergy Metro for its portfolio of five residential programs, three demand response programs, and seven products and services incubator programs for the 4-year program cycle beginning January 1, 2020 through December 31, 2023. Specific Evergy programs covered by this evaluation include:

**Residential Programs:**

- Heating Cooling & Home Comfort
- Energy Savings Products
- Income-Eligible Multi-Family
- Home Energy Report
    - Income-Eligible Home Energy Report: Metro Only
- Pay As You Save

**Demand Response Programs:**

- Business Demand Response
- Residential Demand Response
- Business Smart Thermostats

**Products & Services Incubator Programs:**

- Appliance Recycling
- BPI Certification
- Energy Efficiency Nonprofits
- Energy-Saving Trees
- Market Rate Multifamily
- Power Check
- Virtual Energy Management for Small Business

In accordance with the Missouri Code of State Regulations 20 CSR 4240-22.070 (8) (Missouri regulations), Evergy is required to complete an impact evaluation for each program using one or both methods detailed below.

***Impact evaluation methods 1:*** *At a minimum, comparisons of one (1) or both of the following types shall be used to measure program and rate impacts in a manner that is based on sound statistical principles:*

a. Comparisons of pre-adoption and post-adoption loads of program or demand-side rate participants, corrected for the effects of weather and other inter-temporal differences; or

b. Comparisons between program and demand-side rate participants' loads and those of an appropriate control group over the same period.

***Load impact measurement protocols 2:*** *The evaluator shall 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:*

a. Monthly billing data, hourly load data, load research data, end-use load metered data, building and equipment simulation models, and survey responses; or

b. Audit and survey data on appliance and equipment type, size and efficiency levels, household characteristics, or energy-related building characteristics.

Table B-1 presents ADM's methods and protocols for the impact evaluation with the associated Missouri requirement.

*Table B-1: Missouri Regulations Impact Evaluation Methods and Protocols*

| Sector | Program | Impact Evaluation Method | Impact Evaluation Protocol |
|---|---|---|---|
| Residential | Heating Cooling & Home Comfort | 1a | 2b |
| | Energy Saving Products | 1a | 2b |
| | Income-Eligible Multi-Family | 1a | 2b |
| | Home Energy Report | 1b | 2a |
| | Pay As You Save | 1a | 2b |
| Demand Response | Business Demand Response | 1a | 2a |
| | Residential Demand Response | 1b | 2a |
| | Business Smart Thermostats | 1b | 2a |
| Products & Services Incubator | Appliance Recycling | 1a | 2b |
| | BPI Certification* | N/A | N/A |
| | Energy Efficiency Nonprofits | 1a | 2b |
| | Market Rate Multifamily | 1a | 2b |
| | Power Check* | N/A | N/A |
| | Energy-Saving Trees | 1a | 2b |
| | Virtual Energy Management for Small Business* | N/A | N/A |

*These programs had no impact evaluations in PY3.

# Appendix C Heating, Cooling, and Home Comfort Program-Specific Methodologies

This chapter describes the evaluation activities that were performed by ADM to evaluate the Heating, Cooling, and Home Comfort (HCHC) Program.

## C.1 Program Overview

The HCHC Program provides educational and financial incentives to residential customers by increasing awareness and incorporation of energy efficiency into their homes, while also generating cost-effective energy and demand savings for Evergy. The program encourages home improvements that increase operational energy efficiency and home comfort. It consists of four primary components: 1) Energy Savings Kit (ESK), 2) Online Marketplace, 3) Insulation and Air Sealing, and 4) HVAC as show in Table C-1.

The program seeks to provide financial incentives on a variety of categorically applicable measures and drive market adoption of energy efficient measures and practices through the education of customers and the community of local contractors. This program is eligible to customers that own or rent a residence or are building a new residence. HVAC contractors are also eligible for participation as trade allies for the program. In 2022, energy-efficient equipment sold through an Online Marketplace was added to the program where customers could purchase measures such as LED lightbulbs, faucet aerators, low flow showerheads, and advanced power strips. In PY3, customers could receive eligible energy-efficient equipment/upgrades through the different program components as shown in Table C-1.

*Table C-1: Program Components and Equipment Offered*

| Program Component | Measure |
|---|---|
| Energy Savings Kit* | LED Lightbulbs |
| | Faucet Aerators |
| | Low Flow Showerheads |
| | Pipe Insulation |
| | Advanced Power Strips |
| Online Marketplace | LED Lightbulbs |
| | Faucet Aerators |
| | Low Flow Showerheads |
| | Advanced Power Strips |
| Insulation and Air Sealing | Attic/Ceiling Insulation |
| | Air Sealing |
| HVAC | Central AC |
| | Air Source Heat Pump |
| | Ground Source Heat Pump |
| | Ductless Mini-Split Heat Pump |
| | A/C Mini-Split |

*There was one furnace filter alarm included in the Energy Savings Kit Program in 2022.

PY3 performance metrics are summarized in Table C-2. Overall, gross verified energy savings were close to the targeted value, while the gross verified peak demand savings exceeded the targeted value.

*Table C-2: Performance Metrics - Heating, Cooling, and Home Comfort Program*

| Metric | PY3 Total | MO West | MO Metro |
|---|---|---|---|
| Number of Participants* | 5,436 | 3,111 | 2,325 |
| ***Energy Savings (kWh)*** | | | |
| Targeted Energy Savings | 15,893,305 | 8,338,188 | 7,555,117 |
| Reported Energy Savings | 11,015,961 | 6,674,569 | 4,341,392 |
| Gross Verified Energy Savings | 9,318,475 | 5,572,188 | 3,746,287 |
| Net Verified Energy Savings | 6,750,594 | 3,865,891 | 2,884,703 |
| ***Peak Demand Reduction (kW)*** | | | |
| Targeted Peak Demand Reduction | 6,134.80 | 3,654.69 | 2,480.11 |
| Reported Peak Demand Reduction | 6,619.02 | 4,077.65 | 2,541.36 |
| Gross Verified Peak Demand Reduction | 6,266.64 | 3,820.26 | 2,446.38 |
| Net Verified Peak Demand Reduction | 4,426.46 | 2,554.26 | 1,872.20 |
| ***Benefit / Cost Ratios*** | | | |
| Total Resource Cost Test Ratio | 1.04 | 0.99 | 1.11 |

*Represents the number of unique account numbers in the program

## C.2 EM&V Methodology

This section provides an overview of the gross and net impact evaluation of the Heating, Cooling, and Home Comfort Program. Data collection included participant surveys, trade ally surveys, and in-depth interviews with program staff. Additional sources of data to inform the impact evaluation were a census of program tracking data from the program implementor’s tracking and reporting system, along with requested project documentation. Program tracking data included customer contact information and descriptions of the measures installed.

### C.2.1 Sampling Plan

Table C-3 summarizes the sample size for each primary data collection activity performed in 2022.

*Table C-3: Sample Sizes for Data Collection Efforts*

| Data Collection Activity | Achieved Sample Size |
|---|---:|
| Participant Surveys Completed | 722 |
| Trade Ally Surveys Completed | 20 |
| In-Depth Interviews with Program Staff | 8 |

### C.2.2 Data Collection

**_Participant Survey_**

For PY3, the Heating, Cooling, and Home Comfort Program participants were surveyed monthly regarding their experience with the program.[11] The evaluation team sent 3,689 total participants the online survey. The first survey invite was sent via email in July 2022 to customers who participated in the program during the months of January through June of 2022. Six additional survey invites were sent, one for every month remaining in PY3, along with an email reminder for each survey invite. Since some program participants could not be sent an online survey,[12] phone surveys were conducted in order to help reduce survey bias. A random sample of 303 participants who did not have a valid email address were pulled from the program tracking data and contacted to complete the survey via phone call in October and December 2022, which resulted in 30 survey completes. A total of 722 program participants completed the survey in 2022, of which 361 completes were from the Missouri West jurisdiction and 352 completes from Missouri Metro jurisdiction.

**_Trade Ally Survey_**

An online survey from a census of highly active trade allies was administered to assess program impacts on recommendations made to customers and collect additional feedback on the program. In December 2022, a total of 178 trade allies were sent the online survey, which resulted in 20 survey completes.

**_Program Staff Interviews_**

In November 2022, program staff members from Evergy and the implementation contractor (ICF) were interviewed to obtain the program administrator's perspective on program processes and operations for the Heating, Cooling, and Home Comfort Program in PY3.

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[11] Customers who purchased energy-efficient equipment through the Online Marketplace in 2022 were not surveyed.

[12] Not all Evergy customers participating in the HCHC Program had a valid email address in the program tracking data in 2022.

### C.2.3 Gross Impact Methodologies

The method used to calculate and verify energy savings (kWh) and demand reduction (kW) consisted of:

- Program tracking data census. The tracking data was reviewed for a census of homes and measures. The data was verified for duplicate participation within the program and to ensure there were no discrepancies within the tracking data.
- Measure installation verification. In-service rates (ISR) were calculated by measure for a sample of program participants using data from the participant survey.
- HVAC efficiency verification. The AHRI data from a sample of approximately 151 HVAC units (70 central ACs, 40 air source heat pumps, 20 ground source heat pumps, 20 ductless mini-split heat pumps, and one A/C mini-split) and from the program were pulled. The efficient SEER and EER values reported in the tracking data were then verified using the AHRI database for each unit.
- Reported savings review. Reported savings calculations were reviewed for all measures to determine the cause of savings discrepancies.
- Standard for verification of savings. The calculation of gross energy savings and demand impacts primarily relied on energy savings values and algorithms from the Evergy TRM. The data collected from the participant survey, along with program tracking data were used as inputs to the savings algorithms as outlined in the Evergy TRM.

The gross energy savings and demand impacts algorithms are outlined in A.2.2.

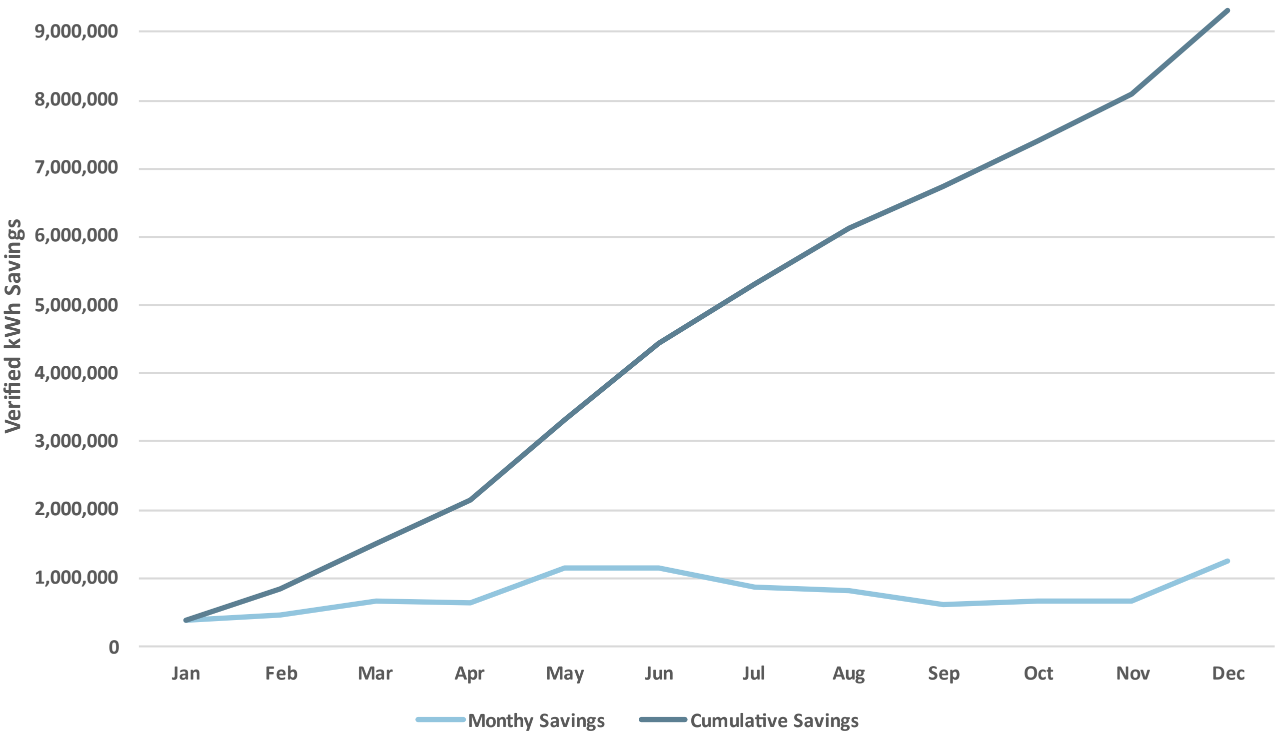
## C.3 Gross Impact Evaluation Findings

This section details the level of program activity for PY3, the reported and verified gross savings that resulted from that activity A.2.2.

### C.3.1 Program Activity

The Heating, Cooling, and Home Comfort Program in 2022 had 5,553 total projects installed as part of the program. Final energy savings were based on a total of 18,956 energy savings measures. Figure C-1 below details the verified savings accumulated over the program year.

*Figure C-1: Cumulative Verified Energy Savings During the 2022 Program Year*



### C.3.2 Gross Energy Saving and Demand Reduction

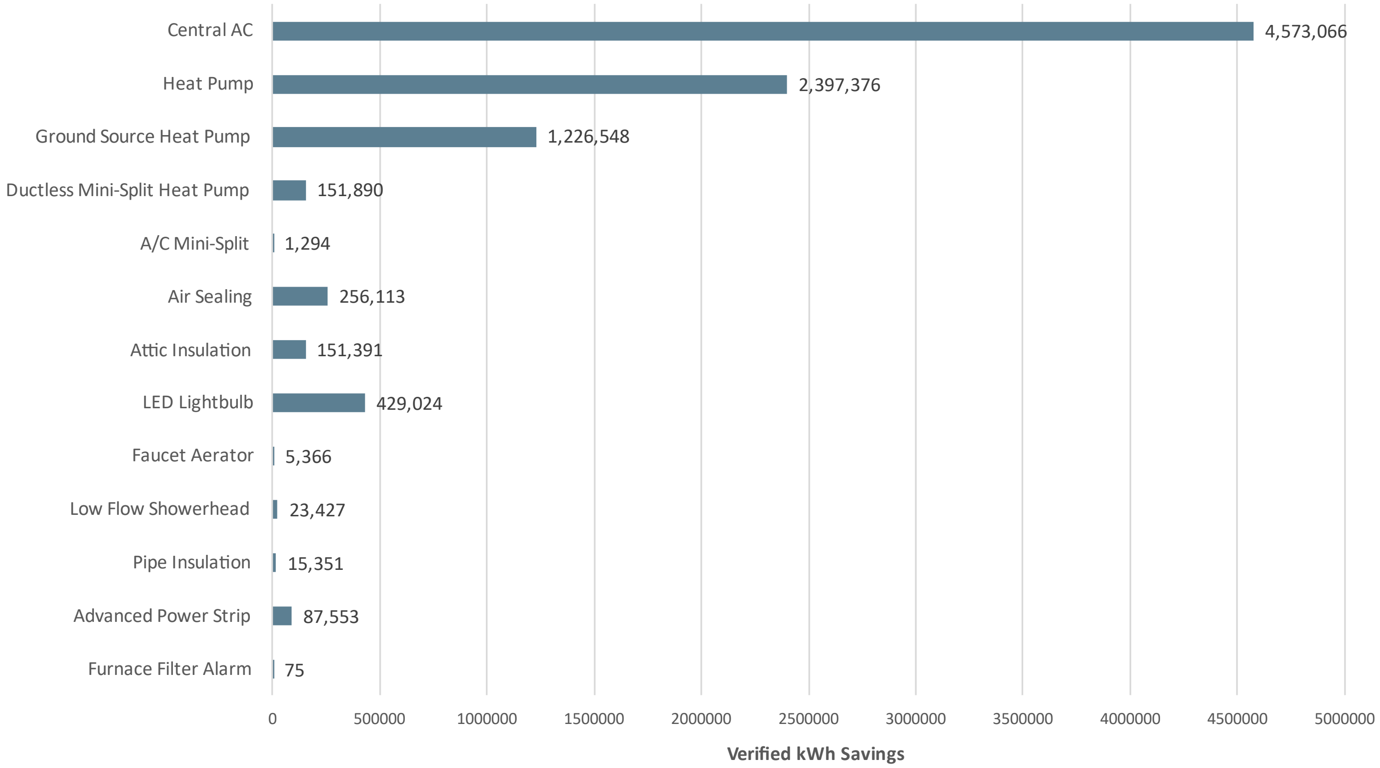
Based on the impact evaluation results, the total verified gross savings for the Heating, Cooling, and Home Comfort Program are 9,318,475 kWh, which resulted in a realization rate of 85 percent and 6,266.64 kW, which resulted in a realization rate of 95 percent. Table C-4 presents the gross verified energy and Demand Reduction and realization rates by measure.

*Table C-4: Reported and Verified Gross Energy Savings & Demand Reduction*

| Measure | Reported Energy (kWh) | Gross Verified Energy (kWh) | Reported Demand (kW) | Gross Verified Demand (kW) | $RR_{kWh}$ | $RR_{kW}$ |
|---|---|---|---|---|---|---|
| Air Sealing | 410,656 | 256,113 | 73.17 | 120.53 | 62% | 165% |
| Attic Insulation | 218,824 | 151,391 | 36.54 | 62.16 | 69% | 170% |
| Central AC | 4,733,893 | 4,573,066 | 5,131.45 | 5,046.40 | 97% | 98% |
| Heat Pump | 3,482,578 | 2,397,376 | 912.36 | 701.10 | 69% | 77% |
| Ground Source Heat Pump | 1,309,107 | 1,226,548 | 354.86 | 239.53 | 94% | 68% |
| Ductless Mini-Split Heat Pump | 245,193 | 151,890 | 31.45 | 25.62 | 62% | 81% |
| AC Mini-Split | 2,318 | 1,294 | 3.23 | 1.80 | 56% | 56% |
| LED Lightbulb - ESK | 434,864 | 425,344 | 53.30 | 52.35 | 98% | 98% |
| LED Lightbulb - Online Marketplace | 9,034 | 3,680 | 1.12 | 0.20 | 41% | 18% |
| Faucet Aerator - ESK | 4,638 | 3,961 | 2.83 | 2.38 | 85% | 84% |
| Faucet Aerator - Online Marketplace | 3,588 | 1,405 | 0.77 | 0.30 | 39% | 39% |
| Low Flow Showerhead - ESK | 18,184 | 15,128 | 1.98 | 1.74 | 83% | 88% |
| Low Flow Showerhead - Online Marketplace | 20,942 | 8,299 | 2.28 | 0.90 | 40% | 40% |
| Pipe Insulation | 15,463 | 15,351 | 1.77 | 1.75 | 99% | 99% |
| Advanced Power Strip - ESK | 84,460 | 71,830 | 9.43 | 8.06 | 85% | 85% |
| Advanced Power Strip - Online Marketplace | 22,145 | 15,723 | 2.47 | 1.76 | 71% | 71% |
| Furnace Filter Alarm | 75 | 75 | 0.02 | 0.02 | 100% | 100% |
| **Total** | **11,015,961** | **9,318,475** | **6,619.02** | **6,266.64** | **85%** | **95%** |

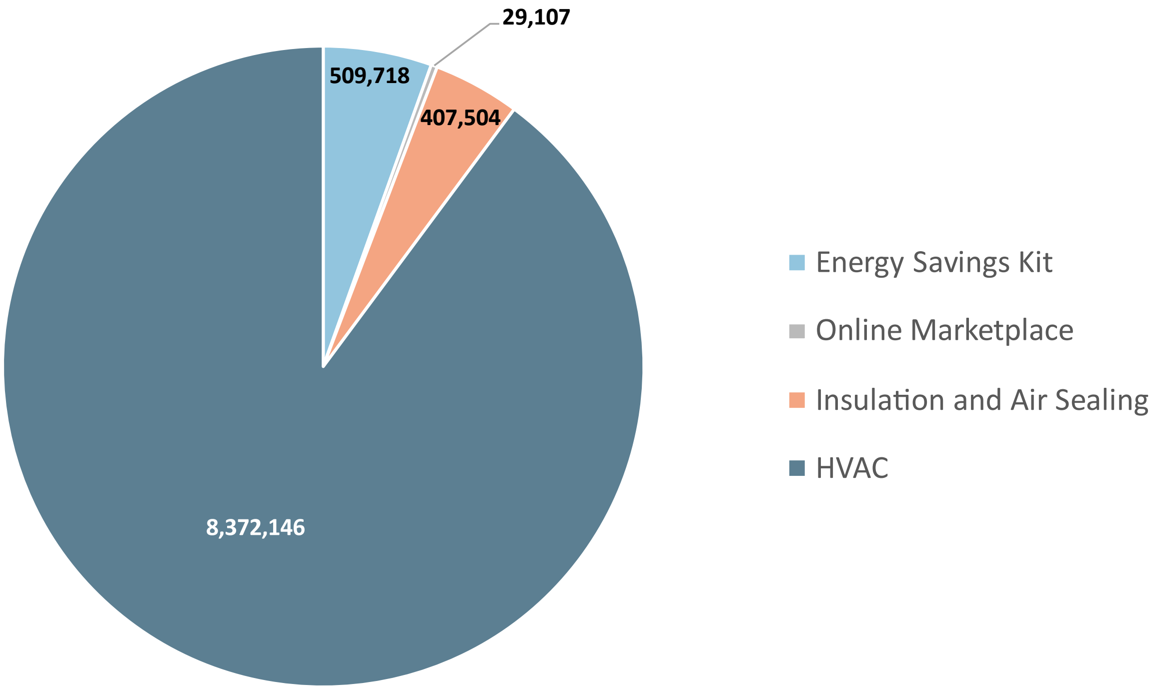
Figure C-2 shows the energy savings each measure contributed to the program overall.

*Figure C-2: kWh Savings Per Measure*



A breakdown of the verified energy savings for the Energy Savings Kit, Online Marketplace, Insulation and Air Sealing, and HVAC program channels is show Figure C-3.

*Figure C-3: Verified Energy Savings per Program Channel*



The gross impact analysis consisted of verifying measure installation and checking the program tracking data to ensure that savings algorithms were appropriately applied. ISRs for each measure type were developed based on the sources outlined in Table C-5. The quantities and ISRs per measure are summarized in Table C-6.

*Table C-5: ISR Sources*

| Program Channel | Source |
|---|---|
| Energy Savings Kit | Participant Survey |
| Online Marketplace | - |
| LED Lightbulb | 2021 Online Marketplace Survey |
| Faucet Aerator | IL TRM v9, Vol 3 (Page 212) for "Efficiency Kit Kitchen Aerator" |
| Low Flow Showerhead | IL TRM v9, Vol 3 (Page 220) for "Efficiency Kits - One showerhead kit" |
| Advanced Power Strip | IL TRM v9, Vol 3 (Page 64) for "Time of Sale" |
| Insulation and Air Sealing | Participant Survey |
| HVAC | Participant Survey |

*Table C-6: Measure Quantities and ISRs*

| Measure Type | Quantity of Measures Reported | In-Service Rate | Quantity of Measures Verified |
|---|---|---|---|
| Air Sealing | 347 | 100% | 347 |
| Attic Insulation | 373 | 100% | 373 |
| Central AC | 3,606 | 100% | 3,606 |
| Heat Pump | 623 | 100% | 623 |
| Ground Source Heat Pump | 75 | 100% | 75 |
| Ductless Mini-Split Heat Pump | 78 | 100% | 78 |
| AC Mini-Split | 1 | 100% | 1 |
| LED Lightbulb - ESK | 11,996 | 93% | 11,172 |
| LED Lightbulb - Online Marketplace | 248 | 41% | 102 |
| Faucet Aerator - ESK | 158 | 89% | 141 |
| Faucet Aerator - Online Marketplace | 95 | 61% | 58 |
| Low Flow Showerhead - ESK | 88 | 89% | 78 |
| Low Flow Showerhead - Online Marketplace | 102 | 62% | 63 |
| Pipe Insulation | 121 | 95% | 115 |
| Advanced Power Strip - ESK | 820 | 85% | 697 |
| Advanced Power Strip - Online Marketplace | 215 | 71% | 153 |
| Furnace Filter Alarm | 1 | 100% | 1 |

For each measure in the program, total gross energy savings and demand reduction were determined as a product of the number of measures installed as part of the program and the gross savings per measure. A description of verified gross findings for each measure type is included below.

***LED Lightbulb - ESK****:* The energy savings for LED lightbulbs have a realization rate of 98 percent and the demand savings had a realization rate of 98 percent. The differences in energy and demand savings between the reported savings and verified savings are outlined below:

- An ISR of 93 percent was applied to the overall verified energy and demand savings.
- Reported savings used the same kWh/kW savings (based on a 9W screw-in LED lightbulb) for all four bulb types in the program, while verified savings used different baseline wattages, efficient wattages, and hours of use for the 5W, 6W, and 8W specialty bulbs.
- Reported savings used a combination of the old primary key (8.5) from PY2 and the updated primary key (8.6) from PY3.

- Reported savings used an ISR of 94 percent as per the Evergy TRM (based on previous ISR data), while the verified savings used an ISR of 93 percent (based on the 2022 participant survey data).

***LED Lightbulb – Online Marketplace****:* The energy savings for LED lightbulbs have a realization rate of 41 percent and the demand savings had a realization rate of 18 percent. The differences in energy and demand savings between the reported savings and verified savings are outlined below:

- In addition to the differences listed above, the reported savings assumed an ISR of 100 percent, while the verified savings used an ISR of 41 percent (based on the 2021 Online Marketplace survey for standard LED lightbulbs).

***Faucet Aerator - ESK:*** The energy savings for faucet aerators have a realization rate of 85 percent and the demand savings have a realization rate of 84 percent. The difference in energy and demand savings between the reported savings and verified savings is a result of the reported savings calculations using deemed savings values from the Evergy TRM for all kitchen and bathroom faucet aerators, while the verified savings were calculated by using program tracking data and then deemed inputs from the Evergy TRM for all other inputs when necessary. Outlined below are the differences in calculation inputs between the reported savings and verified savings:

- Reported savings used an ISR of 94 percent as per the Evergy TRM, while the verified savings used an ISR of 89 percent (based on the 2022 participant survey data).
- Report savings used a value of 2.56 for number of persons per household for all faucet aerators in the program, while the verified savings used a value based on the actual household type (2.56 persons per household for single family and 2.1 for multi-family) from the program tracking data.
- Reported savings used value of 2.83 for Faucets Per Household (FPH) for all bathroom faucet aerators in the program, while the verified savings used a value based on the household type (2.83 persons per household for single family and 1.5 for multi-family) from the program tracking data.
- Reported savings used a value of 1.5 for Low Flow GPM for all bathroom aerators in the program, while the verified savings used a value of 1 (based on spec sheets and updated in program tracking data).

***Faucet Aerator – Online Marketplace:*** The energy savings for faucet aerators have a realization rate of 39 percent and the demand savings have a realization rate of 39 percent. The differences in energy and demand savings between the reported savings and verified savings are outlined below:

- In addition to the differences listed above, the reported savings assumed an ISR of 100 percent, while the verified savings used an ISR of 61 percent (based on the IL TRM v9, Vol 3 (Page 212) for “Efficiency Kit Kitchen Aerator”).

***Low Flow Showerhead – ESK*:** The energy savings for low flow showerheads have a realization rate of 83 percent and the demand savings have a realization rate of 88 percent. The difference in energy and demand savings between the reported savings and verified savings is a result of the reported savings calculations using deemed savings values from the Evergy TRM for all low flow showerheads, while the verified savings were calculated by using program tracking data and then deemed inputs from the 2022 Evergy TRM for all other inputs when necessary. Outlined below are the differences in calculation inputs between the reported savings and verified savings:

- Reported savings used a combination of the old primary key (11.3) from PY2 and the updated primary key (11.4) from PY3.
- Reported savings used an ISR of 97 percent/98 percent as per the Evergy TRM, while the verified savings used an ISR of 89 percent (based on the 2022 participant survey data).
- Reported savings used a value of 2.56 for number of persons per household for all low flow showerheads in the program, while the reported savings used a value based on the household type (2.56 persons per household for single family and 2.1 for multi-family).
- Reported savings used a value of 1.79 for number of Showerheads Per Household (SPH) for all low flow showerheads in the program, while the verified savings used a value based on the household type (1.79 persons per household for single family and 1.3 for multi-family).

***Low Flow Showerhead – Online Marketplace*:** The energy savings for low flow showerheads have a realization rate of 40 percent and the demand savings have a realization rate of 40 percent. The differences in energy and demand savings between the reported savings and verified savings are outlined below:

- In addition to the differences listed above, the reported savings assumed an ISR of 100 percent, while the verified savings used an ISR of 62 percent (based on the IL TRM v9, Vol 3 (Page 220) for “Efficiency Kits – One showerhead kit”).

***Pipe Insulation:*** The energy savings for hot water pipe insulation have a realization rate of 99 percent and the demand savings have a realization rate of 99 percent. Outlined below are the differences between the reported savings and verified savings:

- Reported savings assumed a 100 percent ISR, while the verified savings used an ISR of 95 percent (based on the 2022 participant survey data).

- Reported savings used a combination of the old primary key (10.3) from PY2 and the updated primary key (10.4) from PY3.
    - Old primary key (10.3) Electric Energy Savings = 123.16 kWh
    - Updated primary key (10.4) Electric Energy Savings = 133.54 kWh

***Advanced Power Strip - ESK*****:** The energy savings for advanced power strips have a realization rate of 85 percent and the demand savings have a realization rate of 85 percent. An ISR of 85 percent was applied to the overall energy and demand savings.

***Advanced Power Strip – Online Marketplace*****:** The energy savings for advanced power strips have a realization rate of 71 percent and the demand savings have a realization rate of 71 percent. An ISR of 71 percent was applied to the overall energy and demand savings as per the IL TRM v9, Vol 3 (Page 64) for "Time of Sale".

***Furnace Filter Alarm*****:** The energy savings for advanced power strips have a realization rate of 100 percent and the demand savings have a realization rate of 100 percent. An ISR of 100 percent was applied to the overall energy and demand savings.

***Air Sealing:*** The energy savings for air sealing have a realization rate of 62 percent and the demand savings have a realization rate of 165 percent. The difference in energy and demand savings between the reported savings and verified savings is a result of the reported savings calculations multiplying the deemed values for Electric Energy Savings (Annual kWh/unit) and Demand Savings (kW/unit) from the Evergy TRM by the Square Footage Installed per project from the program tracking data, while the verified savings were calculated by using program tracking data and then deemed inputs from the Evergy TRM for all other inputs when necessary. Outlined below are the differences in calculation inputs between the reported savings and verified savings:

- For baseline heating system fuel type, reported savings assumed electric heated homes for all projects in the program, while verified energy savings split the baseline heating system fuel type based on 2022 self-reported survey data[13]. All inputs in the verified savings calculations were adjusted based on the heating system fuel type split as reported by program participants, which resulted in 70% gas heated and 30% electric heated[14].
    - Reported savings included full heating savings for all projects.
    - Verified savings only included full heating savings for electric heated homes and heating savings for reduction in fan run time only for gas heated homes.

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[13] As stipulated in the Staff Change Request File submitted in 2021.

[14] The split in electric versus gas heated homes as reported by survey participants in 2022 is consistent to what was reported from the survey in 2020 and 2021.

- Reported savings used fixed CFM50_existing and CFM50_new from the Evergy TRM, while verified savings use project-specific values (as reported in the program tracking data).
- Reported savings used a CF of 68 percent, which is the Peak Coincidence Factor for Central A/Cs, while verified savings used CF based on the baseline cooling system (68 percent for central AC and 72 percent for heat pumps).
- Reported savings used fixed values for all climate zone-based inputs from the Evergy TRM, while the verified savings used values specific to the project zip code.
- For all fixed adjustments to air sealing savings from the Evergy TRM, verified savings used adjustments whether the project had a corresponding attic insulation project installed as part of the program in 2022, while the reported savings assumed 100 percent (no attic insulation).

***Attic/Ceiling Insulation:*** The energy savings for attic/ceiling insulation have a realization rate of 69 percent and the demand savings have a realization rate of 170 percent. The difference in energy and demand savings between the reported savings and verified savings is a result of the reported savings calculations multiplying the deemed values for Electric Energy Savings (Annual kWh/unit) and Demand Savings (kW/unit) from the Evergy TRM by the Square Footage Installed per project from the program tracking data, while the verified savings were calculated by using program tracking data and then deemed inputs from the Evergy TRM for all other inputs when necessary. Outlined below are the differences in calculation inputs between the reported savings and verified savings:

- Reported savings assumed electric heated homes for all projects, while verified energy savings used a 70 percent/30 percent split of gas vs. electric heat homes (based on 2022 self-reported survey data as stipulated in the Staff Change Request File submitted in 2021).
    - Reported savings included full heating savings for all projects.
    - Verified savings only includes full heating savings for electric heated homes and heating savings for reduction in fan run time only for gas heated homes.
- Reported savings used fixed R_attic and R_old from the Evergy TRM, while verified savings used project-specific values (as reported in the program tracking data).
- Reported savings used a CF of 70 percent, which assumed a mixture of central ACs and heat pumps, while verified savings used CF based on the baseline cooling system (68 percent for central AC and 72 percent for heat pumps).

- Reported savings used fixed inputs for all climate zone-based inputs from the Evergy TRM, while the verified savings used inputs specific to the project zip code.

***Central Air Conditioner:*** The energy savings for central air conditioners have a realization rate of 97 percent and the demand savings have a realization rate of 98 percent. The difference in energy and demand savings between the reported savings and verified savings is a result of the reported savings calculations multiplying the deemed values for Electric Energy Savings (Annual kWh/unit) and Demand Savings (kW/unit) from the Evergy TRM by the Equipment Size (Tons) per project from the program tracking data, while the verified savings were calculated by using program tracking data and then deemed inputs from the Evergy TRM for all other inputs when necessary. Outlined below are the differences in calculation inputs between the reported savings and verified savings:

- Reported savings used efficient SEER and EER values from the Evergy TRM, while verified savings used project-specific values (as reported in the program tracking data).
- Reported savings used fixed SEERadj from the Evergy TRM, while the verified savings used values based on the actual SEER_ee/EER_ee (as reported in the program tracking data).
- Reported savings used fixed inputs for all climate zone-based inputs from the Evergy TRM, while the verified savings used inputs specific to the project zip code.

***Air Source Heat Pump:*** The energy savings for air source heat pumps have a realization rate of 69 percent and the demand savings have a realization rate of 77 percent. The difference in energy and demand savings between the reported savings and verified savings is a result of the reported savings calculations multiplying the deemed values for Electric Energy Savings (Annual kWh/unit) and Demand Savings (kW/unit) from the Evergy TRM by the Equipment Size (Tons) per project from the program tracking data, while the verified savings were calculated by using program tracking data and then deemed inputs from the Evergy TRM for all other inputs when necessary. Outlined below are the differences in calculation inputs between the reported savings and verified savings:

- Reported savings used efficient SEER, EER, and HSPF values from the Evergy TRM, while verified savings used project-specific values (as reported in the program tracking data).
- Reported savings used fixed SEERadj from the Evergy TRM, while the verified savings used values based on the actual SEER_ee/EER_ee (as reported in the program tracking data).

- Reported savings used fixed inputs for all climate zone-based inputs from the Evergy TRM, while the verified savings used inputs specific to the project zip code.
- Reported savings assumed air source heat pump (electric) baseline for all early replacement units, including projects with gas furnace baseline heating equipment. For all early replacement units in the program, the verified savings adjusted all calculation inputs based on the actual baseline heating/cooling equipment as specified in the program tracking data.
    - Reported savings claimed excess heating savings by using an existing HSPF of 5.54, while the verified savings used a value of 8.2.

***Ground Source Heat Pump:*** The energy savings for ground source heat pumps have a realization rate of 94 percent and the demand savings have a realization rate of 68 percent. The difference in energy and demand savings between the reported savings and verified savings is a result of the reported savings calculations multiplying the deemed values for Electric Energy Savings (Annual kWh/unit) and Demand Savings (kW/unit) from the Evergy TRM by the Equipment Size (Tons) per project from the program tracking data, while the verified savings were calculated by using program tracking data and then deemed inputs from the Evergy TRM for all other inputs when necessary. Outlined below are outlines the differences in calculation inputs between the reported savings and verified savings:

- Reported savings used efficient SEER, EER, and HSPF values from the Evergy TRM, while verified savings used project-specific values (as reported in the program tracking data).
- Reported savings used fixed inputs for all climate zone-based inputs from the Evergy TRM, while the verified savings used inputs specific to the project zip code.
- For measures labeled as early replacement replacing a ground source heat pump, reported savings were modeled after an air source heat pump baseline (used an existing HSPF of 5.54), while verified savings were modeled after a ground source heat pump baseline (used an existing HSPF 8.2).
- Reported savings claiming excess de-superheater savings (savings for replacing a water heater with the ground source heat pump).
    - Reported savings multiplied the de-superheater savings by the unit tonnage.
    - Verified savings accounted for de-superheater savings (when an electric hot water heater is replaced) but did not multiply by the unit tonnage.

***Ductless Mini-Split Heat Pump:*** The realization rate for ductless mini-split heat pumps was 62 percent for energy savings and 81 percent for demand savings. The difference in energy and demand savings between the reported savings and verified savings is a result of the reported savings calculations multiplying the deemed values for Electric Energy Savings (Annual kWh/unit) and Demand Savings (kW/unit) from the Evergy TRM by the Equipment Size (Tons) per project from the program tracking data, while the verified savings were calculated by using program tracking data and then deemed inputs from the Evergy TRM for all other inputs when necessary. Outlined below are the differences in calculation inputs between the reported savings and verified savings:

- Reported savings used efficient SEER, EER, and HSPF values from the Evergy TRM, while verified savings used project-specific values (as reported in the program tracking data).
- Reported savings used fixed inputs for all climate zone-based inputs from the Evergy TRM, while the verified savings used inputs specific to the project zip code.

***A/C Mini-Split:*** The realization rate for A/C mini-split heat pumps was 56 percent for energy savings and 56 percent for demand savings. The difference in energy and demand savings between the reported savings and verified savings is a result of the reported savings calculations multiplying the deemed values for Electric Energy Savings (Annual kWh/unit) and Demand Savings (kW/unit) from the Evergy TRM by the Equipment Size (Tons) per project from the program tracking data, while the verified savings were calculated by using program tracking data and then deemed inputs from the Evergy TRM for all other inputs when necessary. Outlined below are the differences in calculation inputs between the reported savings and verified savings:

- Reported savings used efficient SEER, EER, and capacity values from the Evergy TRM, while verified savings used project-specific values (as reported in the program tracking data).
- Reported savings used fixed inputs for all climate zone-based inputs from the Evergy TRM, while the verified savings used inputs specific to the project zip code.

## C.4 Net Savings Evaluation Findings

Survey data from a total of 722 survey participants were used to determine the free ridership for this program. The data collection methodology for the participant survey is outlined in Section C.2.2. A census of participants from the program were surveyed in order to ensure the maximum number of survey complete for each measure type could be achieved. Survey respondents were asked a series of questions aimed at determining the program influence on the purchase decisions for each installed measure. The measure-level free ridership of each participant was weighted by the measure energy savings to determine the project-level free ridership score. This score was applied to the other measures where a survey response was not obtained.

The participant survey also included questions related to their retail purchase or contractor installation of similar products offered by the program to determine participant spillover. A similar method was used to determine non-participant spillover by surveying customers in Evergy's service territory through a general population survey. For any program participant and non-participant surveyed that claimed to have installed energy-efficient equipment/upgrades in 2022 without receiving additional rebates or incentives but were installed based on Evergy program influence were counted as spillover. Participant and non-participant spillover savings for measures similar to those offered through the program were calculated and then extrapolated to the population of respondents (as detailed in Appendix A), which resulted in overall spillover of 2 percent for participants and 7 percent for non-participants.

For the Energy Savings Kit and Online Marketplace sub-programs, all LED lightbulbs, faucet aerator, low flow showerhead, pipe insulation, and advanced power strip measures were assigned a free ridership score of 0 to any project in the program within a low-income zip code. For the attic/ceiling insulation, air sealing, ground source heat pump, ductless mini-split heat pump and furnace filter alarm measures, a free ridership score of 0 was assigned to all projects in the program due to the participant survey counts being too low for those measures to validate using the calculated free ridership numbers. All central AC, heat pump, LED lightbulbs, faucet aerators, low flow showerheads, pipe insulation, and advanced power strip measures were assigned a free ridership score based on the actual survey responses and calculated according to Appendix A.[15]

The overall free ridership score was 36 percent. The measure score was weighted and rolled up into the project level score and applied to the verified gross savings for the projects without a survey response. The sum of the verified net project savings over the total verified gross savings resulted in an overall NTG ratio of 72 percent.

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[15] Excluding all non-low income participants in the Energy Savings Kit and Online Marketplace sub-programs.

## C.5 Impact Evaluation - Final Savings Tables

Based on the impact evaluation results, the total verified gross savings for the Heating, Cooling, and Home Comfort Program are 9,318,475 kWh and 6,266.64 kW and the total verified net savings are 6,750,594 kWh and 4,426.46 kW. A summary of gross and net verified energy savings and demand reduction is shown in Table C-7, Table C-8 and Table C-9. The Heating, Cooling, and Home Comfort Program had an overall realization rate of 85 percent for energy savings and 95 percent for peak demand savings. The Heating, Cooling, and Home Comfort Program had an overall net-to-gross was 72 percent for energy savings and 71 percent for peak demand savings.

*Table C-7: Program Gross Energy Savings (kWh) and Peak Demand Reduction (kW)*

| Jurisdiction | Reported Energy Savings (kWh) | Reported Demand Reduction (kW) | Gross Verified Energy Savings (kWh) | Gross Verified Demand Reduction (kW) | RR (kWh) | RR (kW) |
|---|---|---|---|---|---|---|
| MO West | 6,674,569 | 4,077.65 | 5,572,188 | 3,820.26 | 83% | 94% |
| MO Metro | 4,341,392 | 2,541.36 | 3,746,287 | 2,446.38 | 86% | 96% |
| **Total** | **11,015,961** | **6,619.02** | **9,318,475** | **6,266.64** | **85%** | **95%** |

*Table C-8: Verified Gross and Net Energy Savings (kWh)*

| Jurisdiction | Spillover (Participant) | Spillover (Non-Participant) | Free Ridership | NTG (kWh) | Gross Verified Energy Savings (kWh) | Net Energy Savings (kWh) |
|---|---|---|---|---|---|---|
| MO West | 2.0% | 6.7% | 39.3% | 69.4% | 5,572,188 | 3,865,891 |
| MO Metro | 2.0% | 6.7% | 31.7% | 77.0% | 3,746,287 | 2,884,703 |
| **Total** | **2.0%** | **6.7%** | **36.2%** | **72.4%** | **9,318,475** | **6,750,594** |

*Table C-9: Verified Gross and Net Peak Demand Reduction (kW)*

| Jurisdiction | Spillover (Participant) | Spillover (Non-Participant) | Free Ridership | NTG (kW) | Gross Verified Demand Reduction (kW) | Net Energy Savings (kW) |
|---|---|---|---|---|---|---|
| MO West | 2.0% | 6.7% | 41.8% | 66.9% | 3,820.26 | 2,554.26 |
| MO Metro | 2.0% | 6.7% | 32.2% | 76.5% | 2,446.38 | 1,872.20 |
| **Total** | **2.0%** | **6.7%** | **38.0%** | **70.6%** | **6,266.64** | **4,426.46** |

A breakdown of energy savings and demand by measure is included in Table C-10.

*Table C-10: Gross and Net Verified Energy Savings & Demand Reduction Per Measure*

| Measure | Gross Verified Energy (kWh) | Gross Verified Demand (kW) | Net Verified Energy (kWh) | Net Verified Demand (kW) | $NTG_{kWh}$ | $NTG_{kW}$ |
|---|---|---|---|---|---|---|
| Air Sealing | 256,113 | 120.53 | 241,471 | 114.12 | 94.3% | 94.7% |
| Attic Insulation | 151,391 | 62.16 | 137,710 | 56.93 | 91.0% | 91.6% |
| Central AC | 4,573,066 | 5,046.40 | 3,174,763 | 3,504.78 | 69.4% | 69.5% |
| Heat Pump | 2,397,376 | 701.10 | 1,781,233 | 509.28 | 74.3% | 72.6% |
| Ground Source Heat Pump | 1,226,548 | 239.53 | 787,021 | 156.73 | 64.2% | 65.4% |
| Ductless Mini-Split Heat Pump | 151,890 | 25.62 | 115,559 | 19.10 | 76.1% | 74.5% |
| AC Mini-Split | 1,294 | 1.80 | 1,406 | 1.96 | 108.7% | 108.7% |
| LED Lightbulb - ESK | 425,344 | 52.35 | 375,124 | 46.17 | 88.2% | 88.2% |
| LED Lightbulb - Online Marketplace | 3,680 | 0.20 | 2,703.51 | 0.15 | 73.5% | 73.5% |
| Faucet Aerator - ESK | 3,961 | 2.38 | 4,222 | 2.52 | 106.6% | 105.8% |
| Faucet Aerator - Online Marketplace | 1,405 | 0.30 | 1,383 | 0.30 | 98.4% | 98.4% |
| Low Flow Showerhead - ESK | 15,128 | 1.74 | 16,063 | 1.85 | 106.2% | 106.2% |
| Low Flow Showerhead - Online Marketplace | 8,299 | 0.90 | 7,803 | 0.85 | 94.0% | 94.0% |
| Pipe Insulation | 15,351 | 1.75 | 15,928 | 1.82 | 103.8% | 103.8% |
| Advanced Power Strip - ESK | 71,830 | 8.06 | 73,249 | 8.22 | 102.0% | 102.0% |
| Advanced Power Strip - Online Marketplace | 15,723 | 1.76 | 14,875 | 1.67 | 94.6% | 94.6% |
| Furnace Filter Alarm | 75 | 0.02 | 82 | 0.02 | 108.7% | 108.7% |
| **Total** | **9,318,475** | **6,266.64** | **6,750,594** | **4,426.46** | **72.4%** | **70.6%** |

## C.6 Process Evaluation

### C.6.1 Program Operations

ADM conducted in-depth interviews with the program managers and EM&V manager from Evergy and the implementation staff from ICF. The purpose of the in-depth interviews is to understand better the Heating, Cooling, and Home Comfort Program design, operations, challenges, and future opportunities.

***Roles and Responsibilities***

Two Evergy staff members manage the program; one focuses on the HVAC, insulation, and air sealing components (Whole House Efficiency sub-program), while the other handles the kits portion (Energy Savings Kit). During PY3, management of the Whole House Efficiency sub-program changed when the current program manager left mid-year. During this interim period, the program was managed by a senior Evergy staff member. A new permanent Evergy program manager will take over management in 2023.

The Evergy management for the Energy Savings Kit sub-program remained the same throughout the program year.

ICF serves as the program implementer and has three dedicated staff members who support all aspects of program operations. Within ICF, a new program lead took over responsibilities for program operations early in 2022.

Despite these staffing changes, the program continued to operate effectively throughout the PY3.

### *Program Design*

The HCHC Program offers several, distinct energy-efficiency program strategies for residential customers. The overall goal of the program is to “drive residential customers to become more energy efficient by offering incentives for HVAC, insulation, and air sealing equipment.

> *“The program is delivered through a network of participating trade allies who understand the value of energy efficiency.” (Program Staff)*

The Energy Savings Kit is a sub-program of HCHC that focuses on “bringing awareness to customers about the ways they can make their homes more energy efficient.” The program provides non-diagnostic energy checkups and direct install measures to participating customers. The program also provides additional recommendations to customers for additional energy savings. The Energy Savings Kit sub-program targets residential customers living in low-income zip codes through community events and is co-delivered with Spire, the natural gas utility.

### *Program Performance*

The HCHC Program goals were set for the three-year MEEIA Cycle. The specific goals for PY3 were “stretch goals” of the program. According to the program staff, HCHC is on track to meet about 90 percent of its overall program goals in PY3.

The Energy Savings Kit sub-program has separate goals tied to program participation, as the program staff explained, “The Energy Savings Kit sub-program is more about adding value to the customer experience and pushing them to participate in other programs” rather than reaching specific kW savings goals. For 2022, the participation target was to send out 650 kits to MO Metro and 180 kits in MO West territories. Staff projects that they will reach 90 percent to 95 percent of that goal by the end of the program year. The Energy Savings Kit sub-program goals were added to include the unmet participation goals from PY2.

### *Program Participation and Marketing*

Evergy has an internal marketing staff that develops all customer-facing advertising and marketing. This marketing is done digitally through social media, email campaigns, and the Evergy website with pop-up ads and banners. ICF manages and provides support for the trade ally outreach with quarterly contacts.

Evergy provides LEDs as an added value to both community events and at their Evergy Connect Center, located in the urban core downtown of Kansas City. Evergy participated in five community events in various, low-income locations throughout Kansas City and Missouri in 2022. These events focused on educating the public on energy efficiency and allowing them an opportunity to sign up for energy-efficient programs. Evergy provided the event with bags containing two to four LEDs each for community members to take home with them. The Evergy Connect Center is an in-person billing center where customers can come if they have questions about billing or their usage. Customers can take home two LEDs per person at this center.

### *Program Operations*

There were no changes to the HCHC Program operations regarding the rebates for the HVAC, air sealing, and insulation measures. However, Energy Savings Kit sub-program participants could choose between receiving the energy audit in-home or receiving an in-home audit virtually. In PY3, most program participants opted for an in-person energy audit (85 percent) compared to the 15 percent who selected the virtual option. The virtual in-home audit is performed using the video conferencing feature on the cell phone. Together, the energy auditor guides the participant through the home, asking questions, identifying attributes of the program, and explaining how to correctly install the energy savings items found in the kit.

The lingering effects of the pandemic was the primary reason for offering customers “virtual” energy adults. Overall, trade allies were able to operate the program remotely. Staff believe that COVID-19 generated interest in home comfort, which led to increased participation in early 2022. The long-term participation rates were lower due to the economy, inflation, and price increases.

### *Program Participation and Marketing*

**Whole House Efficiency:** Evergy relies primarily on trade allies to market the program to customers interested in completing a home upgrade, such as HVAC, air sealing, or insulation equipment. The contractor completes the installation and applies for the rebate on the customer’s behalf. Energy audits are not required for HVAC upgrades but are required for the insulation and air sealing portions of the program. The BPI-certified auditor provide recommendations for air sealing and insulation upgrades and then apply for the energy audit rebate on behalf of the customer. Evergy also promotes the HCHC

Program through co-op advertising for its participating contractors and they have developed “solid contractor relationships”, which has contributed the program’s success. The program implementer conducted one-on-one virtual training with 225 participating contractors to ensure they know how to correctly process customer rebates through the program portal. Contractors are encouraged to submit applications within four weeks of the completed job. Evergy program staff create and distributes a monthly newsletter via email that highlight program changes.

**Energy Savings Kit:** The Energy Savings Kit sub-program is marketed to Evergy customers through community events living in low-income zip codes based on census data. Specifically, the program targeted customers with low-income households 200 percent of the Federal Poverty Level (FPL). The goal was to offer both Evergy and Spire co-branded energy audits and kits with direct install items and leave-behind educational materials for these customers. The Energy Savings Kit sub-program was also promoted through social media advertisements. Evergy held 14 community events during 2022 to promote the Energy Savings Kit sub-program at local libraries, community centers, and church parking lots located in the targeted neighborhoods. The staff also created a collateral marketing piece for these community events which cross-promoted all of Evergy’s other residential program offerings.

“The community events really helped (to drive participation) and we had an uptick in participation.” (Program Staff)

### *Communication*

Both Evergy and ICF program staff reported they continue to have excellent communication between the two organizations. The teams communicate frequently, including having standing meetings twice a week to discuss program operations.

### *Data Tracking and Quality Assurances and Controls (QA/QC)*

The program implementer worked with Evergy’s database provider, Resource Innovations, to ensure that all data are tracked properly. As a result, the implementers are able to track key program participation details and create “good reports and dashboards” that help monitor program participation metrics.

**HVAC Equipment QA/QC:** ICF sends emails to participants with completed projects to solicit volunteers to inspect their units. These verification visits are primarily completed virtually. HVAC customers are asked to send photographs of their model numbers to confirm that the unit installed is the unit that their system says was installed.

**Air Sealing and Insulation QA/QC:** ICF randomly visits sites while the trade ally is present to ensure that the level of customer service is correct with the client. Pictures of the insulation installed are taken next to an R ruler to compare with paperwork and confirm accuracy.

**Energy Savings Kit QA/QC** There is no formal QA/QC process for the Energy Savings Kit sub-program as the most kits items are directly installed by the energy auditors. For virtual participants, ICF sends out a post-kit survey asking participants about the number of items they installed and how they disposed of their old light bulbs.

***Challenges for Program***

- External factors such as COVID-19, economic uncertainty, and supply chain issues have led to increasing prices for contractor-delivered services and equipment.
- Consolidation within the trade ally market is occurring. Many trade allies are family-owned businesses, and these owners are selling out to larger regional and national firms. The buyouts and consolidation of trade allies has led to some changes in the relationships, but the implementer continues to work on developing relationships with the new business owners.
- There are upcoming changes in codes and standards. In 2023, the SEER rating of HVAC equipment will be updated and may require some restructuring to the current rebate levels. Moreover, new building codes will go into effect in July 2023 that could also impact current practices for duct sealing insulation. The Inflation Reduction Act passed in 2022 also provides both opportunities and threats to these programs in the next year.

### C.6.2 Participant Survey

For PY3, the Heating, Cooling, and Home Comfort Program participants were surveyed monthly regarding their experience with the program. The evaluation team sent 3,689 total participants the online survey. The first survey invite was sent via email in July 2022 to customers who participated in the program during the months of January through June of 2022. Six additional survey invites were sent, one for every month remaining in PY3, along with an email reminder for each survey invite. Since some program participants could not be sent an online survey,[16] phone surveys were conducted in order to help reduce survey bias. A random sample of 303 participants who did not have a valid email address were pulled from the program tracking data and contacted to complete the survey via phone call in October and December 2022, which resulted in 30 survey completes. A total of 722 program participants completed the survey in 2022, of which 361 completes were from the Missouri West jurisdiction and 352 completes from Missouri Metro jurisdiction.

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[16] Not all participants participating in the Heating, Cooling, and Home Comfort Program had a valid email address in the program tracking data.

Participants were surveyed to verify the measures installed through the program. Participants were also surveyed on decision-making, installation of additional measures, experience with the program, program satisfaction, and household demographics.

### *Program Experience*

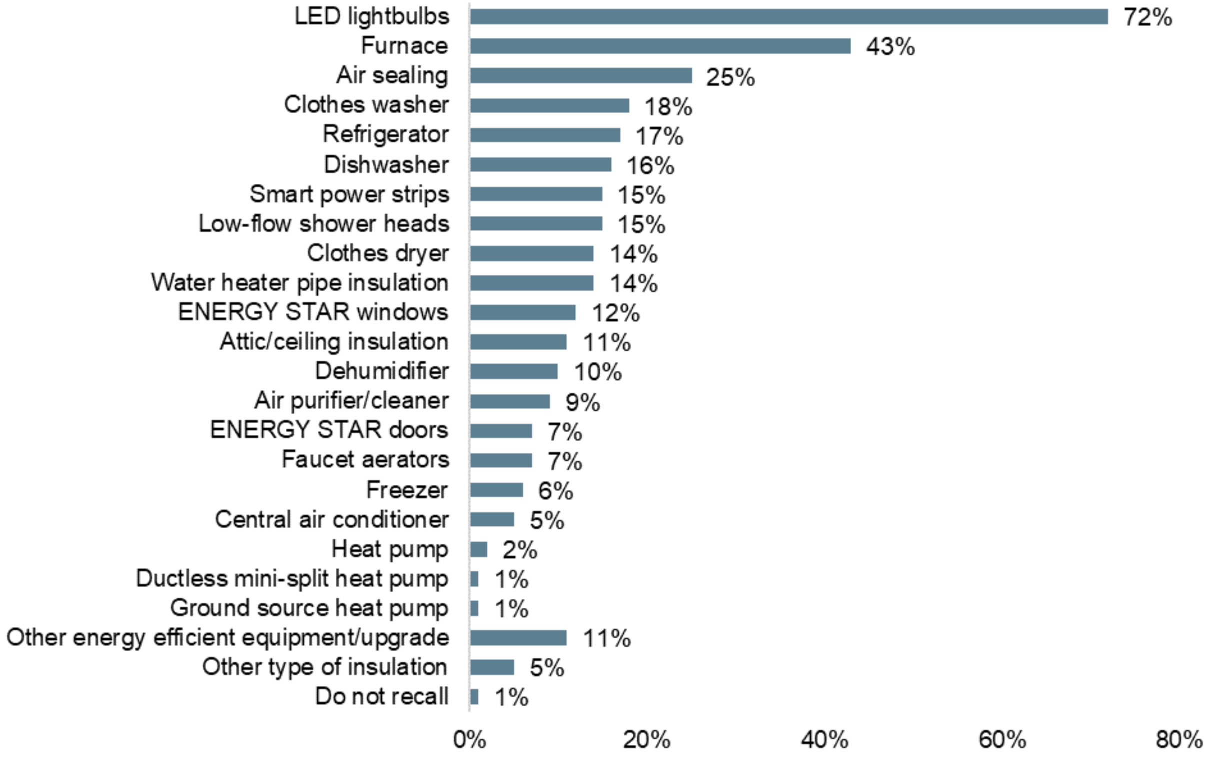
Participants mainly learned about the rebates/discounts offered by Evergy through their contractor/Energy Auditor (47 percent) or via the Evergy website (13 percent). A breakdown of all program awareness sources is shown in Table C-11.

*Table C-11: Program Awareness*

| Response | Count of Respondents (n = 645) | Percent of Responses |
|---|---|---|
| Contractor/Energy Auditor | 305 | 47% |
| Evergy website | 85 | 13% |
| Email | 50 | 8% |
| Bill insert | 45 | 7% |
| Family, friend, or neighbor (word-of-mouth) | 44 | 7% |
| Other source | 48 | 7% |
| General online search | 21 | 3% |
| Community event | 12 | 2% |
| Social media or other online ad (i.e., Facebook) | 10 | 2% |
| Spire website | 5 | 1% |
| Television/radio/media coverage | 5 | 1% |
| Evergy call center referral | 6 | 1% |
| Do not recall | 8 | 1% |
| Connect center referral | 1 | <1% |

Participants were surveyed regarding installing additional energy-efficient equipment/upgrades. Three hundred and fifty-nine participants claimed to purchase additional equipment or improvements. LED lightbulbs (72 percent) were the most commonly installed additional energy-efficient equipment. A breakdown of all the reported installed additional energy-efficient equipment/upgrades is shown in Figure C-4. Most of the participants (84 percent) had their home energy assessments conducted in person (n = 203).

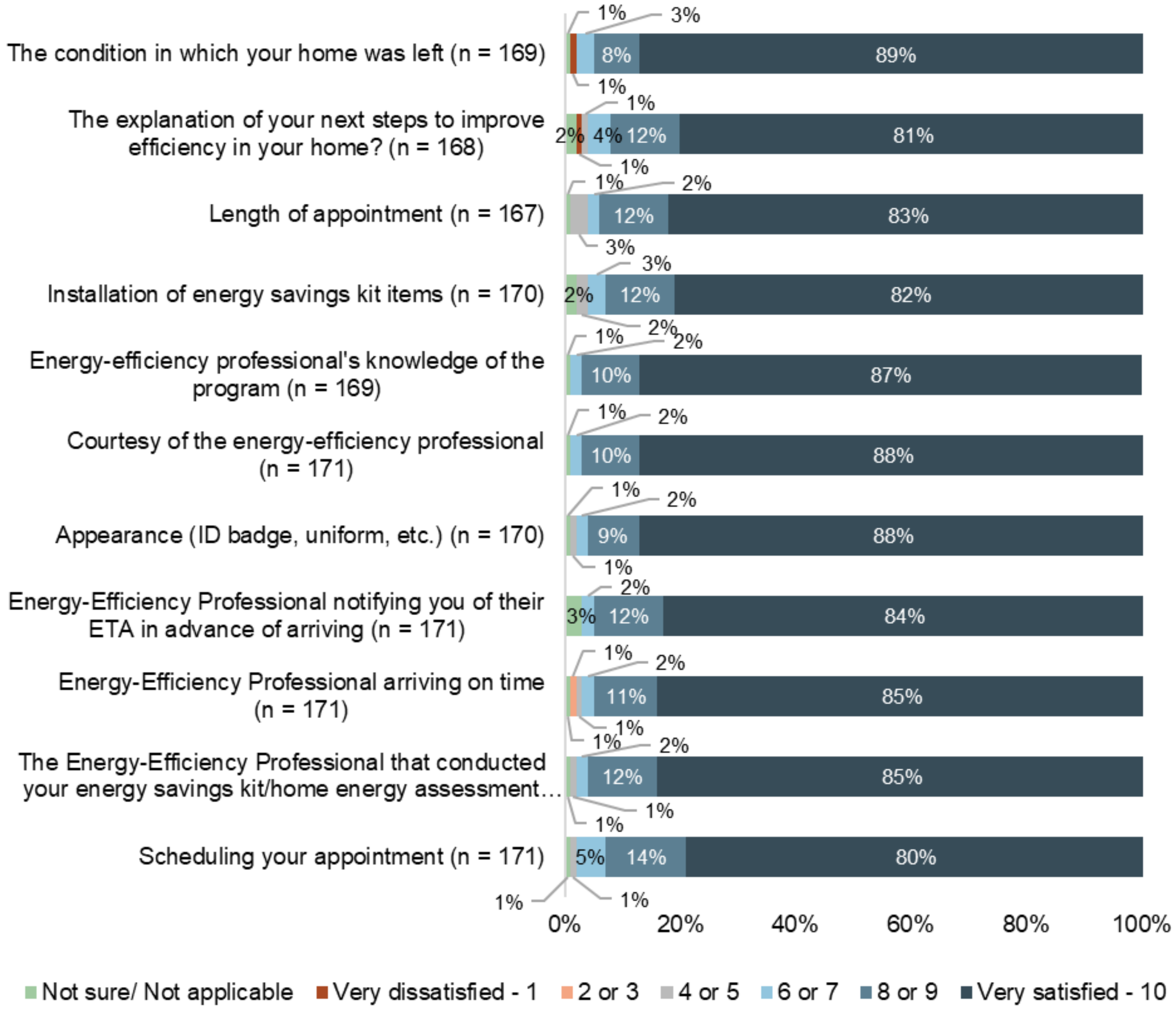
*Figure C-4: Installation of Additional Energy-Efficient Equipment/Upgrades (n = 358)*



### *Program Satisfaction*

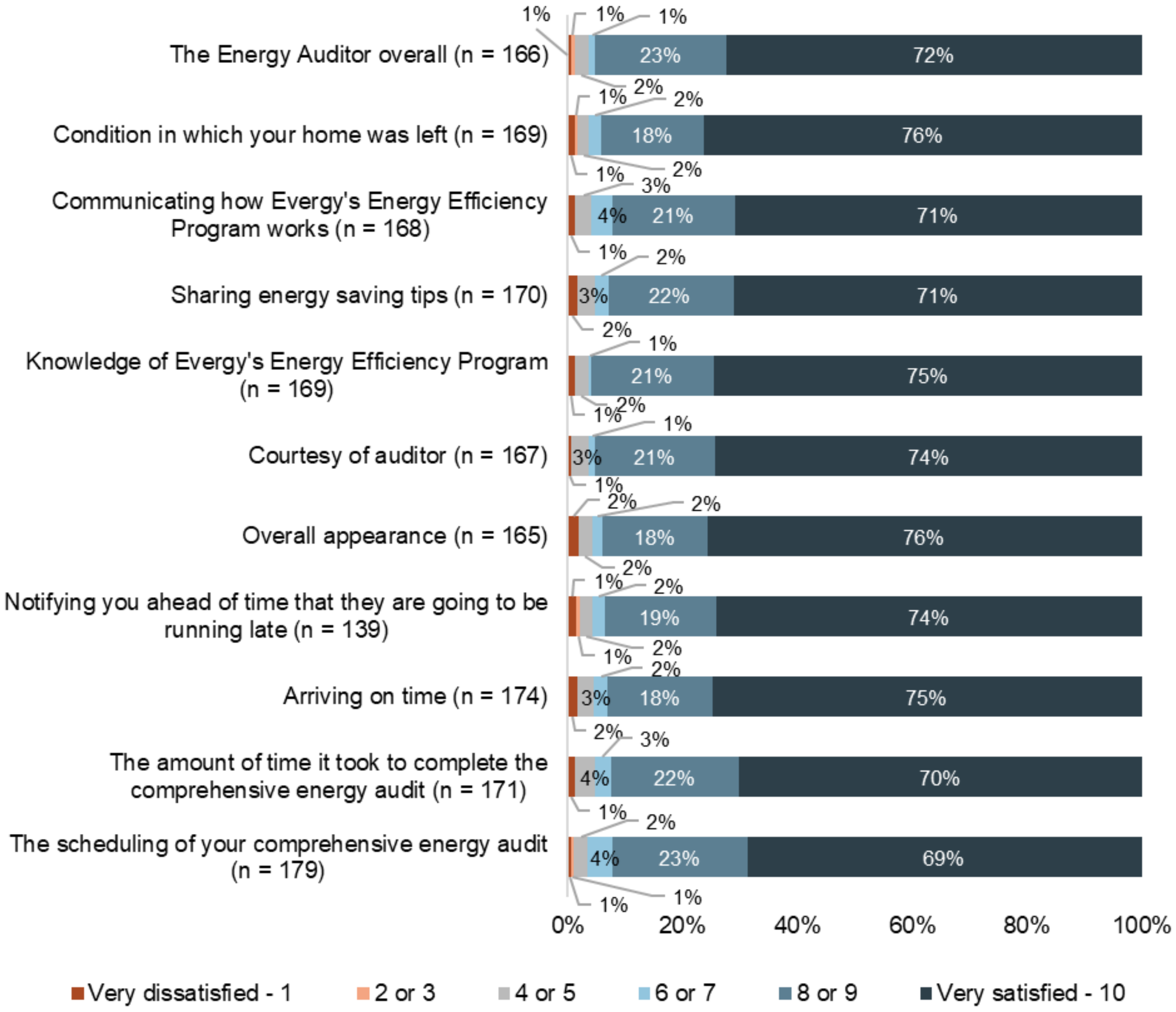
Overall, participants were satisfied with receiving their energy savings kits (see Figure C-5). Most (87 percent) participants stated they were helpful, rating it a seven or higher out of ten.

*Figure C-5: Participant Satisfaction with Receiving the Energy Savings Kit*



Overall, participants were satisfied with their comprehensive energy audit and their energy auditor (see Figure C-6). Ninety-five percent of participants who communicated with Evergy or ICF staff reported being satisfied with their interactions rating their interaction an eight or higher out of ten. For the respondents who were dissatisfied with their interaction with Evergy or ICF staff, one noted the rebate was less than what they were told and another stated that they had “to wait another couple of months to the thermostat program because the energy program is not synced somehow with the account billing program.”

*Figure C-6: Participant Satisfaction with the Comprehensive Energy Audit*



When asked about their satisfaction with the rebate, 85 percent of participants were satisfied with the timeliness in receiving their rebate, and 81 percent of participants were satisfied with the rebate amount rating these aspects a seven or higher out of ten. The Heating, Cooling, and Home Comfort Program was well-received by participants with the overall satisfaction of 91 percent, rating the program a seven or higher out of ten.

### *Home Demographics*

Program participants provided feedback regarding their homes' characteristics, starting with the type of home they live. Most survey respondents (93 percent) owned their homes and lived in a detached single-family home (92 percent). The survey data suggests participants' income ranged mainly between $40,000 to less than $200,000. Table C-12 and Table C-13 summarize all the household demographic results.

*Table C-12: Home Characteristics*

| Home Characteristics | Percentage of Respondents (n = 434) |
|---|---|
| Single-family home, detached construction | 92% |
| Townhome or duplex | 5% |
| Apartment | 3% |
| Preferred not to answer | <1% |
| **Home Size (Square Feet)** | **Percentage of Respondents (n = 433)** |
| Less than 1,000 square feet | 4% |
| 1,000 - 1,999 square feet | 41% |
| 2,000 - 2,999 square feet | 30% |
| 3,000 - 3,999 square feet | 12% |
| 4,000 - 4,999 square feet | 6% |
| 5,000 or greater square feet | 2% |
| Did not know/Preferred not to answer | 4% |
| **Year Home Built** | **Percentage of Respondents (n = 434)** |
| Before 1960 | 25% |
| 1960 to 1969 | 10% |
| 1970 to 1979 | 13% |
| 1980 to 1989 | 9% |
| 1990 to 1999 | 17% |
| 2000 to 2009 | 16% |
| 2010 to 2019 | 5% |
| 2020 or newer | <1% |
| Did not know/Preferred not to answer | 4% |
| **Heating Main Fuel Source** | **Percentage of Respondents (n = 318)** |
| Natural Gas | 68% |
| Electricity | 29% |
| Propane | <1% |
| Other | 1% |
| Did not know/Preferred not to answer | 2% |

*Note: The sum of percentages may exceed 100% due to rounding.*

*Table C-13: Household Characteristics*

| **Own or Rent** | **Percentage of Respondents (n = 433)** |
|---|---|
| Own | 7% |
| Rent | 93% |
| Preferred not to answer | <1% |
| **Number of People per Household** | **Percentage of Respondents (n = 419)** |
| 1 - 2 people | 67% |
| 3 - 4 people | 23% |
| 5 - 6 people | 10% |
| More than 6 people | <1% |
| **Income Before Taxes** | **Percentage of Respondents (n = 434)** |
| Less than $10,000 | 1% |
| $10,000 to less than $20,000 | 3% |
| $20,000 to less than $30,000 | 4% |
| $30,000 to less than $40,000 | 4% |
| $40,000 to less than $50,000 | 5% |
| $50,000 to less than $75,000 | 15% |
| $75,000 to less than $100,000 | 11% |
| $100,000 to less than $150,000 | 18% |
| $150,000 to less than $200,000 | 7% |
| $200,000 or more | 7% |
| Did not know/Preferred not to answer | 30% |
| **Education Level** | **Percentage of Respondents (n = 434)** |
| Some high school | 1% |
| High school graduate or GED equivalent | 7% |
| Some college | 17% |
| Associate’s degree | 9% |
| Bachelor’s degree | 28% |
| Master’s Degree | 25% |
| Professional degree (MD, JD, DDS) | 4% |
| Doctorate degree (Ph.D., D.Sc.) | 5% |
| Not Sure/ Preferred not to answer | 3% |

### C.6.3 Trade Ally Survey

An online survey from a census of highly active trade allies was administered to assess program impacts on recommendations made to customers and collect additional feedback on the program. In December 2022, a total of 178 trade allies were sent the online survey, which resulted in 20 survey completes. Trade allies were surveyed on their company information, program awareness and involvement, program procedures, customer interactions, program influence, and the market.

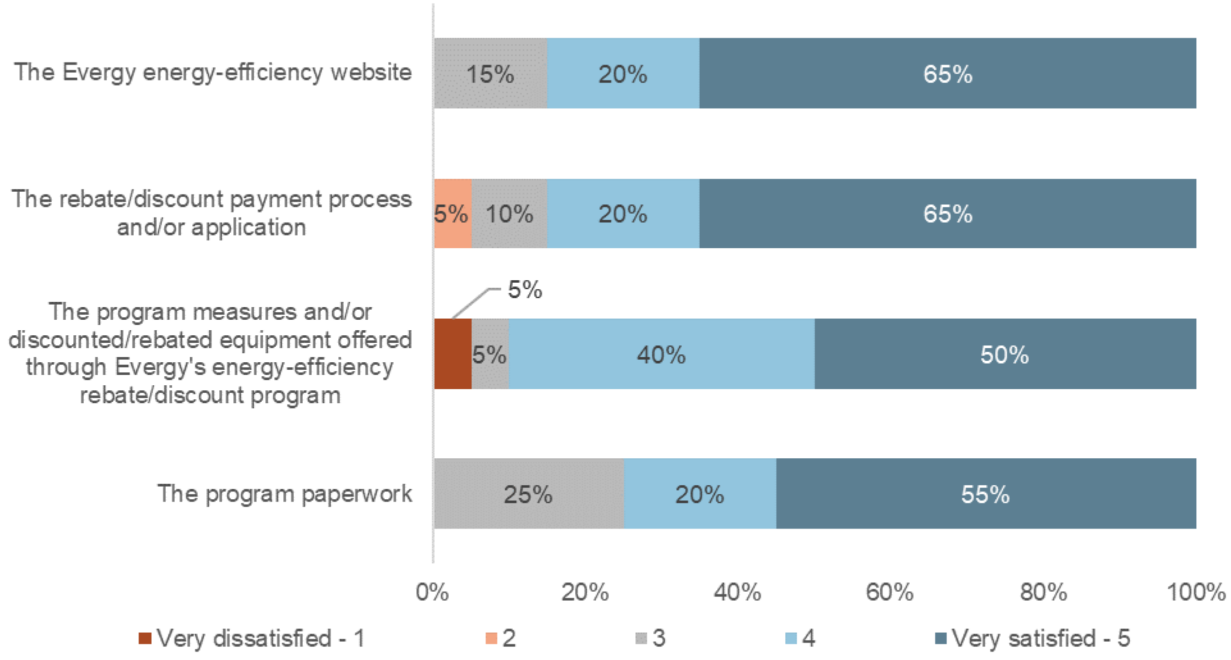
Sixty percent of trade allies have six to twenty-five years of experience with utility-funded energy-efficiency programs, and the most common reasons trade allies decided to participate in the program was to be able to pass discounts/rebates onto customers (100 percent), to improve sales (75 percent), and to benefit from recognition as a qualified trade ally to improve sales (55 percent). While only 20 percent of trade allies reported receiving training for the program in 2022, all respondents (100 percent) reported that the training was very helpful. The trade allies were surveyed about their interactions and satisfaction with ICF program staff. Ninety percent of trade allies reported that the ICF program staff are very professional, very easy to reach when they have questions, very informed on the program, and very quick to respond to their emails/ phone calls when trying to communicate with the staff.

Trade allies were surveyed on their interactions with customers. The majority (75 percent) said that they initially present high efficiency options and equipment to customers when they first interact with them. The main benefits customers receive by participating in the program according to the trade allies were lower utility bills (40 percent) and savings on equipment (30 percent). The majority of trade allies (60 percent) rated the Evergy energy-efficiency discount/rebate program as a seven or higher out of ten in influencing their level of marketing and selling of energy-efficient measures to Evergy customers during 2022. Seventy percent of the trade allies said they would have recommended different equipment types, quantities, or efficiency levels to customers if the program were not available.

Fifty-five percent of respondents reported that Evergy's energy-efficiency rebate program has neither increased nor decreased the number of home energy-efficiency projects they complete. Yet, in the next 12 months 95 percent of respondents believe that the total number of program projects they complete will stay the same or increase. The biggest challenges reported by trade allies was qualifying equipment (32 percent).

Trade allies were surveyed on their satisfaction with different aspects of the program (see Figure C-7). Overall, the majority[17] of respondents were satisfied with all aspects of the program rating them a four or five out of five. The Heating, Cooling, and Home Comfort Program was overall well-received by trade allies with an overall satisfaction of 90 percent, rating the program a four or five out of five.

*Figure C-7: Trade Ally Satisfaction with Different Aspects of the Program (n = 20)*



## C.7 Conclusions and Recommendations

The evaluation team at ADM performed a process evaluation that assessed program documentation and primary data collected from program stakeholders. The evaluation included participant surveys, trade ally surveys, completed interviews with program staff, reviewed program documentation, and analyzing the program tracking data.

The following summarizes the key findings of the process evaluation of the Heating, Cooling, and Home Comfort Program:

- Evergy management of the Whole House Efficiency sub-program changed in PY3 due to the current program manager leaving. A senior Evergy staff member managed that portion of the program during this interim period.

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[17] 90 percent for the measures offered; 85 percent each for the Evergy website and the rebate/application process; 75 percent for the program paperwork.

- The overall program goals for program in PY3 are to achieve a total of 3,489 kW in Missouri West and 2,128 kW reductions in Missouri Metro and the program is on track to meet about 90 percent of its overall program goals this year.
- The Energy Savings Kit sub-program participation goals were added in PY3 to include the unmet participation goals from PY2.
- Energy Savings Kit sub-program continued offering participants a choice between receiving the energy audit in-home or receiving an in-home audit virtually. Most program participants opted for an in-person energy audit (85 percent) compared to the 15 percent who selected the virtual option.
- Evergy held 14 community events during 2022 to promote the Energy Savings Kit sub-program at local libraries, community centers, and church parking lots located in the targeted, low-income neighborhoods.
- External factors such as COVID-19, economic uncertainty, and supply chain issues have led to increasing prices for contractor-delivered services and equipment.
- Upcoming changes in codes and standards pose a threat to the rebated HVAC equipment offered through the program.
- LED lightbulbs (72 percent) were the most commonly installed additional energy-efficient equipment as reported by survey participants.
- Participant satisfaction with the Heating, Cooling, and Home Comfort Program (both the Energy Savings Kit and Whole House Efficiency sub-programs) remained high in 2022 with a 91 percent of survey participants reporting being satisfied with the program overall.
- Although only a small percentage (22 percent) of trade allies reported having program training in 2022, all of those trade allies (100 percent) reported that the training was very helpful.
- Trade ally satisfaction with the Heating, Cooling, and Home Comfort Program remained high in 2022 with 90 percent of trade allies reporting being satisfied with the program overall.

The following recommendations are offered for continued improvement of the Heating, Cooling, and Home Comfort Program:

- **Consider hosting contractor briefings/meetings and/or in-person trainings for trade allies.** Trying to engage trade allies virtually can be much more challenging than in-person meetings where the trade allies can feel more engaged. In-person meetings also create opportunities to introduce the Evergy program staff to trade allies who are consolidating or expanding their operations.

- **Identify potential energy-savings measures for the Energy Savings Kit as the emphasis shifts away from residential lighting.** The kits could include additional weather-stripping measures and energy-savings tips. The Evergy Savings Kit sub-program should continue to be actively promoted through community events, especially those targeting low-income areas.
- **Develop a simplified and more automated application process to reduce the load on trade allies.** As it is, some trade allies reported that the application process has many required components that can be easily overlooked. Drop-down options with pre-programmed equipment and AHRI numbers could be utilized to reduce the time it takes for trade allies to look up the information themselves and would reduce input error.
- **Determine the program impacts of the code/standard changes and economic influences and make adjustments accordingly to the current rebate structure.** Due to the baseline SEER rating of HVAC equipment updating in 2023 and other economic effects, such as inflation, Evergy should assess if the rebates currently offered through the program provide enough incentive to drive customers to install energy efficient equipment. As prices of HVAC equipment continue to increase, the financial burden on customers to install energy efficient equipment increases as well. By not raising the incentives to cover more of the cost of installing the equipment, this can drive the rate of program free ridership up. Revisions to incentives can be implemented on a per equipment type basis and be based on customer needs, equipment inventory, current market conditions, etc.
- **Create additional QA/QC checks for reviewing program tracking data prior to end-of-year reporting.** During the final review of the program tracking data by the evaluation team at ADM, it was discovered that 25 central air conditioner projects were mistakenly processed as air source heat pumps. It was decided that the verified savings would report the projects as central air conditioners, while the reported savings would reflect the projects as air source heat pumps, which resulted in a lower realization rate. Additional implementation QA/QC checks to the program tracking data could help avoid future discrepancies between the reported and verified savings.

# Appendix D Energy Saving Products Program-Specific Methodologies

This chapter describes the evaluation activities that were performed by ADM to evaluate the Energy Savings Product (ESP) Program.

## D.1 Program Overview

The ESP Program focuses on promoting, cultivating, and facilitating the adoption of energy efficient products in residential settings. The program has been designed with two key focuses:

- *Education* – the expansion of both residential customer and sales associate knowledge of and familiarity with the advantages of various energy efficient products available; and
- *Efficient Product Adoption* – market transformation resulting from increased awareness of the benefits of energy efficient technology and is supported through financial, point-of-sale incentives for the purchase of products that meet high efficiency standards.

Through the ESP Program, customers can receive instant discounts for a variety of efficient measures. From 2020 to 2021 these included a selection of LED lighting measures, including standard, specialty, and smart bulbs. In 2021, non-lighting measures were added such as showerheads, aerators, and advanced power strips through the online marketplace.

In 2022, the ESP Program included several different channels from which customers could participate. These channels include upstream rebates at retail outlets and an online marketplace. In addition, two different kit distribution methods were employed in 2022: Thank You Kits and Giveaway Hub. Thank You Kits were shipped to customers free of charge and without the customer opting in or making a request. Customers were targeted from previous HVAC program participants, specifically targeting renters or homeowners with large homes and thus a large number of sockets for LED applications. Thank You Kits included 4 bulbs from each of the following bulb types: A19, BR30 and Globe. The Giveaway Hub Channel targeted customers in predominantly low-income zip codes and customers opt-in to receive the kit in the mail. For Giveaway Hub, the kit included a 6-bulb package of A-19s.

The upstream Rebate and Thank You Kit channels were implemented by ICF while the Online Marketplace and Giveaway Hub channels were implemented by Uplight.

Figure D-1 provides the expected kWh savings distribution in 2022 by channel. Eighty-four percent of expected savings come from the upstream Rebate channel, fifteen percent come from Thank You Kits, and less than two percent come from the other channels.

*Figure D-1: Expected kWh Savings by Channel*

Table D-1 provides a summary of program metrics for PY3 for the ESP Program. Verified energy savings far exceeded program targets but fell slightly short of the reported energy savings.

*Table D-1: Performance Metrics – Energy Saving Products Program*

| Metric | MO West | MO Metro | PY3 Total |
|---|---|---|---|
| Number of Sites | 404,942 | 224,480 | 180,462 |
| ***Energy Impacts (kWh)*** | | | |
| Targeted Energy Savings | 15,634,241 | 8,079,124 | 7,555,117 |
| Reported Energy Savings | 56,372,523 | 30,927,705 | 25,444,819 |
| Gross Verified Energy Savings | 52,821,956 | 29,198,473 | 23,623,482 |
| Net Verified Energy Savings | 30,792,086 | 17,710,898 | 13,081,188 |
| ***Peak Demand Impacts (kW)*** | | | |
| Targeted Peak Demand Reduction | 1,140.18 | 581.83 | 558.35 |
| Reported Peak Demand Reduction | 7,303.26 | 4,000.05 | 3,303.21 |
| Gross Verified Peak Demand Reduction | 6,932.85 | 3,864.89 | 3,067.97 |
| Net Verified Peak Demand Reduction | 4,044.21 | 2,342.61 | 1,701.60 |
| ***Benefit / Cost Ratios*** | | | |
| Total Resource Cost Test Ratio | 3.08 | 2.68 | 3.82 |

## D.2 EM&V Methodologies

The following section details the methodologies ADM used to verify retail sales, estimate energy and peak demand impacts, and assess the performance for the Energy Saving Products program.

### D.2.1 Data Collection

Several primary and secondary data sources were used for the evaluation, as shown Table D-2. Tracking data and supporting documentation for the program was obtained from the program implementor. This tracking data was used as the basis for quantifying participation and assessing program impacts. Tracking data contained the following information used for verification of program savings:

- Program sales
- Measure model number and description
- Measure characteristics (wattage, lumens, efficiency, lifetime)
- Retailer
- Invoice date
- Original retail price
- Evergy sponsored discounts
- Retail price, including all discounts
- Number of bulbs per package

*Table D-2: Data Collection Activities*

| Data Collection Activities | Achieved Sample Size |
|---|---:|
| General Population Survey | 749 |
| Thank You Kit Survey | 350 |
| Program Staff Interviews | 4 |

### D.2.2 Sampling Plan

Primary data collection activities included an online general population survey, a survey for Thank You Kit participants, and interviews with program staff members. The general population survey was administered in three waves to a representative sample of Evergy customers. The first and second waves were contacted in January 2023 and the third in February 2023.

Table D-3 provides the precision achieved by channel and for the ESP Program overall. ADM calculated savings for all measures for every channel other than Online Marketplace. For the Online Marketplace channel, savings were calculated for all lighting measures.

*Table D-3: Precision by Channel and Overall*

| Channel | Precision (95% Confidence) |
|---|---|
| Rebate | 0.0000% |
| Thank You Kits | 0.0000% |
| Giveaway Hub | 0.0000% |
| Online Marketplace | 0.0212% |
| **Overall** | **0.0001%** |

### *General Population Survey*

The general population survey was sent to a randomly selected, representative sample of Evergy’s residential customers. Customers were contacted via email and asked a variety of questions about recent purchases of energy efficient measures. Since customer information is not tracked for marked-down measures in the upstream program, a general population survey provides a cost-effective way of reaching many potential program participants. Each participant received a single-use unique survey link that they could use to participate in the survey. In addition, the survey instrument has several screening questions to determine (a) whether respondents had purchased measures discounted through the upstream program within the program year and (b) that those purchases had been made through participating retailers.

Of the roughly 15,000 customers invited, 749 qualified for the survey and completed it fully. The survey collected data on program awareness and insights into energy-saving product purchases for lighting measures in addition to measure satisfaction, participant motivation, and household demographics.

### *Thank You Kit Survey*

Thank You Kit recipients were sent a survey to determine In-Service Rates (ISRs) and free ridership. Customers were contacted via email and asked a variety of questions about kit item installation, prior plans to purchase kit items (LEDs), and the likelihood of making purchases. Each participant received a single-use unique survey link that they could use to participate in the survey. In addition, the survey instrument screened respondents to determine that they had received the Thank You Kit. 350 Thank You Kit recipients completed the survey.

#### *Program Staff Interviews*

To inform the process evaluation, ADM conducted in-depth interviews with program staff at Evergy and the implementation contractor. These interviews provided insight into various aspects of the program, its organization, and any changes to the program that occurred during 2022. Interviewees also discussed aspects of the program operations that they considered to be successful, and the challenges faced over the course of the program year. These results are presented in Section D.6.

### D.2.3 Gross Impact Methodology

This subsection summarizes the methods used to verify measure savings and calculate gross energy savings and gross demand reduction for each measure.

Reported energy and peak demand impacts for the program were calculated using savings algorithms from the Evergy TRM. ADM's evaluation consisted of: (1) reviewing the assumptions and inputs associated with the energy savings values, (2) verifying that the per-unit impacts were applied appropriately and, (3) making appropriate adjustments for in-service rates and cross sector sales.

#### *Tracking Data Verification*

To verify the types and quantities of distributed measures, ADM reviewed the program tracking database to determine that the measures were claimed during the program year, reported measure wattage and lumens were accurate, and energy and demand impacts aligned with the Evergy TRM algorithms for each measure type. A census of LED bulb model numbers was checked against ENERGY STAR® databases to verify efficient wattage and lumens reported in the tracking database and to verify that all bulbs were ENERGY STAR®.

For 2022, ADM calculated verified energy and demand impacts based on the Evergy TRM. For the upstream rebate channel, ADM used adjusted Hours of Use, Coincident Factors, and Waste Heat Factors as specified in the Evergy TRM based on the installation locations reported in the general population survey.

Reported impacts were calculated in accordance with the savings algorithms.

The model number, SKU, and model name for each program rebated bulb was used to verify the bulb wattage and lumen output for verified savings. ADM found that most wattages and lumens matched the reported values, but some were found that did not. Model specific findings are further discussed in Section D.3.2

#### *In-Service Rate Adjustment*

In-service rates (ISRs) were calculated for each program channel using surveys or the IL TRM, as shown in Table D-4.

*Table D-4: ISR Source by Program Channel*

| Channel | ISR Source |
|---|---|
| Rebate | General Population Survey |
| Thank You Kits | Thank You Kit Survey |
| Giveaway Hub | IL TRM |
| Online Marketplace | 2021 Online Marketplace Survey |

### *Hours of Use and Cross Sector Sales Adjustments*

For upstream rebates, an adjustment to gross impacts was made to account for the proportion of program bulbs estimated to be installed in non-residential settings, since hours of use (HOU) and coincident factor (CF) are typically higher for commercial sockets compared to residential sockets. For each installation location, ADM used the deemed hours of use (HOU), coincident factor (CF), and waste heat factors for energy and demand (WHFe and WHFd) specified in the Evergy TRM.

Surveyed customers who indicated they had purchased LEDs in 2022 were asked how many of the bulbs they purchased were installed in single-family homes, multi-family homes, outdoors, and in commercial spaces. ADM calculated average measure attribute values for standard and specialty bulbs in the Missouri West and Missouri Metro jurisdictions, respectively.

## D.3 Gross Energy Savings and Demand Reduction

Based on the impact evaluation results, the total verified gross savings for the Energy Savings Products Program are 56,372,523 kWh, which resulted in a kWh realization rate of 94 percent and 7,303.26 kW, for a kW realization rate of 95 percent. Table D-5 presents the gross reported energy and demand savings by channel, measure, and jurisdiction. Table D-6 presents the gross verified energy and demand savings. In addition, Table D-7 presents the gross realization rates for each channel, key measure, and jurisdiction.

*Table D-5: Gross Reported Energy Savings & Demand Reduction*

| Channel | MO West | | MO Metro | | Total | |
|---|---|---|---|---|---|---|
| | kWh | kW | kWh | kW | kWh | kW |
| Rebate: LED- Standard | 13,463,240 | 1,640.12 | 11,353,464 | 1,389.45 | 24,816,704 | 3,029.57 |
| Rebate: LED- Specialty | 9,574,552 | 1,327.98 | 8,728,138 | 1,210.59 | 18,302,690 | 2,538.57 |
| Rebate: Budget, LED- Standard | 1,145,994 | 139.61 | 749,336 | 91.52 | 1,895,331 | 231.12 |
| Rebate: Budget, LED- Specialty | 769,617 | 106.75 | 905,419 | 125.58 | 1,675,036 | 232.33 |
| Thank You Kits: LED- Specialty | 3,353,022 | 465.06 | 1,928,759 | 267.52 | 5,281,781 | 732.58 |
| Thank You Kits: LED- Standard | 1,919,249 | 233.81 | 892,255 | 108.93 | 2,811,504 | 342.73 |
| Giveaway Hub: LED- Standard | 511,843 | 63.23 | 759,586 | 93.83 | 1,271,429 | 157.06 |
| Marketplace: LED, Other | 187,492 | 23.16 | 126,367 | 15.61 | 313,859 | 38.77 |
| Marketplace: Holiday LED | 2,696 | 0.33 | 1,494 | 0.18 | 4,189 | 0.52 |
| **Total** | **30,927,705** | **4,000.05** | **25,444,819** | **3,303.21** | **56,372,523** | **7,303.26** |

*Table D-6: Gross Verified Energy Savings & Demand Reduction*

| Channel | MO West | | MO Metro | | Total | |
|---|---|---|---|---|---|---|
| | kWh | kW | kWh | kW | kWh | kW |
| Rebate: LED- Standard | 15,189,200 | 1,882.24 | 12,572,354 | 1,531.37 | 27,761,554 | 3,413.61 |
| Rebate: LED- Specialty | 9,134,551 | 1,345.59 | 7,358,538 | 1,063.00 | 16,493,089 | 2,408.59 |
| Rebate: Budget, LED- Standard | 1,306,984 | 161.96 | 927,998 | 113.03 | 2,234,983 | 275.00 |
| Rebate: Budget, LED- Specialty | 711,041 | 104.74 | 667,981 | 96.50 | 1,379,022 | 201.24 |
| Thank You Kits: LED- Specialty | 729,635 | 107.48 | 337,882 | 48.81 | 1,067,517 | 156.29 |
| Thank You Kits: LED- Standard | 1,268,203 | 157.16 | 573,812 | 69.89 | 1,842,014 | 227.05 |
| Giveaway Hub: LED- Standard | 752,452 | 92.03 | 1,115,787 | 136.46 | 1,868,239 | 228.49 |
| Marketplace: LED, Other | 104,474 | 13.69 | 68,182 | 8.90 | 172,656 | 22.59 |
| Marketplace: Holiday LED | 1,933 | 0.00 | 949 | 0.00 | 2,882 | 0.00 |
| **Total** | **29,198,473** | **3,864.89** | **23,623,482** | **3,067.97** | **52,821,956** | **6,932.85** |

*Table D-7: Gross Realization Rates*

| Channel | MO West | | MO Metro | | Total | |
|---|---|---|---|---|---|---|
| | kWh | kW | kWh | kW | kWh | kW |
| Rebate: LED- Standard | 113% | 115% | 111% | 110% | 112% | 113% |
| Rebate: LED- Specialty | 95% | 101% | 84% | 88% | 90% | 95% |
| Rebate: Budget, LED- Standard | 114% | 116% | 124% | 124% | 118% | 119% |
| Rebate: Budget, LED- Specialty | 92% | 98% | 74% | 77% | 82% | 87% |
| Thank You Kits: LED- Specialty | 22% | 23% | 18% | 18% | 20% | 21% |
| Thank You Kits: LED- Standard | 66% | 67% | 64% | 64% | 66% | 66% |
| Giveaway Hub: LED- Standard | 147% | 146% | 147% | 145% | 147% | 145% |
| Marketplace: LED, Other | 56% | 59% | 54% | 57% | 55% | 58% |
| Marketplace: Holiday LED | 72% | 0% | 64% | 0% | 69% | 0% |
| **Total** | **94%** | **97%** | **93%** | **93%** | **94%** | **95%** |

### D.3.1 Program Activity

The tables below (Table D-8 and Table D-9) provide the package and bulb quantities for each of the ESP channels by jurisdiction. The tracking data compiled by the implementor and provided for the ESP upstream Rebate channel identified a total of 346,247 packages of LEDs were discounted through participating retail stores. Thank You Kits provided customers with 45,701 packages while Giveaway Hub provided 11,667 packages. In addition, the Online Marketplace provided 1,210 LED packages and 115 Holiday LED string light packages.

*Table D-8: Quantities for Upstream Rebates and Thank You Kits*

| Jurisdiction | Channel | Measure | Package Quantity | Bulb Quantity |
|---|---|---|---|---|
| MO West | Rebate | Standard LED | 111,383 | 404,484 |
| MO Metro | Rebate | Standard LED | 88,275 | 334,185 |
| MO West | Rebate | Specialty LED | 78,316 | 231,408 |
| MO Metro | Rebate | Specialty LED | 68,273 | 215,511 |
| MO West | Thank You Kits | Standard LED | 11,486 | 53,138 |
| MO Metro | Thank You Kits | Standard LED | 5,804 | 24,672 |
| MO West | Thank You Kits | Specialty LED | 17,799 | 75,010 |
| MO Metro | Thank You Kits | Specialty LED | 10,612 | 43,148 |
| **Total** | | | **391,948** | **1,381,556** |

*Table D-9: Quantities for Giveaway Hub and Online Marketplace*

| Jurisdiction | Channel | Measure | Package Quantity | Bulb Quantity |
|---|---|---|---:|---:|
| MO West | Giveaway Hub | Standard LED | 4,699 | 28,194 |
| MO Metro | Giveaway Hub | Standard LED | 6,968 | 41,808 |
| MO West | Marketplace | Standard LED | 366 | 2,728 |
| MO Metro | Marketplace | Standard LED | 259 | 1,909 |
| MO West | Marketplace | Specialty LED | 356 | 2,417 |
| MO Metro | Marketplace | Specialty LED | 229 | 1,559 |
| MO Metro | Marketplace | Advanced Power Strip | 1 | - |
| MO West | Marketplace | Showerhead | 1 | - |
| MO West | Marketplace | Holiday LED | 74 | - |
| MO Metro | Marketplace | Holiday LED | 41 | - |
| **Total** | | | **12,994** | **78,615** |

### D.3.2 Verification of Measure Wattage

ADM identified 63 LED models in the program tracking data for which the reported measure wattage or lumens differed from the verified characteristics, cumulatively representing approximately 3.34 percent of total program savings. Adjusted measure specifications for the 20 bulbs with the greatest share of savings are shown in Table D-10. Differences between reported and verified measures specifications result from changes to the reported value in the ENERGY STAR® database, rounding in the specifications reported in the program tracking data, or incorrect specifications reported in the tracking data.

*Table D-10: Parameters Adjusted for Lighting Analysis*

| Model Number | Manufacturer | Reported Wattage | Verified Wattage | Reported Lumens | Verified Lumens | ENERGY STAR ID | % of total Savings |
|---|---|---|---|---|---|---|---|
| A7A19A100 WESD06 | LEEDARSON AMERICA | 15.5 | 15 | 1600 | 1680 | 2295713 | 0.40% |
| 11A19060W ESD043 | LEEDARSON AMERICA | 9.5 | 9.7 | 840 | 840 | 2304774,<br>2304823 | 0.37% |
| 93129774 | GENERAL ELECTRIC | 10 | 9 | 700 | 650 | 2382697 | 0.27% |
| 11A19060W ESD041 | LEEDARSON AMERICA | 9.5 | 9.7 | 800 | 800 | 2304772,<br>2304822 | 0.26% |
| 11A19060W ESD042 | LEEDARSON AMERICA | 9.5 | 9.7 | 800 | 800 | 2304773,<br>2308817 | 0.16% |
| A7A19A75 WESD08 | LEEDARSON AMERICA | 13 | 12.5 | 1100 | 1100 | 2293042 | 0.16% |
| A20BR3065 WESD56 | LEEDARSON AMERICA | 9 | 8 | 685 | 700 | 2374631,<br>2374634 | 0.13% |
| 93128616 | GENERAL ELECTRIC | 13 | 15 | 1200 | 1300 | 2363764 | 0.12% |
| A20BR3065 WESD26 | LEEDARSON AMERICA | 9 | 8 | 665 | 680 | 2374629,<br>2374632 | 0.12% |
| A20BR3065 WESD36 | LEEDARSON AMERICA | 9 | 8 | 665 | 680 | 2374630,<br>2374633 | 0.11% |
| A7A19A75 WESD07 | LEEDARSON AMERICA | 13 | 12.5 | 1100 | 1100 | 2273024,<br>2273026,<br>2273425 | 0.11% |
| A7A19A100 WESP02 | LEEDARSON AMERICA | 14.5 | 14.5 | 1600 | 1550 | 2338970,<br>2400512 | 0.10% |
| 42309 | GENERAL ELECTRIC | 4 | 4 | 320 | 300 | 2312780 | 0.09% |
| B7A19A40 WESD14 | LEEDARSON AMERICA | 13 | 5 | 1000 | 450 | 2387545 | 0.09% |
| 42362 | GENERAL ELECTRIC | 4 | 4 | 320 | 300 | 2312779 | 0.08% |
| GV25D4.5W W503PN | ELONG INTERNATIONAL | 3 | 4.5 | 350 | 500 | 2365458 | 0.08% |
| 11FFA1960 WESD02 | LEEDARSON AMERICA | 7.5 | 8 | 800 | 800 | 2387586 | 0.07% |
| 42287 | GENERAL ELECTRIC | 4 | 4 | 320 | 300 | 2312787 | 0.06% |
| 40674 | SYLVANIA LEDVANCE | 4.5 | 5.5 | 450 | 450 | 2354573 | 0.05% |

| Model Number | Manufacturer | Reported Wattage | Verified Wattage | Reported Lumens | Verified Lumens | ENERGY STAR ID | % of total Savings |
|---|---|---|---|---|---|---|---|
| BR40-1D 15W E26 120V 5000K | KLITE | 12 | 15 | 985 | 1325 | 2375048, 2401492 | 0.05% |
| A7A19A100 WESD06 | LEEDARSON AMERICA | 15.5 | 15 | 1600 | 1680 | 2295713 | 0.40% |
| 11A19060W ESD043 | LEEDARSON AMERICA | 9.5 | 9.7 | 840 | 840 | 2304774, 2304823 | 0.37% |
| 93129774 | GENERAL ELECTRIC | 10 | 9 | 700 | 650 | 2382697 | 0.27% |
| 11A19060W ESD041 | LEEDARSON AMERICA | 9.5 | 9.7 | 800 | 800 | 2304772, 2304822 | 0.26% |
| 11A19060W ESD042 | LEEDARSON AMERICA | 9.5 | 9.7 | 800 | 800 | 2304773, 2308817 | 0.16% |

### D.3.3 Verification of In-Service Rate

In-service rates (ISRs) for the upstream Rebate channel were determined from the General Population survey. The in-service rate assumption for the reported savings, sourced from the Evergy TRM, was 94.2 percent. Through analysis of survey data from the general population survey, ADM found in-service rates of 89 percent for standard LEDs and 88 percent for specialty LEDs.

The verified ISRs per measure, for each jurisdiction, are summarized in Table D-11.

*Table D-11: Measure-Level Verified ISRs, Upstream Rebates*

| Measure Type | Jurisdiction | ISR |
|---|---|---|
| Standard LED | MO West | 88.3% |
| | MO Metro | 89.9% |
| Specialty LED | MO West | 86.1% |
| | MO Metro | 91.0% |

In-service rates (ISRs) for the Thank You Kit channel were determined from the Thank You Kits survey, as shown in Table D-12. The in-service rate assumption for the reported savings was 94.2 percent, however the Thank You Kit survey showed much lower ISRs.

*Table D-12: Bulb Type ISRs, Thank You Kits*

| LED Bulb Type | ISR | Sample Size |
|---|---|---|
| A19 | 54% | 229 |
| BR30 | 16% | 221 |
| Candle | 20% | 214 |

ISRs for the Online Marketplace were determined using the 2021 Online Marketplace Survey results. The ISR for Standard LEDs was 41.2 percent while the ISR for Specialty LEDs was 48.9 percent. This represents a reduction from the in-service rate of 94.2 percent assumed by the Evergy TRM.

For the Giveaway Hub channel, ADM applied a 68 percent ISR by sourcing the ISR for an Income Qualified, Direct Mail Kit program type from the IL TRM.

### D.3.4 Adjustment for Cross Sector Sales

Across both standard and specialty bulbs, roughly 87 percent of the bulbs installed went inside single-family homes, 5 percent went inside multi-family homes, and 6 percent in exterior locations. According to survey responses, bulb installations in commercial locations accounted for only 2 percent of total installations.

## D.4 Net Savings Evaluation Findings

The following section details the free ridership, participant spillover, and leakage estimates used to determine net savings for the Energy Saving Products Program channels in PY3. Additional details regarding the net-to-gross evaluation approaches are shown in section A.1.

Participant spillover was derived from a benchmarking study of recent evaluations of similar lighting programs. ADM estimated the total participant spillover to be 5.5 percent, as shown in Table A-5. Typical rates of participant spillover for similar lighting programs were found to range from 2 percent to 7.4 percent. Spillover was applied to the upstream Rebate and the Online Marketplace channels.

ADM used leakage estimates from PY2 for PY3. Leakage was applied to the upstream Rebate channel. In PY2, leakage estimates were assessed using an approach that combined responses from the general population survey with a geo-mapping analysis. Leakage was estimated for several types of retailers: Mass Merchants (Big Box retailers), DIY stores, and Member channels (e.g., Costco). Together, these three program channels represented 92 percent of the Rebate channel savings in PY3. A savings-weighted leakage rate was applied to the remaining retailer types. ADM found that Evergy’s overall leakage rate was 1.35 percent. Given the large and contiguous size of Evergy's service territory, the low leakage rate is to be expected.

### D.4.1 Upstream Rebates

The survey-based effort for calculating free ridership was conducted using survey responses from a large sample of randomly selected residential customers. ADM's general population survey of Evergy customers was conducted using email invitations, an online survey platform, and small gift card incentive to those who completed the questionnaire. Survey respondents were asked a series of questions to elicit feedback regarding influences on their light bulb purchasing decisions. Each respondent was then assigned a free ridership score based on a consistent free ridership scoring algorithm developed by ADM for upstream lighting programs. The free ridership scoring algorithm developed for the survey instruments is shown in Figure A-2.

ADM analyzed survey responses from 749 Evergy customers. Of these, 544 verified responses were used to calculate a free ridership score for standard LEDs, and 193 responses were used to calculate a free ridership score for specialty LEDs.

For program LEDs distributed through budget-retailers Dollar Tree, True Value, Habitat Restores, and Goodwill, ADM assumed there was no free ridership as these retailers would likely not stock ENERGY STAR® LEDs in the absence of the program. Budget-retailers represented roughly 7.6 percent of gross verified energy savings.

The overall free ridership, spillover, leakage, and net-to-gross ratio for each jurisdiction and measure are shown in Table D-13.

*Table D-13: Free Ridership, Spillover, and Leakage, Upstream Rebates*

| Jurisdiction | Measure | Spillover | Free Ridership | Leakage | Net-To-Gross Ratio |
|---|---|---|---|---|---|
| MO West | LED-Standard | 5.50% | 46.81% | 1.35% | 57.3% |
| MO West | LED-Specialty | 5.50% | 47.15% | 1.35% | 57.0% |
| MO Metro | LED-Standard | 5.50% | 56.28% | 1.35% | 47.9% |
| MO Metro | LED-Specialty | 5.50% | 51.65% | 1.35% | 52.5% |
| MO West | Budget LED* | - | - | - | 100.0% |

* For program LEDs distributed through budget retailers Dollar Tree, True Value, Habitat Restores, and Goodwill, ADM applied an assumed a NTGR of 100 percent.

### D.4.2 Thank You Kits

The survey-based effort for calculating free ridership was conducted using survey responses from a sample of customers receiving Thank You Kits. Survey respondents were asked a series of questions to elicit feedback regarding influences on their light bulb purchasing decisions. Each respondent was then assigned a free ridership score based on a consistent free ridership scoring algorithm developed by ADM for the Thank You Kit channel. The free ridership scoring algorithm developed for the survey instruments is shown in Figure A-3.

The free ridership score is determined as the combination of two scores, the "program influence" score based on the participants likelihood of purchasing without receiving the kit, and the "plans" score based on whether participants had prior plans to purchase the LEDs.

ADM determined free ridership for Thank You Kits from 350 survey responses. Table D-14 show the free ridership and spillover for the different measures in the Thank You Kits.

*Table D-14: Free Ridership, Spillover, Thank You Kits*

| Measure | Spillover | Free Ridership | Net-To-Gross Ratio |
|---|---|---|---|
| LED-Standard | 0.00% | 61.35% | 38.7% |
| LED-Specialty | 0.00% | 39.93% | 60.1% |

### D.4.3 Online Marketplace

For the Online Marketplace channel, ADM applied free ridership from the PY2 Online Marketplace survey. In 2021, ADM conducted a survey of a sample of randomly selected customers who participated in an online sales event. 979 participants were invited to participate in the survey, of which 274 qualified for and completed the survey.

The strength of a survey-based approach is the ability to obtain a large, random sample size cost-effectively. It also allows for further questioning regarding the quantity and location of installed bulbs and the motivation behind bulb purchases. The biggest drawback to the approach is the potential for respondent recall bias. For example, it may be difficult to get accurate responses to questions about the number of bulbs the respondent recently purchased and whether they were discounted through the program.

Survey respondents were asked a series of questions to elicit feedback regarding influences on their light bulb purchasing decisions. Each respondent was then assigned a free ridership score based on a consistent free ridership scoring algorithm. The free ridership scoring algorithm developed for the survey instruments is the same one used for Upstream Rebates (see Section D.4.1).

Free ridership scores were not disaggregated by jurisdiction as there were insufficient responses for the Missouri Metro jurisdiction for the scores in this jurisdiction to be statistically significant. Table D-15 show the free ridership and spillover for the different measures in the Online Marketplace.

*Table D-15: Free Ridership, Spillover, Online Marketplace*

| Measure | Spillover | Free Ridership | Net-To-Gross Ratio |
|---|---|---|---|
| LED-Standard | 5.50% | 14.01% | 91.5% |
| LED-Specialty | 5.50% | 15.76% | 89.7% |

### D.4.4 Giveaway Hub

For the Giveaway Hub channel, ADM verified that participants fell into low-income zip codes and applied a NTGR of 100 percent. Table D-16 show the free ridership and spillover for the different measures in the Giveaway Hub.

*Table D-16: Free Ridership, Spillover, Giveaway Hub*

| Measure | Spillover | Free Ridership | Net-To-Gross Ratio |
|---|---|---|---|
| LED-Standard | 0.00% | 0.00% | 100.0% |
| LED-Specialty | 0.00% | 0.00% | 100.0% |

## D.5 Bulb Type Characteristics and Savings

Table D-17 provides characteristics such as wattage and lumens for the bulb types present in each program channel. Bulb types are broken out by the same lumen ranges utilized in the Evergy TRM.

In addition, Table D-18 provides energy savings and Table D-19 provides demand reductions by bulb type and lumen range for each program channel.

*Table D-17: Bulb Type Characteristics*

| Channel | Lamp Type | Minimum Lumens | Maximum Lumens | Package Quantity | Bulb Quantity | Average ENERGY STAR Wattage | Average ENERGY STAR Lumens | Average Baseline Wattage |
|---|---|---|---|---|---|---|---|---|
| Rebate | 3-Way | 1,050 | 1,489 | 1,288 | 1,288 | 13.0 | 1,337 | 53.0 |
| Rebate | 3-Way | 1,490 | 2,600 | 5,281 | 6,164 | 15.5 | 1,593 | 72.0 |
| Rebate | A-line | 310 | 749 | 30,245 | 109,418 | 5.5 | 469 | 29.0 |
| Rebate | A-line | 750 | 1,049 | 117,859 | 469,585 | 8.8 | 805 | 43.0 |
| Rebate | A-line | 1,050 | 1,489 | 18,562 | 63,489 | 11.2 | 1,113 | 53.0 |
| Rebate | A-line | 1,490 | 2,600 | 30,944 | 94,129 | 14.5 | 1,614 | 72.0 |
| Rebate | A-line | 2,601 | 3,300 | 2,048 | 2,048 | 24.8 | 2,610 | 150.0 |
| Rebate | BR | 525 | 714 | 29,642 | 128,340 | 8.7 | 669 | 65.0 |
| Rebate | BR | 715 | 937 | 4,126 | 23,348 | 12.1 | 861 | 65.0 |
| Rebate | BR | 938 | 1,259 | 3,026 | 6,043 | 12.6 | 1,003 | 65.0 |
| Rebate | BR | 1,260 | 1,399 | 2,447 | 4,894 | 15.0 | 1,227 | 65.0 |
| Rebate | BR | 1,400 | 1,739 | 222 | 780 | 14.0 | 1,426 | 65.0 |
| Rebate | BR | 2,175 | 2,624 | 10 | 10 | 20.0 | 2,175 | 150.0 |
| Rebate | Candle/Flame Tip | 90 | 149 | 32 | 128 | 1.5 | 125 | 15.0 |
| Rebate | Candle/Flame Tip | 150 | 299 | 2,195 | 7,155 | 2.6 | 200 | 25.0 |
| Rebate | Candle/Flame Tip | 300 | 499 | 11,167 | 36,784 | 3.9 | 332 | 40.0 |
| Rebate | Candle/Flame Tip | 300 | 749 | 2,694 | 8,009 | 4.4 | 390 | 40.0 |
| Rebate | Candle/Flame Tip | 500 | 1,049 | 4,462 | 14,971 | 5.3 | 500 | 60.0 |
| Rebate | Candle/Flame Tip | 750 | 1,049 | 1,440 | 5,760 | 8.0 | 800 | 43.0 |
| Rebate | Globe | 250 | 349 | 3,235 | 9,485 | 2.9 | 260 | 25.0 |
| Rebate | Globe | 300 | 499 | 75 | 225 | 4.6 | 300 | 40.0 |
| Rebate | Globe | 350 | 499 | 2,098 | 5,379 | 4.8 | 352 | 40.0 |
| Rebate | Globe | 350 | 749 | 30,690 | 83,565 | 4.6 | 421 | 40.0 |
| Rebate | Globe | 500 | 1,049 | 2,366 | 6,581 | 6.1 | 500 | 60.0 |
| Rebate | MR16 | 0 | 399 | 184 | 500 | 4.8 | 354 | 28.4 |
| Rebate | MR16 | - | - | 106 | 318 | 6.0 | 500 | 54.0 |
| Rebate | Other Decorative | 90 | 149 | 428 | 1,712 | 1.5 | 125 | 15.0 |
| Rebate | Other Decorative | 150 | 299 | 845 | 3,375 | 3.0 | 204 | 25.0 |
| Rebate | Other Decorative | 300 | 499 | 3,600 | 12,239 | 4.1 | 312 | 40.0 |
| Rebate | Other Decorative | 300 | 749 | 1,257 | 4,992 | 4.7 | 388 | 40.0 |
| Rebate | Other Decorative | 310 | 749 | 366 | 723 | 5.2 | 467 | 29.0 |
| Rebate | Other Decorative | 500 | 1,049 | 9,153 | 28,766 | 5.6 | 500 | 60.0 |
| Rebate | Other Decorative | 750 | 1,049 | 4,686 | 4,686 | 9.0 | 800 | 43.0 |
| Rebate | PAR | - | - | 14,163 | 26,310 | 11.9 | 1,048 | 54.0 |

| Channel | Lamp Type | Minimum Lumens | Maximum Lumens | Package Quantity | Bulb Quantity | Average ENERGY STAR Wattage | Average ENERGY STAR Lumens | Average Baseline Wattage |
|---|---|---|---|---|---|---|---|---|
| Rebate | R | 0 | 399 | 196 | 392 | 4.0 | 302 | 30.0 |
| Rebate | R | 400 | 472 | 1,383 | 3,544 | 6.7 | 473 | 45.0 |
| Rebate | R | 473 | 524 | 174 | 348 | 6.5 | 500 | 45.0 |
| Rebate | R | 525 | 714 | 1,995 | 5,633 | 7.2 | 570 | 45.0 |
| Rebate | R | 715 | 937 | 10 | 10 | 13.5 | 900 | 65.0 |
| Rebate | R | 938 | 1,259 | 1,380 | 4,128 | 11.2 | 959 | 74.9 |
| Rebate | R | - | - | 167 | 334 | 15.0 | 1,200 | 54.0 |
| Thank You Kits | A-line | 750 | 1,049 | 17,290 | 77,810 | 8.4 | 810 | 43.0 |
| Thank You Kits | BR | 525 | 714 | 14,539 | 61,080 | 8.5 | 680 | 65.0 |
| Thank You Kits | Candle/Flame Tip | 300 | 499 | 13,077 | 52,308 | 4.0 | 330 | 40.0 |
| Thank You Kits | Globe | 350 | 749 | 795 | 4,770 | 4.0 | 350 | 40.0 |
| Giveaway Hub | A-line | 750 | 1,049 | 11,667 | 70,002 | 9.0 | 800 | 43.0 |
| Marketplace | A-line | 1,490 | 2,600 | 39 | 249 | 13.0 | 1,600 | 72.0 |
| Marketplace | A-line | 1,050 | 1,489 | 10 | 64 | 11.0 | 1,100 | 53.0 |
| Marketplace | A-line | 750 | 1,049 | 552 | 4,179 | 9.0 | 800 | 43.0 |
| Marketplace | A-line | 310 | 749 | 24 | 145 | 5.7 | 471 | 29.0 |
| Marketplace | 3-Way | 1,100 | 1,599 | 25 | 75 | 12.0 | 1,500 | 75.0 |
| Marketplace | 3-Way | 2,000 | 2,549 | 22 | 67 | 19.0 | 2,150 | 125.0 |
| Marketplace | Globe | 350 | 749 | 124 | 783 | 6.0 | 448 | 40.0 |
| Marketplace | Other Decorative | 300 | 499 | 136 | 875 | 4.3 | 332 | 40.0 |
| Marketplace | R | 473 | 524 | 1 | 4 | 7.0 | 500 | 45.0 |
| Marketplace | R | 525 | 714 | 88 | 683 | 8.0 | 650 | 65.0 |
| Marketplace | R | 715 | 937 | 179 | 1,453 | 11.0 | 851 | 65.0 |
| Marketplace | PAR | 938 | 1,259 | 10 | 36 | 15.0 | 1,250 | 54.0 |

*Table D-18: Energy Savings by Bulb Type*

| Channel | Lamp Type | Minimum Lumens | Maximum Lumens | Reported Energy Savings (kWh) | Gross Verified Energy Savings (kWh) | Net Energy Savings (kWh) | RR (kWh) | NTG (kWh) |
|---|---|---|---|---|---|---|---|---|
| Rebate | 3-Way | 1,050 | 1,489 | 57,575 | 45,954 | 25,443 | 80% | 55% |
| Rebate | 3-Way | 1,490 | 2,600 | 275,537 | 312,265 | 173,475 | 113% | 56% |
| Rebate | A-line | 310 | 749 | 3,955,394 | 2,879,252 | 1,635,530 | 73% | 57% |
| Rebate | A-line | 750 | 1,049 | 16,983,176 | 17,857,254 | 9,919,007 | 105% | 56% |
| Rebate | A-line | 1,050 | 1,489 | 2,295,385 | 2,985,907 | 1,808,403 | 130% | 61% |
| Rebate | A-line | 1,490 | 2,600 | 3,404,028 | 5,986,607 | 3,443,694 | 176% | 58% |
| Rebate | A-line | 2,601 | 3,300 | 74,052 | 287,517 | 156,221 | 388% | 54% |
| Rebate | BR | 525 | 714 | 5,736,926 | 6,427,186 | 3,795,231 | 112% | 59% |
| Rebate | BR | 715 | 937 | 1,043,679 | 1,070,447 | 562,890 | 103% | 53% |
| Rebate | BR | 938 | 1,259 | 270,128 | 277,787 | 152,342 | 103% | 55% |
| Rebate | BR | 1,260 | 1,399 | 218,767 | 212,909 | 116,429 | 97% | 55% |
| Rebate | BR | 1,400 | 1,739 | 34,867 | 36,048 | 20,125 | 103% | 56% |
| Rebate | BR | 2,175 | 2,624 | 447 | 1,232 | 702 | 276% | 57% |
| Rebate | Candle/Flame Tip | 90 | 149 | 5,722 | 1,608 | 909 | 28% | 57% |
| Rebate | Candle/Flame Tip | 150 | 299 | 319,836 | 141,333 | 77,729 | 44% | 55% |
| Rebate | Candle/Flame Tip | 300 | 499 | 1,644,282 | 1,156,549 | 753,489 | 70% | 65% |
| Rebate | Candle/Flame Tip | 300 | 749 | 358,010 | 256,997 | 142,972 | 72% | 56% |
| Rebate | Candle/Flame Tip | 500 | 1,049 | 669,219 | 734,144 | 429,020 | 110% | 58% |
| Rebate | Candle/Flame Tip | 750 | 1,049 | 257,478 | 162,979 | 162,979 | 63% | 100% |
| Rebate | Globe | 250 | 349 | 423,989 | 190,623 | 106,472 | 45% | 56% |
| Rebate | Globe | 300 | 499 | 10,058 | 7,549 | 4,303 | 75% | 57% |
| Rebate | Globe | 350 | 499 | 240,447 | 166,698 | 91,751 | 69% | 55% |
| Rebate | Globe | 350 | 749 | 3,735,439 | 2,628,758 | 1,546,484 | 70% | 59% |
| Rebate | Globe | 500 | 1,049 | 294,177 | 308,960 | 168,923 | 105% | 55% |
| Rebate | MR16 | 0 | 399 | 22,351 | 10,503 | 5,855 | 47% | 56% |
| Rebate | MR16 | - | - | 14,215 | 14,266 | 8,079 | 100% | 57% |
| Rebate | Other Decorative | 90 | 149 | 76,528 | 20,965 | 11,704 | 27% | 56% |
| Rebate | Other Decorative | 150 | 299 | 150,866 | 67,502 | 37,687 | 45% | 56% |
| Rebate | Other Decorative | 300 | 499 | 547,096 | 388,761 | 214,577 | 71% | 55% |
| Rebate | Other Decorative | 300 | 749 | 223,147 | 161,662 | 90,774 | 72% | 56% |
| Rebate | Other Decorative | 310 | 749 | 32,319 | 15,369 | 8,511 | 48% | 55% |
| Rebate | Other Decorative | 500 | 1,049 | 1,285,869 | 1,363,079 | 745,515 | 106% | 55% |

| Channel | Lamp Type | Minimum Lumens | Maximum Lumens | Reported Energy Savings (kWh) | Gross Verified Energy Savings (kWh) | Net Energy Savings (kWh) | RR (kWh) | NTG (kWh) |
|---|---|---|---|---|---|---|---|---|
| Rebate | Other Decorative | 750 | 1,049 | 209,469 | 142,633 | 142,633 | 68% | 100% |
| Rebate | PAR | - | - | 1,176,083 | 978,116 | 539,632 | 83% | 55% |
| Rebate | R | 0 | 399 | 17,523 | 9,421 | 5,307 | 54% | 56% |
| Rebate | R | 400 | 472 | 158,420 | 120,107 | 66,191 | 76% | 55% |
| Rebate | R | 473 | 524 | 15,556 | 12,537 | 7,104 | 81% | 57% |
| Rebate | R | 525 | 714 | 251,801 | 186,139 | 101,959 | 74% | 55% |
| Rebate | R | 715 | 937 | 447 | 431 | 231 | 96% | 54% |
| Rebate | R | 938 | 1,259 | 184,526 | 228,826 | 124,966 | 124% | 55% |
| Rebate | R | - | - | 14,930 | 11,770 | 6,558 | 79% | 56% |
| Thank You Kits | A-line | 750 | 1,049 | 2,811,504 | 1,842,014 | 711,938 | 66% | 39% |
| Thank You Kits | BR | 525 | 714 | 2,730,337 | 620,317 | 338,197 | 23% | 55% |
| Thank You Kits | Candle/Flame Tip | 300 | 499 | 2,338,220 | 408,196 | 276,594 | 17% | 68% |
| Thank You Kits | Globe | 350 | 749 | 213,224 | 39,003 | 26,429 | 18% | 68% |
| Giveaway Hub | A-line | 750 | 1,049 | 1,271,429 | 1,868,239 | 1,868,239 | 147% | 100% |
| Marketplace | A-line | 1,490 | 2,600 | 9,070 | 6,982 | 6,388 | 77% | 91% |
| Marketplace | A-line | 1,050 | 1,489 | 2,331 | 1,278 | 1,170 | 55% | 91% |
| Marketplace | A-line | 750 | 1,049 | 152,231 | 67,653 | 61,896 | 44% | 91% |
| Marketplace | A-line | 310 | 749 | 5,282 | 1,606 | 1,469 | 30% | 91% |
| Marketplace | 3-Way | 1,100 | 1,599 | 2,732 | 2,361 | 2,118 | 86% | 90% |
| Marketplace | 3-Way | 2,000 | 2,549 | 2,441 | 3,548 | 3,184 | 145% | 90% |
| Marketplace | Globe | 350 | 749 | 28,523 | 13,309 | 11,944 | 47% | 90% |
| Marketplace | Other Decorative | 300 | 499 | 31,874 | 16,033 | 14,388 | 50% | 90% |
| Marketplace | R | 473 | 524 | 146 | 76 | 68 | 52% | 90% |
| Marketplace | R | 525 | 714 | 24,880 | 19,449 | 17,454 | 78% | 90% |
| Marketplace | R | 715 | 937 | 52,929 | 39,598 | 35,536 | 75% | 90% |
| Marketplace | PAR | 938 | 1,259 | 1,311 | 701 | 629 | 53% | 90% |

*Table D-19: Demand Reduction by Bulb Type, Rebate, and Thank You Kits*

| Channel | Lamp Type | Minimum Lumens | Maximum Lumens | Reported Demand Reduction (kW) | Gross Verified Demand Reduction (kW) | Net Demand Reduction (kW) | RR (kW) | NTGR |
|---|---|---|---|---|---|---|---|---|
| Rebate | 3-Way | 1,050 | 1,489 | 7.99 | 6.72 | 3.72 | 84% | 55% |
| Rebate | 3-Way | 1,490 | 2,600 | 38.22 | 45.71 | 25.40 | 120% | 56% |
| Rebate | A-line | 310 | 749 | 482.54 | 354.51 | 201.51 | 73% | 57% |
| Rebate | A-line | 750 | 1,049 | 2,073.48 | 2,195.30 | 1,220.42 | 106% | 56% |
| Rebate | A-line | 1,050 | 1,489 | 280.09 | 367.55 | 222.63 | 131% | 61% |
| Rebate | A-line | 1,490 | 2,600 | 415.54 | 735.82 | 423.51 | 177% | 58% |
| Rebate | A-line | 2,601 | 3,300 | 9.04 | 35.44 | 19.27 | 392% | 54% |
| Rebate | BR | 525 | 714 | 795.71 | 939.85 | 555.13 | 118% | 59% |
| Rebate | BR | 715 | 937 | 144.76 | 154.69 | 81.35 | 107% | 53% |
| Rebate | BR | 938 | 1,259 | 37.47 | 40.54 | 22.24 | 108% | 55% |
| Rebate | BR | 1,260 | 1,399 | 30.34 | 31.05 | 16.99 | 102% | 55% |
| Rebate | BR | 1,400 | 1,739 | 4.84 | 5.28 | 2.95 | 109% | 56% |
| Rebate | BR | 2,175 | 2,624 | 0.06 | 0.18 | 0.10 | 293% | 57% |
| Rebate | Candle/Flame Tip | 90 | 149 | 0.79 | 0.24 | 0.13 | 30% | 57% |
| Rebate | Candle/Flame Tip | 150 | 299 | 44.36 | 20.64 | 11.36 | 47% | 55% |
| Rebate | Candle/Flame Tip | 300 | 499 | 228.06 | 168.62 | 109.93 | 74% | 65% |
| Rebate | Candle/Flame Tip | 300 | 749 | 49.66 | 37.63 | 20.94 | 76% | 56% |
| Rebate | Candle/Flame Tip | 500 | 1,049 | 92.82 | 107.47 | 62.82 | 116% | 58% |
| Rebate | Candle/Flame Tip | 750 | 1,049 | 35.71 | 23.54 | 23.54 | 66% | 100% |
| Rebate | Globe | 250 | 349 | 58.81 | 27.94 | 15.61 | 48% | 56% |
| Rebate | Globe | 300 | 499 | 1.40 | 1.11 | 0.63 | 80% | 57% |
| Rebate | Globe | 350 | 499 | 33.35 | 24.35 | 13.41 | 73% | 55% |
| Rebate | Globe | 350 | 749 | 518.10 | 384.19 | 226.06 | 74% | 59% |
| Rebate | Globe | 500 | 1,049 | 40.80 | 45.06 | 24.64 | 110% | 55% |
| Rebate | MR16 | 0 | 399 | 3.10 | 1.54 | 0.86 | 50% | 56% |
| Rebate | MR16 | - | - | 1.97 | 2.10 | 1.19 | 106% | 57% |
| Rebate | Other Decorative | 90 | 149 | 10.61 | 3.07 | 1.72 | 29% | 56% |
| Rebate | Other Decorative | 150 | 299 | 20.93 | 9.89 | 5.53 | 47% | 56% |
| Rebate | Other Decorative | 300 | 499 | 75.88 | 56.82 | 31.38 | 75% | 55% |
| Rebate | Other Decorative | 300 | 749 | 30.95 | 23.73 | 13.33 | 77% | 56% |
| Rebate | Other Decorative | 310 | 749 | 4.48 | 2.25 | 1.25 | 50% | 55% |
| Rebate | Other Decorative | 500 | 1,049 | 178.35 | 198.80 | 108.78 | 111% | 55% |

| Channel | Lamp Type | Minimum Lumens | Maximum Lumens | Reported Demand Reduction (kW) | Gross Verified Demand Reduction (kW) | Net Demand Reduction (kW) | RR (kW) | NTGR |
|---|---|---|---|---|---|---|---|---|
| Rebate | Other Decorative | 750 | 1,049 | 29.05 | 20.87 | 20.87 | 72% | 100% |
| Rebate | PAR | - | - | 163.12 | 142.85 | 78.84 | 88% | 55% |
| Rebate | R | 0 | 399 | 2.43 | 1.38 | 0.78 | 57% | 56% |
| Rebate | R | 400 | 472 | 21.97 | 17.55 | 9.67 | 80% | 55% |
| Rebate | R | 473 | 524 | 2.16 | 1.84 | 1.05 | 85% | 57% |
| Rebate | R | 525 | 714 | 34.92 | 27.16 | 14.88 | 78% | 55% |
| Rebate | R | 715 | 937 | 0.06 | 0.06 | 0.03 | 101% | 54% |
| Rebate | R | 938 | 1,259 | 25.59 | 33.36 | 18.23 | 130% | 55% |
| Rebate | R | - | - | 2.07 | 1.72 | 0.96 | 83% | 56% |
| Thank You Kits | A-line | 750 | 1,049 | 342.73 | 227.05 | 87.75 | 66% | 39% |
| Thank You Kits | BR | 525 | 714 | 378.70 | 90.83 | 49.52 | 24% | 55% |
| Thank You Kits | Candle/Flame Tip | 300 | 499 | 324.31 | 59.73 | 40.47 | 18% | 68% |
| Thank You Kits | Globe | 350 | 749 | 29.57 | 5.73 | 3.88 | 19% | 68% |
| Giveaway Hub | A-line | 750 | 1,049 | 157.06 | 228.49 | 228.49 | 145% | 100% |
| Marketplace | A-line | 1,490 | 2,600 | 1.12 | 0.86 | 0.79 | 77% | 91% |
| Marketplace | A-line | 1,050 | 1,489 | 0.29 | 0.16 | 0.14 | 55% | 91% |
| Marketplace | A-line | 750 | 1,049 | 18.81 | 8.27 | 7.57 | 44% | 91% |
| Marketplace | A-line | 310 | 749 | 0.65 | 0.20 | 0.18 | 30% | 91% |
| Marketplace | 3-Way | 1,100 | 1,599 | 0.34 | 0.33 | 0.29 | 97% | 90% |
| Marketplace | 3-Way | 2,000 | 2,549 | 0.30 | 0.49 | 0.44 | 162% | 90% |
| Marketplace | Globe | 350 | 749 | 3.52 | 1.84 | 1.65 | 52% | 90% |
| Marketplace | Other Decorative | 300 | 499 | 3.94 | 2.21 | 1.99 | 56% | 90% |
| Marketplace | R | 473 | 524 | 0.02 | 0.01 | 0.01 | 59% | 90% |
| Marketplace | R | 525 | 714 | 3.07 | 2.67 | 2.40 | 87% | 90% |
| Marketplace | R | 715 | 937 | 6.54 | 5.45 | 4.89 | 83% | 90% |
| Marketplace | PAR | 938 | 1,259 | 0.16 | 0.10 | 0.09 | 60% | 90% |

## D.6 Impact Evaluation – Final Savings Tables

Based on the impact evaluation results, the total verified gross energy savings for the ESP Program are 52,821,956 kWh, and the total verified gross peak demand savings are 6,932.85 kW. The tables below summarize the verified gross energy and demand savings for the ESP Program by jurisdiction and channel.

*Table D-20: Program Gross Energy Savings (kWh)*

| Jurisdiction | Channel | Reported Energy Savings (kWh) | Gross Verified Energy Savings (kWh) | RR (kWh) |
|---|---|---|---|---|
| MO West | Rebate | 24,953,403 | 26,341,776 | 106% |
| MO Metro | Rebate | 21,736,358 | 21,526,871 | 99% |
| MO West | Thank You Kits | 5,272,271 | 1,997,838 | 38% |
| MO Metro | Thank You Kits | 2,821,014 | 911,693 | 32% |
| MO West | Giveaway Hub | 511,843 | 752,452 | 147% |
| MO Metro | Giveaway Hub | 759,586 | 1,115,787 | 147% |
| MO West | Marketplace | 190,188 | 106,407 | 56% |
| MO Metro | Marketplace | 127,861 | 69,131 | 54% |
| **Total** | | **56,372,523** | **52,821,956** | **94%** |

*Table D-21: Program Gross Demand Savings (kW)*

| Jurisdiction | Channel | Reported Demand Reduction (kW) | Gross Verified Demand Reduction (kW) | RR (kW) |
|---|---|---|---|---|
| MO West | Rebate | 3,214.46 | 3,494.54 | 109% |
| MO Metro | Rebate | 2,817.14 | 2,803.90 | 100% |
| MO West | Thank You Kits | 698.87 | 264.64 | 38% |
| MO Metro | Thank You Kits | 376.45 | 118.70 | 32% |
| MO West | Giveaway Hub | 63.23 | 92.03 | 146% |
| MO Metro | Giveaway Hub | 93.83 | 136.46 | 145% |
| MO West | Marketplace | 23.49 | 13.69 | 58% |
| MO Metro | Marketplace | 15.80 | 8.90 | 56% |
| **Total** | | **7,303.26** | **6,932.85** | **95%** |

For Upstream Rebates, the realization rate differed from 100 percent due to differences between assumptions used to model bulb savings and the actual bulb characteristics found in the analysis. The reported savings were based on the Evergy TRM, which uses 2019 program averages to estimate the savings from standard and specialty bulbs. In 2022, the difference between actual and baseline bulb wattage in the program tracking data was higher for Standard LEDs and lower for Specialty LEDs than planning assumptions. In addition, the average hours of use were slightly higher for Standard LEDs and slightly lower for Specialty LEDs than what is assumed by the Evergy TRM. These were largely due to the differences between the actual and assumed installation locations. Installation rates calculated from the 2022 program survey were also slightly lower than the Evergy TRM.

For the Thank You Kit channel, ISRs were much lower than assumptions in the Evergy TRM used to calculate reported energy savings. The reported energy savings assumed ISRs in line with upstream rebates, however, the ISRs calculated from the Thank You Kit survey were substantially lower.

For the Giveaway Hub channel, the expected savings did not account for package size and assumed only one bulb per package. Because each package came with 6 light bulbs, this would cause realization rates to be 600 percent. However, there were two other adjustments that served to reduce realization rates. First, the expected savings applied savings values for one shipping and one tax line item for each kit. Second, the expected savings assumed an ISR of 94 percent, while ADM applied an ISR of 68 percent. The realization rate is greater than 100 percent after these adjustments were made.

For the Online Marketplace channel, the applied ISR was much lower than the Evergy TRM value which resulted in a realization rate less than 100 percent. In addition, holiday LED string lights used Evergy TRM savings for standard LED bulbs, while ADM used Evergy TRM savings for holiday LED string lights.

*Table D-22: Verified Gross and Net Annual Energy Savings (kWh)*

| Jurisdiction | Channel | Gross Verified Energy Savings (kWh) | Net Energy Savings (kWh) | NTG (kWh) |
|---|---|---|---|---|
| MO West | Rebate | 26,341,776 | 15,934,207 | 60% |
| MO Metro | Rebate | 21,526,871 | 11,477,598 | 53% |
| MO West | Thank You Kits | 1,997,838 | 927,950 | 46% |
| MO Metro | Thank You Kits | 911,693 | 425,208 | 47% |
| MO West | Giveaway Hub | 752,452 | 752,452 | 100% |
| MO Metro | Giveaway Hub | 1,115,787 | 1,115,787 | 100% |
| MO West | Marketplace | 106,407 | 96,290 | 90% |
| MO Metro | Marketplace | 69,131 | 62,595 | 91% |
| **Total** | | **52,821,956** | **30,792,086** | **58%** |

*Table D-23: Verified Gross and Net Annual Energy Savings (kW)*

| Jurisdiction | Channel | Gross Verified Demand Reduction (kW) | Net Demand Reduction (kW) | NTG (kW) |
|---|---|---|---|---|
| MO West | Rebate | 3,494.54 | 2,112.97 | 60% |
| MO Metro | Rebate | 2,803.90 | 1,500.67 | 54% |
| MO West | Thank You Kits | 264.64 | 125.23 | 47% |
| MO Metro | Thank You Kits | 118.70 | 56.40 | 48% |
| MO West | Giveaway Hub | 92.03 | 92.03 | 100% |
| MO Metro | Giveaway Hub | 136.46 | 136.46 | 100% |
| MO West | Marketplace | 13.69 | 12.39 | 91% |
| MO Metro | Marketplace | 8.90 | 8.06 | 91% |
| **Totals** | | **6,932.85** | **4,044.21** | **58%** |

## D.7 Process Evaluation

### D.7.1 Program Operations

ADM conducted in-depth interviews with Evergy's energy-efficiency products and services portfolio manager, Evergy's DSM portfolio manager, ICF's director of programs, and ICF's program manager for the Energy Saving Products (ESP) Program. The purpose of the in-depth interviews was to better understand ESP's program design, operations, challenges, and future opportunities.

#### *Roles and Responsibilities*

Evergy program staff provide overall management and guidance to its implementer, ICF. In April 2022, the current Evergy program manager left the company, and program management responsibilities shifted back to a senior Evergy employee and former ESP program manager. A new Evergy project manager will take over program management in January 2023.

The program implementation staff from ICF remained the same.

#### *Program Design*

This program promotes energy-efficient products through multiple channels to Evergy's residential customers. Since 2016, the focus has been on promoting energy efficient lighting products through participating retailers.

**Changes in Program Design:** In 2022, Evergy contracted with Uplight to offer two online marketplaces that sell energy efficient products across various product categories. The Online Marketplace sells products in the following categories:

- Lighting- LED lighting and specialty bulbs (e.g., Filament Candelabra LEDs, LEDs, and related lighting products)
- Smart Home- Home Security devices, including cameras, doorbells, and hubs
- Water Fixtures- faucet aerators and showerheads
- Power Strips in multiple configurations

In August, Evergy launched the Online Income-Eligible Giveaway Hub, which provides free lighting products to income-eligible residential customers. Uplight also manages this online program.

### *Program Performance*

**Retail Sales:** ESP's Retail segment remained relatively strong in PY3. The program manager indicated a slight drop in the number of active participating retailers, totaling 100 which was slightly lower compared to 125 retailers previously. Several underperforming retailers were dropped from the program, and several other retailers closed their businesses. A few smaller hardware stores also declined to participate in 2022.

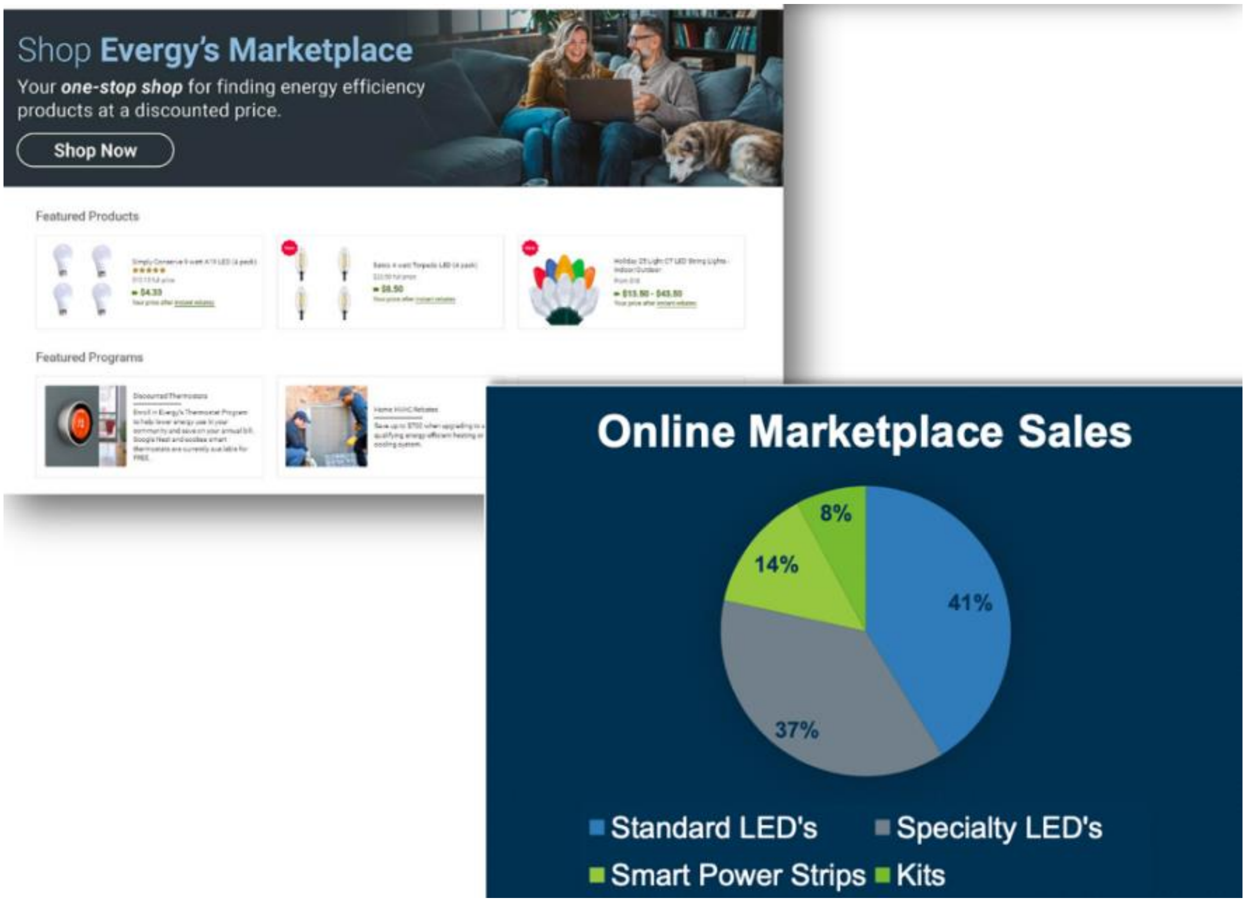
The Retail portion focuses exclusively on promoting LED lighting products and is viewed as Evergy's final push to promote energy-efficient lighting before this measure is removed from future program plans.

> *"We want to just maximize lighting savings," (Program Staff).*
>
> *"ICF has been running the program since 2016 and there haven't been a lot of changes within the store managers and personnel are well aware of the program, and we have had a solid field staff who have worked with this program in 2016 and the staff knows how to talk to and train up new retail staff." (Program Staff)*

**Online Marketplace:** Evergy promoted LEDs in 2022 through its online marketplace in 2022 (see Figure D-2). The marketplace also expanded its product scope to include energy efficiency products from its Energy Savings Kit program.

The Evergy staff broadened LED offers to include decorative LEDs for fixtures and filament LEDs (specialty bulbs). In November, the Online Market promoted a Black Friday sale and started selling decorative LED holiday lights.

*Figure D-2: Evergy's Online Marketplace*



Shop Evergy's Marketplace

Your *one-stop shop* for finding energy efficiency products at a discounted price.

Evergy program staff reported that product sales on the online platform have been less than anticipated, primarily due to Uplight's policy to charge for shipping costs for purchases less than $49.00.

> *"Customers are accustomed to not paying shipping costs and that has been a huge barrier…Uplight's policies doesn't allow the utility to offset the shipping costs." (Program Staff)*

As Evergy staff noted, most online purchases fall below the $49.00 minimum threshold, as customers are not making bulk purchases.

Adding a smart thermostat would increase the dollar amount of online purchases, however smart thermostats are currently not offered through Uplight's program.

**Giveaway Hub:** Evergy also targeted previous HVAC program participants to give-away 6 packs of LEDs, specifically targeting renters or homeowners with large homes and thus a large number of sockets for LED applications. This outreach was highly effective with Evergy reporting that 9,000 households received over 70,000 LEDs.

> *"We've had more participation for Giveaway hub and less participation for the Online Market."*

### *Program Participation and Marketing*

Evergy promotes the Online Market through a variety of methods, including emails, postcards, flyers, Facebook Posts, and online marketing.

Evergy staff explained that the program received an increased budget due to reallocation from under-performing programs.

### *Effects of the Pandemic*

Evergy staff reported that there have been some “lingering effects” of the program pandemic due to a combination of COVID issues and supply chain constraints from China.

> *“We’ve seen some shipping issues earlier in the Spring with supply constraints from China. Manufacturers were switched to a different model and that would cause delays and confusion at the store level.” (Program Staff)*

The lighting market also faced other challenges including the EISA backstop ruling, which effectively ended most LED promotions.

> *“We have a lot of model number changes and there has been difficulty (for retailers) in knowing what they have in stock.” (Program Staff)*

### *Communication*

Both the utility and implementation staff reported that communication regarding the retailer platform continues to be excellent. The implementer holds weekly meetings and provides timely updates on retailer activities.

Futhermore, the implementation contractor also shares updates with the representatives from national retailers. However, a few retailers are shifting resources away from the residential lighting program given the shift in the overall market, so communications with some retailers have “gone dark” in the past few months.

### *Data Tracking*

The data tracking and QA/QC systems are working well for the retailer program. However, the utility staff reported some challenges with Uplight’s current tracking system as there have been delays in providing data in a timely manner.

> *“We have continued frustration…with getting data from the Giveaway Hub,” (Program Staff)*

### *Quality Assurances and Controls (QA/QC)*

ICF continues to provide detailed reports regarding light bulb sales and ensures that each incented bulb is discounted at the agreed-upon price.

> *"We check everything and at a big store that could be 70 different SKUs. We are checking prices and POP…Our sales invoice has to match the invoice from the MOU…across the board." (Program Staff)*

Uplight verifies the zip codes for eligibility for customers using both online marketplaces.

### *Challenges for the Program*

The program staff also identified several ongoing challenges as the ESP Program during the past year. These challenges include:

- Decreased demand for LED bulbs. The implementation staff indicated that while the program is still meeting its goals, there has been a steady decline in LED demand.

> *"The store traffic has been down, which is an inflation-driven issue. People aren't in the stores as much." (Program Staff)*

The program staff also believe that LEDs may have reached its saturation point in the Evergy's service territory with a decrease in sales from traditional retailers and a shift to more sales among thrift stores.

- The shipping charge has negatively impact online sales. Uplight's current policy of requiring a $49.00 minimum charge has reduced online sales overall.

### *Future Plans*

Evergy will continue to promote its non-lighting measures, including water saving measures and smart power strips, on its online marketplace. Evergy also included promotions of its holiday lights and special sales events during the holiday season (i.e., Black Friday and Cyber Monday).

## D.7.2 General Population Survey

The evaluation team gathered insights regarding the energy efficiency product purchases made by Evergy customers during 2022. The team created 15,000 individual survey links and sent them via an Evergy email blast. The first "wave" of the survey was sent on January 10, 2022, the second on January 19, 2023, and the third on February 2, 2023. Up to two email reminders were sent; the survey remained in the field until February 17, 2023. Survey participants who completed the questionnaire received an electronic gift card for providing their feedback (see Table D-24).

*Table D-24: Summary of Email Survey Response*

| Metric | Result |
|---|---|
| Initially Contacted | 15,000 |
| Completed | 749 |
| **Response rate** | **5%** |

### *Lighting Purchases*

The general population survey asked respondents about a variety of energy efficient products, including light bulbs, as it was also used to estimate spillover for the Heating, Cooling, and Home Comfort program. Seventy-five percent of respondents purchased ENERGY STAR® LED lightbulbs, making it the most popular measure in PY3. Of the people who purchased the measure (n = 561), 91 percent purchased standard LED light bulbs, 44 percent purchased specialty LED light bulbs, and two percent stated they purchased other light measures such as smart light bulbs or floodlights, and one percent did not recall the type of light bulbs they purchased. Percentages exceeded 100 percent because respondents had the option of choosing more than one LED light bulb type.

Of the respondents who purchased standard or specialty LEDs, and knew the bulbs were discounted, 40 percent of LEDs purchasers (n = 88) and 45 percent of specialty LEDs purchasers (n =29) knew Evergy had provided the discounts (see Table D-25). Fifty-seven percent of people who bought standard LEDs (n = 35) stated the discount had been very important in their decision to buy the measures compared to 38 percent who bought specialty bulbs (n = 13).

*Table D-25: Discounted Lighting Measures*

| Discount Awareness | Any Discount | | Discounted by Evergy | |
|---|---|---|---|---|
| | Standard LEDs (n = 413) | Specialty LEDs (n = 211) | Standard LEDs (n = 88) | Specialty LEDs (n = 29) |
| Yes | 22% | 14% | 40% | 45% |
| No | 46% | 49% | 39% | 41% |
| Do not recall | 32% | 37% | 22% | 14% |

Of the participants who were aware of Evergy's sponsored rebates (n = 84), 25 percent first learned about the rebates through an Evergy newsletter, 19 percent through an instore display, 13 percent through the Evergy website, and 11 percent through bill inserts (Table D-26).

*Table D-26: Awareness of Evergy Lighting Discounts*

| Source | Percent of Respondents (n = 84) |
|---|---|
| Evergy newsletter | 25% |
| In-store display | 19% |
| Evergy website | 13% |
| Bill inserts | 11% |
| Message printed on your bill | 8% |
| Friend or relative (word-of-mouth) | 5% |
| Evergy representative | 2% |
| Social media (such as Facebook or Twitter) | 2% |
| Home Energy Report | 2% |
| Newspaper/magazine/print media | 1% |
| I wasn't aware that Evergy provided lighting discounts | 7% |
| Do not recall | 4% |
| Community Event, Salesperson, TV ad, or Other | 0% |

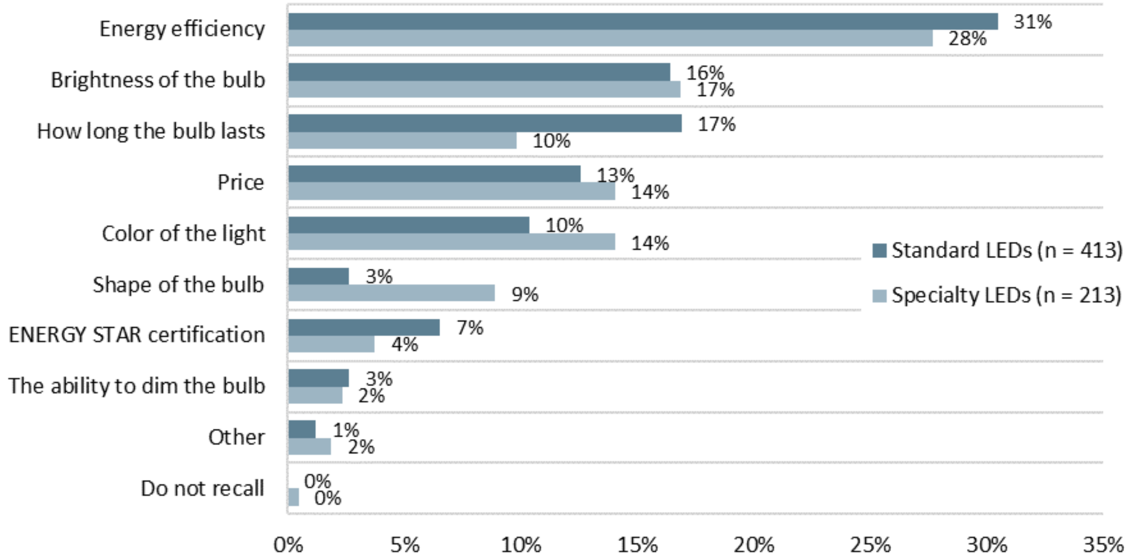
Most respondents purchased the new lighting measures to replace burned-out bulbs, old bulbs, to have spare bulbs on hand, or working bulbs for a different color or brightness. Table D-27 summarizes the reasons for both the standard and specialty bulbs. Participants also expressed the top five characteristics important to them when buying light bulbs. According to respondents, energy efficiency was the most important reason for buying the new bulbs (see Figure D-3).

*Table D-27: Reasons for LED Purchase*

| Reasons | Standard LEDs (n = 710) | Specialty LEDs (n = 244) |
|---|---|---|
| Replace burned-out bulbs | 42% | 36% |
| Replace old, inefficient bulbs | 26% | 24% |
| Replace working bulbs with a different color or brightness | 10% | 13% |
| Install new light fixture or lamp socket | 8% | 10% |
| To have spare bulbs on hand | 14% | 14% |
| Other | 1% | 1% |

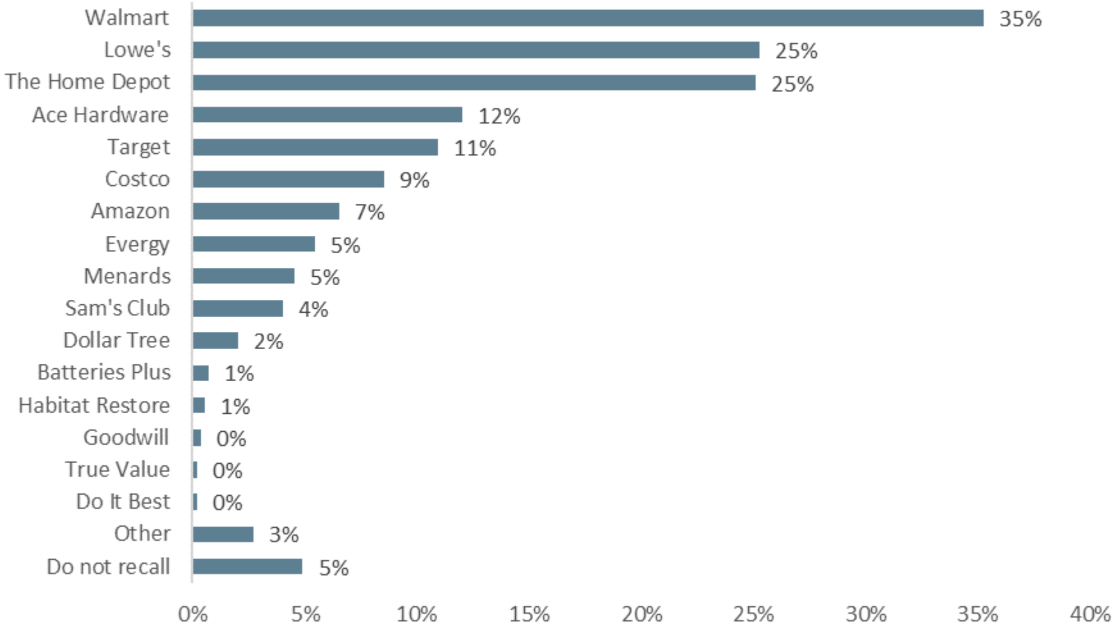
*Note: Percentages may exceed 100% due to respondents being able to select more than one response.*

*Figure D-3: Most Important Light Bulb Characteristics*



Many respondents purchased their LED light bulbs from various retailers. The top stores were Walmart (35 percent), Lowe's and The Home Depot (25 percent each), Ace Hardware (12 percent), and Target (11 percent) as noted in Figure D-4.

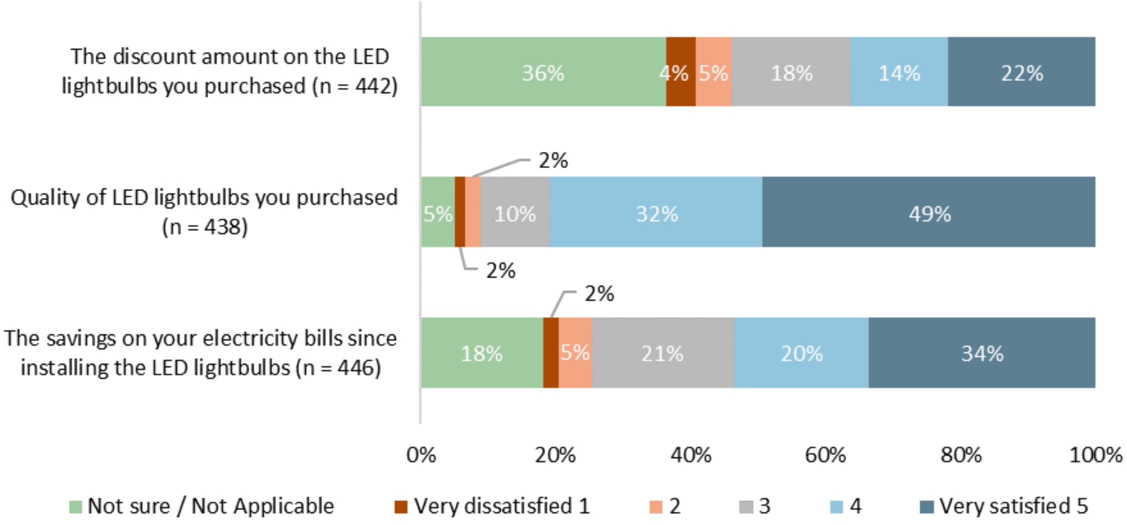
*Figure D-4: LED Purchases by Retailer (n = 550)*



*Note: Percentages may exceed 100% due to respondents being able to select more than one response.*

Participants who purchased the energy efficient light bulbs stated they were satisfied, rating their overall satisfaction a four or a five out of five. Similarly, fours and fives were given to specific components of satisfaction, including: the LED discount (36 percent), the quality of the LED measures (81 percent), and the savings on their electric bill (54 percent) (see Figure D-5 for more details).

*Figure D-5: Customer Satisfaction*



### *Demographics*

A large majority of respondents reported owning a single-family, detached home (see Table D-28). Sixty-six percent of homes were reported to be at least 1,000 to just under 3,000 square feet, and 69 percent of homes were built after 1959.

*Table D-28: Home Characteristics*

| Responses | Percent of Respondents |
|---|---|
| **Rent or Own** | **(n = 749)** |
| Own | 71% |
| Rent | 27% |
| Prefer not to answer | 2% |
| **Home Type** | **(n = 746)** |
| Single-family home | 77% |
| Apartment or condominium | 12% |
| Duplex or townhome | 9% |
| Manufactured or mobile home | 1% |
| Other | 1% |
| Not sure | <1% |
| Prefer not to answer | <1% |
| **Home Size (Square Feet)** | **(n = 748)** |
| Less than 1,000 square feet | 13% |
| 1,000-1,999 square feet | 44% |
| 2,000-2,999 square feet | 22% |
| 3,000-3,999 square feet | 9% |
| 4,000 square feet or great | 2% |
| Not sure | 9% |
| Prefer not to answer | 1% |
| **Year Home Was Built** | **(n = 749)** |
| Before 1960 | 22% |
| 1960 to 1979 | 20% |
| 1980 to 1999 | 21% |
| 2000 to 2019 | 23% |
| 2019 or newer | 5% |
| Not sure | 9% |
| Prefer not to answer | <1% |

## D.8 Conclusions and Recommendations

ADM performed a process evaluation that assessed program documentation and primary data collected from program stakeholders. The evaluation included interviews with program staff, a general population survey, a review of program documentation, and an analysis of program tracking data.

The following section summarizes the key findings from the process evaluation activities for the Energy Saving Products program for PY3:

- In 2022, Evergy contracted with Uplight to offer two online marketplaces that sell energy efficient products across various product categories. In August 2022, Evergy launched the Online Income-Eligible Giveaway Hub, which provides free lighting products to income-eligible residential customers.
- Evergy promotes the online marketplaces through a variety of methods, including emails, postcards, flyers, Facebook Posts, and online marketing. The ESP Program is cross promoted through email and paper copy with other programs such as the Heating, Cooling, Home Comfort Program, and Home Energy Reports.
- ESP's Retail segment remained relatively strong in PY3. The Retail portion focuses exclusively on promoting LED lighting products and is viewed as Evergy's final push to promote energy-efficient lighting before this measure is removed from future program plans.
- Evergy reported that 1,166 packages have been sold through the Online Market in PY3, which includes 1,049 Standard and Specialty LEDs. However, Evergy program staff reported that product sales on the online platform have been less than anticipated, primarily due to Uplight's policy to charge shipping costs for purchases less than $49.00.
- Through the Giveaway Hub, Evergy targeted previous HVAC program participants to give-away packs of LEDs, specifically targeting renters or homeowners with large homes and thus a large number of sockets for LED applications. This outreach was highly effective with Evergy reporting that 9,000 households received over 70,000 LEDs.
- For general population survey respondents who purchased a lighting product (n = 561), 91 percent purchased standard LED light bulbs, 44 percent purchased specialty LED light bulbs, and two percent stated they purchased other light measures such as smart light bulbs or floodlights, and one percent did not recall the type of light bulbs they purchased. Percentages exceeded 100 percent because respondents had the option of choosing more than one LED light bulb type. Most respondents purchased the new lighting measures to replace burned-out bulbs, old bulbs, to have spare bulbs on hand, or working bulbs for a different color or brightness.

- Participants expressed the top five characteristics important to them when buying light bulbs. Among respondents, energy efficiency, brightness, bulb's lifespan, price, and color were the most important factors. Participants who purchased the energy efficient light bulbs stated they were satisfied with the LED discount (36 percent), savings on their electric bill (54 percent), and quality of the LED measures (81 percent).
- Participants who knew about Evergy's sponsored rebates first learned about them through an Evergy newsletter (25 percent), an in-store display (19 percent), the Evergy website (13 percent), and bill inserts (11 percent). Walmart, Lowe's, and The Home Depot were the most popular stores for purchasing LED bulbs for survey respondents. Over half (57 percent) of people who bought standard LEDs stated the discount had been very important in their decision to buy the measures, as did 38 percent of people who bought specialty bulbs.

The following recommendations are offered for continued improvement of the Energy Saving Products program.

- **Provide additional customer education and cross-promotion of programs.** Customer awareness of the ESP Program remains low. Additional educational materials in stores (as permitted by the retailers), as well as promotion through social media, bill inserts, and emails could improve the program performance and customer engagement.
- **Add additional non-lighting measures to the ESP Program.** Evergy should pivot away from LED lighting-only point-of-sale rebates to include non-lighting measures such as ENERGY STAR® appliances and smart thermostats.
- **Continue to develop an online marketplace.** Program staff indicated that the online marketplace was successful in PY1 and PY2 and are exploring additional avenues for marketing the availability of the online marketplace and opportunities to add measures for purchase. The online marketplace provides an avenue to reach hard-to-reach customers and expand to additional measures.
- **Evergy should continue to push for free shipping on all its online products.** This will become increasingly important as sales of LEDs are discontinued in the next program year.
- **Evergy should consider creating product bundles, such as home security bundles.** This would increase the overall transaction amount and also make it easier for customers to purchase and install this equipment (Utility Online Marketplace Strategies).

# Appendix E Income-Eligible Multi-Family Program-Specific Methodologies

This chapter describes the evaluation activities that were performed by ADM to evaluate the Income-Eligible Multi-Family (IEMF) Program.

## E.1 Program Overview

The IEMF Program provides qualifying, income-eligible properties with assistance through energy assessments, program applications, technical support, and upgrade incentives. Evergy has contracted with ICF International Inc. to manage and implement the program. The program consists of three components: direct install, prescriptive, and custom measures. During 2022, the direct-install measures included 5- and 6-watt specialty LED bulbs (candelabras and globes) and 9-watt general purpose LED bulbs that the implementation contractor installed in multi-family units. In addition to direct install measures, prescriptive measures were installed in existing multi-family units as part of updating inefficient equipment. The following prescriptive measures were installed through the program:

- Air source heat pumps
- Bathroom exhaust fans
- Central air conditioning units
- Dishwashers
- Clothes washers and dryers
- Programable and smart thermostats
- Refrigerators
- LED lighting

Custom projects included the replacement of in-unit and common area existing lighting with high-efficiency LED lighting and installation of a limited number of faucet aerators and low-flow showerheads with low-flow replacements.

Residents and property managers benefitted from the measures by increasing the value of the property, reducing utility bills, and making the property more comfortable, healthier, and safer.

To qualify for the IEMF Program, the property must receive service from Evergy and meet one of the following requirements:

- Documented participation in a federal, state, or local housing program.
- Location in a low-income census tract.

- Rent roll documentation, where at least 50 percent of units have rents affordable to households at or below 80 percent of area median income, as published annually by the Department of Housing and Urban Development (HUD).
- Documented tenant income information demonstrating at least 50 percent of units are rented to households either at or below 200 percent of the federal poverty level, or at or below 80 percent of area median income.
- Documented information demonstrating the property is on the waiting list for, currently participating in, or has in the last five years participated in the Weatherization Assistance Program.

The program partners with the Low-Income Housing Tax Credit (LIHTC) program and has been enhanced to allow for a longer payout period for rebates up to 12 months after the cycle ends to better coordinate with the LIHTC.

Table E-1 provides a summary of program metrics for PY3 for the IEMF Program. Gross verified energy savings (kWh) had a 100 percent realization rate and a peak demand reduction (kW) had an 86 percent realization rate.

*Table E-1: Performance Metrics – Income-Eligible Multifamily*

| Metric | PY3 Total | MO West | MO Metro |
|---|---|---|---|
| Number of Sites | 18 | 7 | 11 |
| ***Energy Impacts (kWh)*** | | | |
| Targeted Energy Savings | 2,342,925 | 1,181,931 | 1,160,994 |
| Reported Energy Savings | 2,144,360 | 633,124 | 1,511,236 |
| Gross Verified Energy Savings | 2,144,983 | 799,829 | 1,345,155 |
| Net Verified Energy Savings | 2,144,983 | 799,829 | 1,345,155 |
| ***Peak Demand Impacts (kW)*** | | | |
| Targeted Peak Demand Reduction | 450.37 | 222.82 | 227.55 |
| Reported Peak Demand Reduction | 455.68 | 71.64 | 384.04 |
| Gross Verified Peak Demand Reduction | 393.41 | 87.14 | 306.27 |
| Net Verified Peak Demand Reduction | 393.41 | 87.14 | 306.33 |
| ***Benefit / Cost Ratios*** | | | |
| Total Resource Cost Test Ratio | 0.59 | 0.42 | 0.76 |

## E.2 EM&V Methodology

This chapter provides an overview of the data collection activities and impact calculation methodologies that ADM employed in the evaluation of the IEMF Program.

Data collection activities for the analysis consisted of a review of program materials, verification of equipment specifications based on equipment model numbers and interviews with Evergy and ICF program staff. The process evaluation gained perspective from in-depth interviews with Evergy and ICF program staff.

### E.2.1 Gross Impact Methodology

ADM used the following steps to evaluate IEMF Program gross energy savings and peak demand reduction.

- Reviewed the program tracking data to determine the scope of the program and to ensure there were no duplicate or erroneous project entries.
- Reviewed all available data for each site including invoices, equipment specification sheets, pre- and post-inspection reports, and estimated savings calculators. This review process informed ADM's evaluation by identifying potential uncertainties and missing data, as well as providing model specifications and other measure characteristics.
- Calculated verified gross savings. The sources for energy savings algorithms are the Evergy TRM.

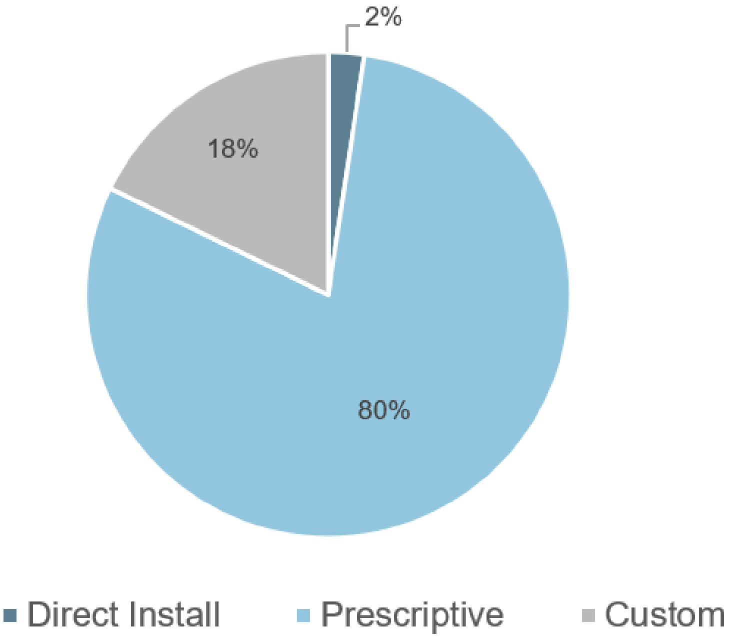
Specific impact evaluation algorithms used to calculate energy savings and demand reductions are detailed in Appendix M.3.

## E.3 Gross Impact Findings

### E.3.1 Program Activity

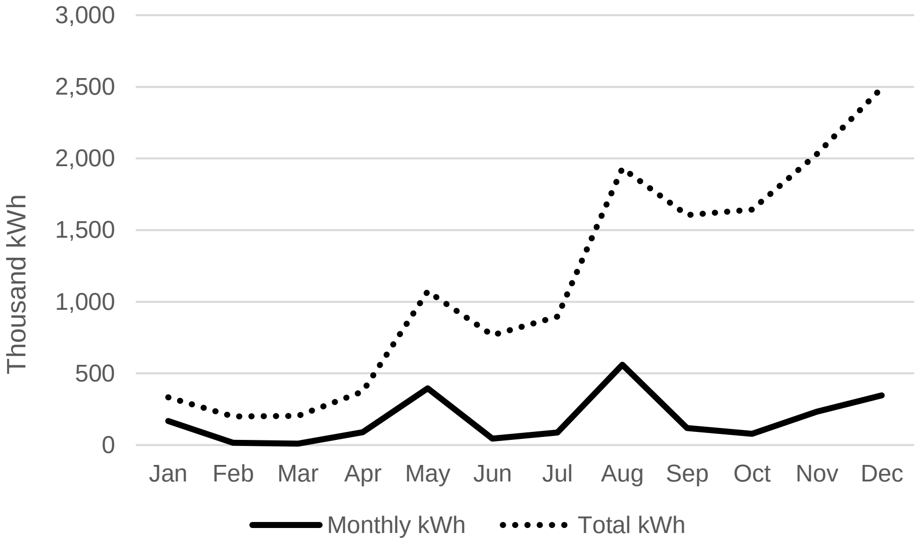
Figure E-1 summarizes IEMF Program activity by the percentage of verified savings across the custom, prescriptive, and direct install measures.

*Figure E-1: IEMF Savings by Project Type*



Participation in IEMF Program was relatively even throughout the year as shown in Figure E-2.

*Figure E-2: Accrual of Reported kWh Savings during the Program Year*



A total of 18 properties participated in the program in 2022, each contributing from 0.2 percent to 14 percent of total program savings. Each property's contribution to total program savings is shown in Table E-2.

*Table E-2: Property Contribution to Total Program Savings*

| Project | Jurisdiction | Verified Total kWh | Program Contribution |
|---|---|---|---|
| 1 | MO West | 184,908 | 9% |
| 2 | MO West | 190,004 | 9% |
| 3 | MO West | 94,514 | 4% |
| 4 | MO West | 243,076 | 11% |
| 5 | MO West | 50,343 | 2% |
| 6 | MO West | 5,090 | 0.2% |
| 7 | MO West | 31,893 | 1% |
| 8 | MO Metro | 56,646 | 3% |
| 9 | MO Metro | 227,853 | 11% |
| 10 | MO Metro | 118,714 | 6% |
| 11 | MO Metro | 59,841 | 3% |
| 12 | MO Metro | 32,488 | 2% |
| 13 | MO Metro | 308,727 | 14% |
| 14 | MO Metro | 10,204 | 0.5% |
| 15 | MO Metro | 219,235 | 10% |
| 16 | MO Metro | 270,899 | 13% |
| 17 | MO Metro | 36,970 | 2% |
| 18 | MO Metro | 3,579 | 0.2% |
| **Total** | | **2,144,983** | **100%** |

### E.3.2 Gross Energy Savings and Demand Reduction

The verified gross annual energy savings (kWh) and peak demand reduction (kW) are summarized by measure in Table E-3. The realization rate for energy savings was 100 percent and 86 percent for demand reduction. Detailed descriptions of savings calculations are included in the measure level findings below.

*Table E-3: Gross Energy and Demand Savings*

| Measure Type | Qty | Reported | | Verified | | Realization Rate | | % of Program Savings |
|---|---|---|---|---|---|---|---|---|
| | | kWh | kW | kWh | kW | kWh | kW | |
| **Direct Installation** | | | | | | | | |
| Lighting | 1,378 | 51,418 | 6.20 | 50,591 | 6.06 | 98% | 98% | 2% |
| **Direct Install Total** | **1,378** | **51,418** | **6.20** | **50,591** | **6.06** | **98%** | **98%** | **2%** |
| **Prescriptive** | | | | | | | | |
| Air Source Heat Pump | 189 | 697,672 | 108.36 | 635,125 | 130.32 | 91% | 120% | 30% |
| Bathroom Fan | 423 | 66,297 | 7.60 | 83,233 | 9.85 | 126% | 130% | 4% |
| CAC | 148 | 107,881 | 122.39 | 109,745 | 94.60 | 102% | 77% | 5% |
| Clothes Dryer | 88 | 14,118 | 1.89 | 6,767 | 0.91 | 48% | 48% | 0% |
| Clothes Washer | 88 | 11,176 | 1.44 | 10,141 | 1.31 | 91% | 91% | 0% |
| Dishwasher | 318 | 11,766 | 0.86 | 6,172 | 0.45 | 52% | 53% | 0% |
| ECM Auto Fan | 156 | 169,226 | 86.42 | 121,501 | 49.40 | 72% | 57% | 6% |
| Refrigerator | 688 | 478,848 | 72.17 | 466,254 | 70.12 | 97% | 97% | 22% |
| Thermostat | 447 | 155,003 | 5.42 | 227,190 | 5.78 | 147% | 107% | 11% |
| **Prescriptive Total** | **2,545** | **1,711,987** | **406.57** | **1,666,128** | **362.75** | **97%** | **89%** | **78%** |
| **Custom** | | | | | | | | |
| Lighting | 2,347 | 375,440 | 41.89 | 422,498 | 23.53 | 113% | 56% | 20% |
| Water Saving | 54 | 5,515 | 1.03 | 5,766 | 1.07 | 105% | 105% | 0.3% |
| **Custom Total** | **2,401** | **380,956** | **42.91** | **428,264** | **24.60** | **112%** | **57%** | **20%** |
| **Grand Total** | **6,324** | **2,144,360** | **455.68** | **2,144,983** | **393.41** | **100%** | **86%** | **100%** |

### E.3.3 Methodologies and Discussion of Realization Rates

The source of the methodologies used to calculate savings and a discussion of realization rates, by measure, is included below.

#### *Direct Installed Measures*

**In-Unit LEDs:** Reported energy savings were uniform regardless of the wattage of the installed bulb. Evaluated energy savings were calculated as specified in the Evergy TRM using baseline wattages specified in the IL TRM[18] and efficient wattages indicated by the measure description. The resulting kWh realization rate for lighting was 98 percent.

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[18] Baseline wattages for all bulb types were not included in the 2022 Evergy TRM, so the IL TRM was used for calculation inputs where needed.

***Prescriptive Measures***

**Air Source Heat Pumps (ASHP):** The reported energy savings for *IEMF - ASHP SEER 16 - replace ASHP ER: MF* were calculated using time-of-sale baseline efficiency values; an early-replacement measure for this efficiency specification was not available in the 2022 Evergy TRM as it as it was for similar heat pumps with different efficiency specifications (e.g., SEER 15, 17 and 18). ADM calculated verified savings using early replacement baseline values as presented in the IL TRM[19]. As a result, evaluated saving were much higher than claimed savings, resulting in realization rates for this measure ranging from 887 to 924 percent.

The reported energy savings for *Ductless ASHP Replace Electric Resistance ER* were calculated as specified in the Evergy TRM using deemed variable values. ADM calculated verified savings using model specifications for installed equipment for capacity, SEER, HSPF and EER values. Note that deemed values in the Evergy assume a 1-ton heat pump capacity; installed heat pumps with higher capacities result in high realization rates. One ducted heat pump was mistakenly included in the tracking data as a ductless heat pump; as a result, verified savings were lower than reported savings for that single unit.

One project replaced a central gas boiler with a single ductless heat pumps for each residential unit. The tracking data identified these units as replacing electric resistance heating, when in they were, in fact, replacing a central gas unit. For these heat pumps, time-of-sale baseline 8.2 HSPF value was drawn from the Every TRM. For cooling savings, 6.3 SEER and 7.7 EER[20] baseline values were drawn for early replacement room air conditioners from MO TRM.

Overall, the realization rate for heat pumps was 91 percent.

**Central Air Conditioners:** Energy savings for central air conditioners were calculated as specified in the Evergy TRM using specifications for installed model numbers. Small differences in reported and verified cooling capacities accounted for an energy savings (kWh) realization rate of 102 percent.

**Bathroom Exhaust Fans:** Reported savings for bathroom exhaust fans we calculated using variable values included in the Evergy TRM; verified savings calculations use specifications for installed model numbers. For continuous running fans, actual cubic feet per minute (CFM) volume capacity was higher than TRM values, resulting in a 155 percent realization rate. For intermittent running fans, both the efficiency rating and the CFM capacity of the installed models was lower than values included in the TRM, reducing verified savings and realization rates. Realization rates for intermittent fans was 28 percent. The overall energy saving (kWh) realization rate was 126 percent.

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[19] IL TRM v9 vol3 pages 77, 78, and 83.

[20] MO TRM Vol 3 3/31/2017 Ductless HP, section 3.4.5, pg 102 and 103.

**ECM Auto Fans:** Energy savings for electronically commutated motor (ECM) exhaust fans was calculated as specified in the Evergy TRM using specifications for installed model numbers. ECM auto fans replaced existing fans at a property where a single central chiller provides cooling for all 156 units. The central chiller has a 200-ton capacity. Cooling capacity per unit was calculated as 200 tons divided by 156 units (1.28 ton). The Evergy TRM assumes a 2.43-ton air conditioning capacity; therefore, the 72 percent realization rate reflects lower verified savings.

**Dishwashers:** Energy savings for dishwashers were calculated as specified in the Evergy TRM using specifications for installed model numbers. Reported savings assume that 100 percent of residential units will have electric water heaters. Only 15 percent of water heaters were electric, resulting in lower verified savings. Therefore, the verified energy savings resulted in a realization rate of 52 percent.

**Thermostats:** Energy savings for programable and smart thermostats were calculated as specified in the Evergy TRM. Reported in-service rates used to calculate reported savings reflect self-installed units, while verified savings were calculated using 100 percent in-service rate because they were direct installed measures. The differences in reported and verified in-service rates resulted in a realization rate of 147 percent.

**Refrigerators:** Energy savings for refrigerators were calculated as specified in the Evergy TRM. ADM used model specifications reported in the ENERGY STAR® database of energy efficient products for product model numbers reported in the program tracking data. Installed models all had automatic defrosting, while the reported savings values assumed refrigerators would be manual defrost models. This had a negative impact on realization rates. The verified energy savings (kWh) resulted in a realization rate of 97 percent.

**Clothes Washers:** Energy savings for clothes washers were calculated as indicated in the Evergy TRM using specifications for installed model numbers. Verified washer capacity and Integrated Modified Energy Factor (IMEF) values varied from reported values (both higher and lower). Additionally, 48 installed washing machines were not ENERGY STAR®-certified and therefore did not generate savings. Overall verified energy savings (kWh) resulted in a 91 percent realization rate for clothes washers.

**Clothes Dryer:** Energy savings for clothes dryers were calculated as indicated in the Evergy TRM using specifications for installed model numbers. Forty-eight dryers were not ENERGY STAR®-certified and therefore did not generate savings. Overall, verified energy savings (kWh) resulted in a 48 percent realization rate for clothes dryers.

### *Custom Measures*

**Lighting:** ADM calculated energy savings for custom LED lighting projects as specified in the Evergy TRM. Baseline and efficient wattages, installation location and hours of use were verified using project lighting inventory forms. Some reported baseline wattages did not consider the ballast; ballast effect on baseline wattages was included in the verified calculations, increasing the kWh realization rate on a number of projects.

Reported kWh savings were calculated without using waste heat factor, and reported kW reduction was calculated without using waste heat factor or coincidence factor. This resulted in lower kW realization rates.

**Low Flow Faucet Aerators:** Energy savings and demand reductions for low-flow faucet aerators were calculated as specified in the Evergy TRM using baseline and efficient specifications reported in program tracking data. Baseline and efficient gallons per hour were slightly different than reported values, resulting in a 105 percent realization rate.

**Low Flow Showerheads:** Energy savings and demand reductions for low-flow showerheads were calculated as specified in the Evergy TRM using baseline and efficient specifications reported in program tracking data. Baseline and efficient gallons per hour were slightly different than reported values, resulting in a 105 percent realization rate.

## E.4 Net Savings Evaluation Findings

The NTGR for the IEMF Program is stipulated at 1.00, due to (1) the specific targeting of the low-income sector; and (2) the small contributions of the program to the overall portfolio saving, which do not justify the cost of conducting primary research needed to adjust the NTGR from stipulated values.

## E.5 Impact Evaluation - Final Savings Tables

Based on the impact evaluation results, the total verified energy savings for the IEMF Program was 2,144,983 kWh with a 100 percent realization rate. Total verified net peak demand reduction was 393.41 kW with an 86 percent realization rate. Table E-4, Table E-5, and Table E-6 summarize the verified energy and demand savings for the IEMF Program.

*Table E-4: Gross Energy Savings (kWh) and Peak Demand Reduction (kW)*

| Jurisdiction | Reported Energy Savings (kWh) | Reported Demand Reduction (kW) | Gross Verified Energy Savings (kWh) | Gross Verified Demand Reduction (kW) | RR (kWh) | RR (kW) |
|---|---|---|---|---|---|---|
| MO West | 633,124 | 71.64 | 799,829 | 87.14 | 126% | 122% |
| MO Metro | 1,511,236 | 384.04 | 1,345,155 | 306.37 | 89% | 80% |
| **Total** | **2,144,360** | **455.68** | **2,144,983** | **393.41** | **100%** | **86%** |

*Table E-5: Verified Gross and Net Annual Energy Savings (kWh)*

| Jurisdiction | NTG (kWh) | Gross Verified Energy Savings (kWh) | Net Energy Savings (kWh) |
|---|---|---|---|
| MO West | 100% | 799,829 | 799,829 |
| MO Metro | 100% | 1,345,155 | 1,345,155 |
| **Total** | **100%** | **2,144,983** | **2,144,983** |

*Table E-6: Verified Gross and Net Peak Demand Reduction (kW)*

| Jurisdiction | NTG (kW) | Gross Verified Demand Reduction (kW) | Net Demand Reduction (kW) |
|---|---|---|---|
| MO West | 100% | 87.14 | 87.14 |
| MO Metro | 100% | 306.27 | 306.27 |
| **Total** | **100%** | **393.41** | **393.41** |

## E.6 Program Metrics

MEEIA Cycle III specifies two program metrics to be used in evaluating the performance of the IEMF Program.

- Spend at least 85 percent of budget: “The Spend of at least 85 percent of Budget performance element will create a threshold criterion that ensures at least 85 percent of the Commission-approved annual budget (administrative cost, plus customer incentive cost) for the program year is spent. The actual spend will be reported directly out of the Company’s accounting system and included in the EM&V report. The Company will also provide a list of ‘lock-in projects’ and their locked-in date for inclusion for the program year spend.”[21]

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[21] MEEIA 3 (2019 – 2022) filing, Nov 29, 2018. pg 59.

- Average Percent Energy Savings per Project: “The Average Percent Energy Savings Per Project performance element will be calculated using a pre-project property energy benchmarking tool to identify each project’s energy usage and the TRM’s energy savings values.”[22]

### E.6.1 Average Percent Energy Savings per Project

ADM reviewed the total site consumption for each project reported in the program tracking data and calculated reported savings as a percentage of total site consumption prior to project completion. The average percentage energy savings per project was 19 percent. One new construction project was excluded from the calculation as no pre-treatment consumption existed. Another project was excluded because it involved HVAC fuel switching, therefore calculating percent savings where benchmark conditions did not include heating would not accurately reflect a percent electricity savings. Average percent savings by jurisdiction is reported in Table E-7.

*Table E-7: Average Percent Energy Savings by Jurisdiction*

| Jurisdiction | Benchmark Energy Use kWh | Verified Total Energy Savings kWh | % Savings |
|---|---|---|---|
| MO West | 4,446,555 | 799,829 | 18% |
| MO Metro | 4,865,075 | 1,014,415 | 21% |
| **Total** | **9,311,631** | **1,814,244** | **19%** |

### E.6.2 Percentage of Budget Spent

The total 2022 program expenditures were 103 percent of the annual budget, exceeding the 85 percent spending requirement (see Table E-8). Ninety-six percent of the budget was spent for the 2020 - 2022 cycle (see Table E-9). Long lead projects are projects that are approved in one year but not completed until the following year; long lead projects are included in the expenditure calculation of the year the expense is approved. As such, 2022 long lead time projects were added to this year’s expenditures and 2021 long lead projects that were included in the 2021 calculation of percentage of budget spent were removed from the 2022 calculation.

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[22] Ibid.

*Table E-8: Program Budget and Spending in 2022*

| Jurisdiction | Program Budget | 2022 Program Spending | 2022 Long Lead Spending | 2021 Long Lead Spending[23] | Adjusted 2022 Spend | Total Program Spending (% of Budget) |
|---|---|---|---|---|---|---|
| MO West | $933,668 | $840,812 | $99,074 | $81,182 | $858,704 | 92% |
| MO Metro | $818,672 | $967,337 | $222,193 | $249,120 | $940,411 | 115% |
| **Total** | **$1,752,340** | **$1,808,149** | **$321,267** | **$330,302** | **$1,799,114** | **103%** |

*Table E-9: 2020-2022 Program Budget and Spending*

| Jurisdiction | 2020-2022 Program Budget | 2020-2022 Spending | 2022 Long Lead Spending | 2020-2022 Plus Long Lead | Cumulative % Spending |
|---|---|---|---|---|---|
| MO West | $2,761,841 | $2,386,109 | $99,074 | $2,485,183 | 90% |
| MO Metro | $2,420,633 | $2,249,489 | $222,193 | $2,471,682 | 102% |
| **Total** | **$5,182,474** | **$4,635,598** | **$321,267** | **$4,956,865** | **96%** |

## E.7 Process Evaluation

### E.7.1 Program Operations

ADM conducted in-depth interviews with Evergy program staff and the third -party implementer. The purpose of the in-depth interviews was to better understand IEMF program design, operations, challenges, and future opportunities.

***Program Design***

The IEMF Program is designed to achieve deep energy savings in affordable multifamily housing within Evergy's Missouri territory. Projects range from high- and mid-rise urban multifamily housing to 4-unit, senior housing buildings in rural communities.

The IEMF Program provides incentives designed to reach Evergy customers who may otherwise be unable to participate in energy efficiency programs. Many affordable housing units and multifamily properties do not invest in energy efficient equipment or appliances due to upfront costs. As a result, renters or multi-family tenants bear the economic burden of energy waste from inefficient equipment in the apartment complex. The program aims to overcome the difference in cost between standard- and high-efficiency equipment to make energy efficient products accessible to these income eligible customers.

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[23] The following amounts were reported as 2021 long lead spending reported in the 2021 EM&V report: MO Metro $343,909 and MO West $99,321. The 2021 long lead spending has been adjusted here to reflect project reductions and extensions. The revised percentage of budget spent for 2021 was 89 percent.

The program offers three different channels for measure installation: direct installation, prescriptive and custom. Direct installed measures include in-unit, LED lightbulbs that made up 2 percent of program savings. Prescriptive measures accounted for 78 percent of program savings and included energy-efficient appliances and HVAC equipment. Custom measures are primarily interior and exterior common-area lighting installations that accounted for 20 percent of program savings.

The percentage of savings generated through direct install measures continues to decline as the program matures and builds a pipeline of long-term, deep savings projects. As long-term projects with high-savings measures are planned and approved, low-impact direct install measures are less effective contributors to program goals. Prescriptive measures provide deeper energy savings and uniform budgeting parameters; program staff projects that the bulk of program savings will continue to come from prescriptive measures.

### *Program Participation and Marketing*

As the program implementer, ICF is responsible for program outreach and marketing. Large, multi-stage projects with long lead times often involve partnerships with sustainability consultants, architects, and contractors. As such, relationships with project partners are key to identifying future projects and marketing the program to building owners and developers. ICF and Evergy also communicate to Evergy customers through newsletters and community events to heighten project residents' awareness of the program benefits.

### *Communication*

Program staff indicated that ICF and Evergy meet multiple times a week and at least once weekly explicitly about IEMF projects. Overall communication is effective and productive.

Staff communicate with other stakeholders (e.g., energy efficiency interest groups, industry watchdogs, DSM program regulations, and economic groups) about program status. The stakeholders' main concern is budget management. In general, the program has not faced issues and the stakeholders have expressed approval of program operations.

### *Data Tracking and Quality Assurances and Controls (QA/QC)*

ADM received data from Evergy and the implementer. The tracking dataset of record from Evergy includes one dataset for direct install and prescriptive measures and a second dataset for custom projects. ADM also had access to project data files stored in SightLine, a project tracking application.

Direct install and prescriptive measures are identified in the tracking data using the Evergy TRM primary key, a unique identifier that ties the installed measure to the correct measure in the Evergy TRM. In contrast, all custom measures are identified with the same primary key simply indicating that it is a custom measure, even when the measure is itself a standard measure, for example, faucet aerators and showerheads. Reported savings calculations for direct install and prescriptive measures rely on deemed variable values from the TRM, while custom measures include actual baseline and efficient variable values to calculate savings. As a result, the savings calculated for the same measure may not be the same across all measure categories (direct install, prescriptive and custom).

### *Challenges for IEMF Program*

While most of the challenges imposed by the coronavirus pandemic have subsided, current inflationary pressures present one of the largest obstacles for long-term projects.

Program staff identified inflationary pressure and available financing as the largest challenges to program participation. Long-term projects secure financing based on initial cost estimates. Due to the multi-year duration of many program projects, inflationary pressures have increased actual expenses beyond budget forecasts. To combat inflation, some projects are locking in pricing by pre-purchasing and storing equipment for future installation.

Multi-source financing continues as a perennial challenge, exacerbated by inflation. In recognition of these hurdles, the Missouri Housing Development Commission is considering applications for up to an additional 15 percent of funding for projects impacted by inflation. ICF staff reported that despite the challenges, no projects were cancelled because of inflation impacts during PY3.

## E.8 Conclusions and Recommendations

The following summarizes the key findings from the evaluation activities for the IEMF Program.

- The 2022 IEMF Program generated 2,144,983 kWh in energy savings and 393.4 in kW demand reduction.
- The realization rate for energy savings (kWh) was 100 percent and for 86 percent peak demand reduction (kW).
- The IEMF Program spent 103 percent of its 2022 approved budget, meeting the obligation to spend at least 85 percent of the program budget during the program year.
- The average percent energy savings (kWh) for projects in 2021 was 19 percent.
- The primary challenge to projects during PY3 was rising costs caused by inflation.

- The ICF program manager expects direct installation measures to contribute a smaller portion of savings in the future.
- In addition to reducing project resident's home utility bills, program benefits also include improved home comfort, healthier interior air quality, and generally higher quality of life for tenants.
- Program staff are optimistic about trends for financing of affordable house rehabilitation.
- Program staff are optimistic about the future of the program.

ADM makes the following are recommendations to improve overall performance of the IEMF Program:

- **When multiple models of a measure are installed in a project, create separate records for each model number.** Savings are calculated using model specifications and would be easier to verify if each savings were calculated separately for each distinct equipment model number.
- **Add waste heat factors and coincident factors drawn from IL TRM to reported custom lighting savings calculations.**
- **Correct baseline efficiency values for ASHP SEER 16 - replace ASHP ER: MF measure to reflect early replacement versus time-of-sale efficiency.**
- **Add clothes washer and dishwasher measures to Evergy TRM that specify water heater fuel type.**
- **ADM recommends the collection of additional documentation by the implementer in the form of an attestation that HVAC units categorized as early replacement were in working order at the time of replacement.** ADM will work with both implementation and Evergy program staff to ensure the operating status of early replacement HVAC units in the program is being included as part of the data collection.

# Appendix F Home Energy Reports Program-Specific Methodologies

This chapter describes the evaluation activities that were performed by ADM to evaluate the Home Energy Report (HER) Program.

## F.1 Program Overview

The HER Program began providing Home Energy Reports (HERs) in 2013 to a portion of single-family residential customers. The program is designed to provide information intended to educate and influence customers' behavior to lower energy usage. The HER is delivered in paper and/or e-mail format and is composed of several modules of information to help customers understand and manage their energy use. The household receives personalized information about their own energy consumption as well as a comparison to the household energy consumption of similar homes, or "neighbors". Also included on the reports is information on other Evergy energy-efficiency programs to encourage additional home improvements in support of reducing energy usage.

Table F-1 provides a summary of program metrics for PY3 for the HER Program.

*Table F-1: Performance Metrics - Home Energy Report Program*

| Metric | PY3 Total | MO West | MO Metro | MO Metro Low-Income |
|---|---|---|---|---|
| Number of Participants | 465,977 | 274,787 | 170,817 | 20,373 |
| ***Energy Savings (kWh)*** | | | | |
| Targeted Energy Savings | 32,862,521 | 20,355,375 | 9,579,000 | 2,928,146 |
| Reported Energy Savings | 34,075,085 | 17,673,336 | 15,417,818 | 983,931 |
| Gross Verified Energy Savings | 35,019,615 | 19,426,866 | 14,004,386 | 1,588,363 |
| Net Verified Energy Savings | 35,019,615 | 19,426,866 | 14,004,386 | 1,588,363 |
| ***Peak Demand Reduction (kW)*** | | | | |
| Targeted Peak Demand Reduction | 4,116.02 | 2,550.00 | 1,200.00 | 366.02 |
| Reported Peak Demand Reduction | 3,889.53 | 2,020.12 | 1,756.49 | 112.93 |
| Gross Verified Peak Demand Reduction | 5,883.68 | 3,263.93 | 2,352.89 | 266.86 |
| Net Verified Peak Demand Reduction | 5,883.68 | 3,263.93 | 2,352.89 | 266.86 |
| ***Benefit / Cost Ratios*** | | | | |
| Total Resource Cost Test Ratio (HER) | 1.62 | 1.50 | 1.82 | - |
| Total Resource Cost Test Ratio (Income-Eligible HER) | 0.71 | - | 0.71 | - |

Since its launch, the program has expanded to include eleven cohorts. One of the cohorts, launched in 2014, consists of income-eligible customers. This single cohort defines the Income-Eligible HER Program. All cohorts have experimental design using randomized controlled trials (RCT), which randomly assign a subset of Evergy's residential customers into a treatment or control group.

Table F-2 summarizes the cohorts implemented in the HER Program within the Evergy service area. The counts in this table represent the total number of customers active at any point during PY3.

*Table F-2: Summary of Evergy Home Energy Report Program Participation*

| Jurisdiction | Cohort | Treatment Start Date | Number of Treatment Group Customers | Number of Control Group Customers |
|---|---|---|---|---|
| MO West | 201309_e_gmo | August 2013 | 59,293 | 29,763 |
| | 201503_e_gmo | March 2015 | 13,239 | 9,655 |
| | 201604_e_gmo | April 2016 | 77,458 | 9,716 |
| | 201706_e_gmo | June 2017 | 25,024 | 11,606 |
| | 201904_e_gmo | April 2019 | 59,855 | 23,492 |
| | 202002_e_gmo | May 2020 | 9,987 | 3,924 |
| | | March 2021 | 14,985 | 5,887 |
| | | February 2022 | 14,946 | 7,496 |
| MO Metro | 201407_e_high_users | July 2014 | 91,342 | 12,204 |
| | 201503_e_kmo | March 2015 | 12,229 | 9,683 |
| | 201607_e_kmo | July 2016 | 17,334 | 11,122 |
| | 202002_e_kmo | May 2020 | 19,974 | 9,989 |
| | | March 2021 | 14,982 | 7,496 |
| | | February 2022 | 14,956 | 7471 |
| MO Metro: Low-Income | 201407_e_low_income | August 2014 | 20,373 | 12,215 |
| **Total** | | | **465,977** | **171,719** |

Although the program currently uses the third-party implementation contractor, Opower, ADM estimated savings for HER Program using the originally designated control groups developed by Oracle. ADM analyzed each of the cohorts treated during the 2022 program year using the same methodology. The following table (Table F-3) displays the impact evaluation findings for the HER Program.

*Table F-3: Home Energy Report Program Impact Evaluation Results*

| Cohort | Reported kWh Savings (kWh) | Reported Demand Savings (kW) | Verified kWh Savings (kWh) | Verified Demand Savings (kW) | Verified kWh Realization Rate | Verified kW Realization Rate |
|---|---|---|---|---|---|---|
| kcpl_201309_e_gmo | 6,106,990 | 699.14 | 7,069,355 | 1,187.73 | 116% | 170% |
| kcpl_201503_e_gmo | 850,777 | 96.96 | 1,348,253 | 226.52 | 159% | 234% |
| kcpl_201604_e_gmo | 6,176,531 | 705.28 | 6,425,793 | 1,079.60 | 104% | 153% |
| kcpl_her_201706_e_gmo | 1,911,529 | 217.93 | 1,738,814 | 292.14 | 91% | 134% |
| kcpl_her_201904_e_gmo | 3,602,096 | 410.82 | 2,844,652 | 477.93 | 79% | 116% |
| kcpl_her_202002_e_gmo | -974,587 | -110.01 | - | - | - | - |
| kcpl_201407_e_high_users | 12,291,258 | 1399.46 | 10,251,455 | 1,722.36 | 83% | 123% |
| kcpl_201503_e_kmo | 753,139 | 86.74 | - | - | 0% | - |
| kcpl_201607_e_kmo | 802,997 | 91.60 | 1,540,103 | 258.75 | 192% | 282% |
| kcpl_her_202002_e_kmo | 1,570,424 | 178.69 | 2,212,829 | 371.78 | 141% | 208% |
| kcpl_201407_e_low_income | 983,931 | 112.93 | 1,588,363 | 266.86 | 161% | 236% |
| **Total** | **34,075,085** | **3,889.53** | **35,019,615** | **5,883.68** | **103%** | **151%** |

For the HER Program, the verified savings were found to be 35,019,615 kWh with an average annual household savings value of 146.04 kWh. Further impact evaluation results are provided in the sections below.

## F.2 EM&V Methodology

This section describes the gross impact evaluation of the HER Program. Each of the cohorts treated during PY3 were analyzed using the same methodology.

The participant and control group billing data in the pre-period (defined as the period *before* a household starts receiving HERs) and in the post-period (defined as the period *after* a household starts receiving HERs that also occurs during PY3) was used to estimate program impact for each cohort. The methods detailed in the Uniform Methods Project (UMP) behavioral chapter by the National Renewable Energy Laboratory[24] were followed for this evaluation. In addition, the cross-participant savings were estimated from other downstream energy-efficiency programs offered to Evergy residential and low-income customers.

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[24] Li, M.; Haeri, H.; Reynolds, A. (2018). The Uniform Methods Project: Methods for Determining Energy-Efficiency Savings for Specific Measures. Golden, CO; National Renewable Energy Laboratory. NREL/SR-7A40-70472. http://www.nrel.gov/docs/fy18osti/70472.pdf

### F.2.1 Gross Impact Methodologies

ADM’s analysis was divided into six distinct steps:

1. Data preparation and cleaning, including true-up, calendarization, and combination with weather data;
2. Validity testing of remaining treatment and control groups during the baseline period;
3. Estimation of monthly and annual billed consumption differences between treatment and control groups via regression modeling;
4. Estimation and removal of cross-participant savings from other programs (uplift);
5. Estimation of demand savings; and
6. Estimation of program attrition.

ADM explored several linear regression models for the impact evaluation of the Home Energy Report program. Each approach involves panel linear regression models to estimate energy savings for the treatment group. The explored methods required monthly billing data for the program participants and a comparable counterfactual group. All groups passed equivalency tests and therefore did not require ADM to create any ad-hoc control groups.

The following types of LFER models were explored during the evaluation of this program: Difference in Difference (D-in-D) with monthly controls, D-in-D with weather controls, and Post-Program Regression (PPR) models. The UMP recommends both the D-in-D and PPR model regressions. The D-in-D uses data from the treatment and control groups during the pre- and post-period. The PPR model is a panel regression model that calculates the differences between treatment and control consumption in the post-program period. However, it includes controls on lagged energy use for the same calendar month of the pre-program period to include in the model any small systematic differences in pre-treatment usage trends between the participant and control customers.

ADM utilized both the PPR and D-in-D models to present the evaluated savings, as this combination displayed sufficient fitness and consistency across waves. This specification is recommended by the UMP to obtain precise savings estimates by comparing the treatment and control groups during the pre- and post-periods.

ADM present savings estimates in three formats for each program year:

- Daily and annual energy savings per home
- Annual percent savings per home
- Program-level savings

The percent savings per home is calculated by dividing the average annual energy savings estimated in the treatment group by the average annual energy consumption from the control group for each program year. The program-level savings are calculated by multiplying the average annual household impact estimate by the weighted number of active program participants in the treatment group after removing double counted savings due to cross-participation, by program year.

### Data Preparation and Cleaning

Oracle provided the following data to support the analysis:

- Pre-treatment and post-treatment monthly electric billing data for 465,977 participants and 170,102 non-participants. The data started on June 1, 2012 and ended on January 27, 2023, with the start date depending on when customers were added to program cohorts;
- Treatment and control group account activation and account inactivation dates; and;
- Participant tracking data, including date of installation and reported kWh savings for each measure installed through each Evergy program.

### True-Up

In some cases, Oracle used estimated meter readings. As part of the data preparation process, ADM corrected for estimated readings by adjusting actual readings to account for them, otherwise known as a "true-up" process. For each metered reading and all estimated readings immediately preceding it, ADM summed the billed usage and number of days spanning those bills. The total billed usage for that cumulative period was then divided by the total number of days to calculate an average usage per day. This average usage per day was multiplied by the number of days in each individual bill to generate a corrected usage value. Because the number of estimated readings per actual reading is inconsistent, the number of estimated readings prior to the first actual reading in the provided dataset cannot be assumed. Therefore, the first metered reading in the billing data, and all estimated readings preceding, were excluded from the dataset. Similarly, estimated readings that did not have a corresponding actual reading (generally towards the tail end of provided billing data) were also excluded from analysis. The following equation provides the method of calculating the adjusted usage for billing data after the first metered reading and all prior estimated readings have been excluded:

*Equation F-1: Billing Data Adjustment Calculation*

$$Adjusted\ usage_m = \ Billing\ days_m \times \sum_i^n \frac{Billed\ usage}{\sum_i^n Billing\ days}$$

Where:

*i* = *First estimated bill in a sequence of estimated bills leading to a metered bill*

*n* = *A metered bill providing an adjustment factor for preceding estimated bills*

*m* = *The billing month of interest*

*Billed usage* = *The total kWh billed in a monthly bill*

*Billing days* = *The total number of days in a monthly bill's billing period*

### *Calendarization*

Monthly billing periods in utility bill data do not fall on consistent dates between participants. For example, one customer’s June bill may run from May 16 to June 17 while another may run from May 20 to July 5. To make the monthly billing data consistent between participants and to represent each month accurately, ADM calendarized the data such that monthly billing data matched calendar dates. For example, if 15 days in a billing period belonged to June and 15 days belonged to July, 50 percent of the billed usage would be attributed to June and 50 percent attributed to July. The proportioned usage and number of days that fall under a given calendar month are then summed to generate a calendarized usage value and the number of billed days for that month. The following equation provides the method for calculating the monthly usage by calendar month:

*Equation F-2 Monthly Billing Data Calculation*

$$Monthly\ usage_m = \sum_{i}^{n} \left( Adjusted\ usage_i \times \frac{Month\ days_i}{Billing\ days_i} \right)$$

Where:

$i$ = *First bill containing the month of interest*

$n$ = *Last bill containing the month of interest*

$m$ = *The month of interest*

$Monthly\ usage$ = *The calendarized monthly usage for a given month*

$Month\ days$ = *The number of days belonging to the month of interest in a billing period*

$Billing\ days$ = *The number of days in a billing period*

### *Restrictions*

After calendarization was completed, an average daily usage value was calculated by dividing the monthly usage by the number of billed days in a month. Additionally, data was filtered using the following criteria:

- Customer billing data that had inconsistent or missing account inactivation and/or activation dates were removed from the initial data set.
- Customer billing data that extended outside the active account date ranges were excluded.
- Customers without at least 9 of the 12 months of pre-period data, as well as at least 6 of the 12 months of post-period data were removed from the analysis.
- Customer data which had average daily usage that differed from the first quartile or third quartile by three times the inter-quartile range or more at the cohort level were excluded from analysis. Such records were considered outlier data since the average daily kWh usage was unusually small or unusually large. These levels of consumption are unrealistic for residential households and can be reasonably categorized as the result of a reading error rather than a valid reading from high or low users.

Overall, ADM aimed to remove erroneous readings rather than remove high and low users, as these subgroups contribute real behaviors to the average savings estimates.

### *Weather Data*

ADM identified the US Air Force code for each airport closest to each customer’s listed ZIP code. Weather data from the National Oceanic and Atmospheric Administration was utilized to calculate heating degree days (HDD) and cooling degree days (CDD) for each unique weather station. This data was then combined with customers’ calendarized billing data to assign HDD and CDD values, matching based on US Air Force airport code, billing start date, billing end date, and customer ID.

HDD and CDD are defined as the difference between the daily temperature and a pre-defined temperature setpoint during the heating and cooling seasons, respectively. These values were estimated using a range of setpoints (55- to 75-degree temperature base), with the HDD and CDD combination that yielded the largest model R-square value used in the final analysis. This accounts for the “dead-band” in residential heating and cooling loads, as there is a range of temperatures in which a residential customer will be neither heating nor cooling.

After data preparation and cleaning, validity testing was performed for all cohorts evaluated. The details of this step are provided in the next section.

### *Validity Testing*

The method for evaluation requires the counterfactual group remains statistically valid for each treatment group. Validity is tested by examining each billing record in the pretreatment period for customers from both the treatment and control groups. Each calendarized monthly record is tested for statistically significant differences using a simple two tailed t-test. Equivalency tests were performed for each month between the provided treatment group and the provided control group. The cohorts 202002_e_gmo and 202002_e_kmo consist of customers with diverse initiation dates for treatment, specifically May 2020, March 2021, and February 2022, and the quantity of customers in each group is comparable (Table F-12). ADM thus divided the customers in these two cohorts into smaller groups based on the start date of treatment. Subsequently, the validity testing and panel regression modeling were performed separately for each subgroup. The validity of each RCT was tested by completing t-tests for the average daily usage of each of the pre-period months between the remaining treatment group and remaining control. If the pre-period average daily usage rejected the null hypothesis at the 95 percent confidence level for several of the 12 pre-period months, the RCT was considered invalid.

For cohorts that do not pass equivalency testing, propensity score matching (PSM) is performed to create an ad-hoc control group comprising of participants that have not received HERs. Equivalency testing is performed on the created control group to confirm that it is statistically comparable to the treatment group in pre-period usage. All cohorts passed equivalency testing at the 95 percent confidence level during the evaluation of the 2022 program year and therefore the creation of an ad-hoc control group was not required.

### *Panel Regression Modeling*

ADM explored multiple linear regression models that compare the treatment group and valid comparison group. The comparison control group used was created during the RCT design. This approach, with randomized control trial, is detailed in the UMP as a preferred method for evaluation of opt-out behavioral programs. The following sections summarize the model specification that were utilized to estimate impact savings for the program.

### *Post-Program Regression Model Specification*

The post-program regression (PPR) model combines both cross-sectional and time series data in a panel dataset. This model uses only the post-program data, with lagged energy use for the same calendar month of the pre-program period acting as a control for any small systematic differences between the participant and control customers. In particular, energy use in calendar month t of the post-program period is framed as a function of both the participant variable and energy use in the same calendar month of the pre-program period. The underlying logic is that systematic differences between participants and controls will be reflected in differences in their past energy use, which is highly correlated with their current energy use. The version we estimate includes monthly fixed effects and interacts these monthly fixed effects with the pre-program energy use variable. These interaction terms allow pre-program usage to have a different effect on post-program usage in each calendar month.

The model specification is as follows:

*Equation F-3: Post-Program Regression (PPR) Model Specification*

$$ADC_{it} = \alpha_0 + \beta_1(Treatment)_i + \beta_2\ (PreUsage)_i + \beta_3(Month)_t \\ + \beta_4(Month \times PreUsage)_{it} + \varepsilon_{it}$$

Where:

$i$ = *The ith household*

$t$ = *The first, second, third, etc. month of the post-treatment period*

$ADC_{it}$ = *Average daily usage for reading t for household i during the post-treatment period*

$Treatment_i$ = *Dummy variable indicating whether household i was in the treatment or control group*

$Month_t$ = *Dummy variable indicating month-year of month t*

$PreUsage_i$ = *Average daily usage across household i's available pre-treatment billing reads*

$\varepsilon_{it}$ = *Customer-level random error*

$\alpha_0$ = *The model intercept*

$\beta_{1-4}$ = *Coefficients determined via regression*

The coefficient $\beta_1$ represents the average change in consumption between the pre-period and post-period for the treatment group.

In this specification, savings are calculated by:

*Equation F-4: Monthly Savings Estimate*

$$Savings = \sum Treatment\ Coeff \times Number\ of\ recipients\ in\ month\ i \times Number\ of\ days\ in\ month\ i$$

### ***Difference-in-Difference Model Specification***

A difference-in-differences (D-i-D) panel regression model was used to compare the treatment group and valid comparison control group. The comparison control group used was the original group created during the RCT design.

The D-i-D mixed-effects model specification contains customer-specific dummy variables to account for the natural variation in household electricity usage that cannot be explicitly controlled for. The specification of customer specific effects allows the model to capture much of the baseline differences across customers while obtaining reliable estimates of the impact of participation in the program.

Independent variables, such as CDD and HDD, were included to account for the impact that weather has on energy usage. ADM then fit a linear mixed-effects panel regression model to estimate energy usage differences between treatment and control households.

*Equation F-5: Linear Mixed-Effects Difference-in-Difference (D-in-D) Panel Regression Model Specification*

$$ADC_{it} = \alpha_0 + \beta_1(Post)_{it} + \beta_2(Treatment)_i + \beta_3(Post * Treatment)_{it} + \beta_4(CDD)_{it} + \beta_5(HDD)_{it} + \varepsilon_{it}$$

Where:

| | |
|---|---|
| *$t$* | = *The monthly period for which energy usage is being predicted* |
| *$i$* | = *The ith household* |
| *$ADC_{it}$* | = *Estimated average daily consumption (dependent variable) in home i during period t* |
| *$\alpha_0$* | =*The model intercept* |
| *$Post\_{it}$* | = *Dummy variable indicating whether period t was in pre- or post-treatment* |
| *$Treatment\_{i}$* | = *Dummy variable indicating whether household i was in treatment group or control group* |
| *$CDD\_{it}$* | = *Average cooling degree days during period t at home i* |
| *$HDD\_{it}$* | = *Average heating degree days during period t at home i* |
| *$\varepsilon_{it}$* | = *Customer-level random error* |

$\{\beta_1,\beta_2,\beta_3,\beta_4,\beta_5\}$ = *Coefficients determined via regression*

### Remove Double Counted Savings

Participants in both the treatment and control groups participate in other Evergy residential energy-efficiency programs. Additionally, the HERs sent to customers include information about other Evergy incentives and programs, which may lead to customers adopting more energy-efficient upgrades for their home. This additional participation of HERs recipients in other Evergy programs can lead to an increase in regression-derived savings, referred to as uplift. When a household participates in an efficiency program because of this encouragement, the utility might count their savings twice: once in the regression-based estimate of HER program savings and again in the estimate of savings for the other energy efficiency program. Although uplift rarely displays a statistically significant difference between the treatment and control groups, the UMP recommends removing uplift from each group at the household level.

The double counted savings, whether positive or negative, are subtracted from the cohort's savings estimates from the regression analysis to get total verified savings. The approach for removal of double counted savings will differ based on whether the other program is a downstream program or upstream program. The following sections detail our methodology for each.

### Downstream Programs

Downstream programs traditionally track installed measures at the customer level. Evergy delivered customer-level tracking data for other programs offered to residential customers. ADM evaluated these programs and used the verified savings from each program to remove double counting for the HER Program. The residential Evergy programs included in the double counting analysis are the HCHC, IEMF, PAYS, and RDR programs.

ADM corrected for cross-program participation that occurred after treatment began if the treatment group participated in other programs at a higher rate than the control group. The double counted savings by cross-participants were calculated on a per-household level for each treatment group in each cohort as follows:

*Equation* F-6*: Double Count Specification*

$$Double\ Counting = \left(\frac{OP\ kWh}{Household_{Treatment}} - \frac{OP\ kWh}{Household_{Control}}\right) \times \#\ Accounts_{Treatment}$$

Where:

$\frac{OP\ kWh}{Household_{Treatment}}$ = *Other program kWh per household in the treatment group*

$\frac{OP\ kWh}{Household_{Control}}$ = *Other program kWh per household in the control group*

$\# \, Accounts_{Treatment}$ = *Total accounts in the treatment group*

To estimate double counted program savings from downstream program uplift, the following steps were performed:

- HER program treatment and control group customers were matched to the utility energy-efficiency program tracking data by customer ID;
- The difference between treatment and control group customers in average savings attributable to other energy-efficiency programs was calculated to estimate the savings per participant due to uplift; and
- The savings due to uplift was multiplied by the number of “weighted customers” in the treatment group to determine the savings adjustment for the entire cohort. Customers are weighted by the proportion of days during PY3 that they are active in the program.

ADM summarized and removed uplift due to participation in the HCHC, IEMF, and PAYS programs for each cohort. The double counted savings analysis included all downstream savings from these programs that occurred during PY3. It also included any downstream savings from these program measures that occurred during PY2, if PY3 was within that measure’s effective useful life (EUL).

### *Upstream Programs*

Estimating savings from program uplift for measures that the utility does not track at the customer level is more difficult. Because upstream programs are unable to track participation at the customer level, the approach to estimating program uplift differs from that of downstream programs. Upstream program uplift estimation therefore requires household surveys to be conducted.

To determine if there was a significant difference in the number of incentivized lightbulbs purchased by the treatment and control groups, ADM included questions in the program’s participant survey asking if participants had received a discount or rebate on any LED lightbulbs during PY3. ADM then performed a two-sample z-test using the responses from these questions. The responses for PY3 indicated that there was no statistically significant difference in the number of incentivized lightbulbs purchased by the treatment and control groups, therefore savings calculations do not include any program uplift removal. See Section F.3.3 for more information.

### *Estimate Demand Savings*

ADM estimated demand savings for the program using monthly billing data provided by Evergy. Specifically, coincident demand savings are calculated by taking the estimated energy savings from August, dividing it by the number of hours in August times a factor of 1.5. The demand reduction was evaluated for each cohort and summed to calculate the program-level demand reduction.

*Equation F-7: Demand Savings Calculation, Per Participant*

$$Demand\ Savings = (AugSavings/h) * 1.5$$

Where:

$AugSavings$ = *Per participant energy savings estimated for the month of August*

$h$ = *Number of hours in August*

### *Attrition Analysis*

The tracking of treatment and control households can be affected by either move-outs or opt-outs (known collectively as ‘attrition’). If a household’s final bill was the end of the evaluated post-period, it is considered a move-out and bills occurring after move-out will be removed from the analysis. Opt-outs, however, remain in the regression analysis, as the program savings estimated is the “intent-to-treat” savings. It remains useful to estimate attrition to gather information on persistence of savings.

ADM summarized the cumulative level of both treatment and control move-outs over the program life by month, cohort, and treatment/control status for each program year by identifying if customers’ last bills were sent or their accounts were labeled as inactive prior to the end of the program year. Customers with missing inactive account dates were presumed to be move-outs if their last bill was sent prior to November 1, 2022.

## F.3 Gross Impact Evaluation Findings

This section details the level of program activity for 2022 as well as the reported and verified gross savings.

The program-level savings are calculated by multiplying the average annual household impact estimate (corrected for double counted savings) by the weighted number of active program participants in the treatment group. Weights are calculated by taking the total number of program evaluation days in the program year and dividing by the number of days for that year.

ADM calculated the percent savings per home by dividing the average annual energy savings by the average annual energy consumption of the control group. That value is then adjusted for uplift from downstream measures. This methodology is presented in the UMP Chapter 17 Residential Behavior Protocol.[25]

### F.3.1 Data Preparation and Cleaning

Billing data provided by Evergy was prepared and cleaned. The following table (Table F-4 through Table F-6) represents the unique number of customers per cohort and treatment group throughout the data cleaning process.

*Table F-4: Treatment Group Customer Counts by Cohort – Missouri West*

| Restriction | 201309_E | 201503_E | 201604_E | 201706_E | 201904_E | 202002_E |
|---|---|---|---|---|---|---|
| All accounts listed as active in the program during PY3 | 59,293 | 13,239 | 77,458 | 25,024 | 59,855 | 39,918 |
| After true-up, calendarization, and outlier removal | 58,914 | 13,181 | 77,102 | 24,853 | 59,302 | 39,766 |
| After removing customers with an insufficient amount of billing data | 25,906 | 7,364 | 39,255 | 11,805 | 24,200 | 15,785 |

*Table F-5: Treatment Group Customer Counts by Cohort – Missouri Metro*

| Restriction | 201407_E_High_Users | 201503_E | 201607_E | 202002_E |
|---|---|---|---|---|
| All accounts listed as active in the program during PY3 | 91,342 | 12,229 | 17,334 | 49,912 |
| After true-up, calendarization, and outlier removal | 90,825 | 12,108 | 17,194 | 49,686 |
| After removing customers with an insufficient amount of billing data | 43,866 | 2,585 | 5,640 | 25,536 |

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[25] https://energy.gov/sites/prod/files/2015/02/f19/UMPChapter17-residential-behavior.pdf

*Table F-6: Treatment Group Customer Counts by Cohort – Missouri Metro (Low-Income)*

| Restriction | 201407_E_Low_Income |
|---|---:|
| All accounts listed as active in the program during PY3 | 20,373 |
| After fixing acct active and inactive dates | 20,164 |
| After removing customers with an insufficient amount of billing data | 7,041 |

### F.3.2 Validity Testing

Clean data was tested for statistically significant differences in usage between the treatment and control groups for each of the 12 pre-period months by cohort. Table F-7 through Table F-17 detail differences and statistical significance between each cohort's treatment and control groups for each of the 12 months in the pre-period, relative to each cohort's intervention date.

*Table F-7: 201309-E Cohort T-Test Results – Missouri West*

| Pre-Period Month | Treatment Group Average Daily Usage (kWh/day) | Control Group Average Daily Usage (kWh/day) | Average Daily Usage Difference (kWh/day) | P-value | Significant Difference? |
|---|---:|---:|---:|---:|:---:|
| January | 48.7688 | 49.1082 | -0.3393 | 0.25 | No |
| February | 46.8175 | 47.0792 | -0.2617 | 0.36 | No |
| March | 44.5730 | 44.7383 | -0.1652 | 0.54 | No |
| April | 37.3771 | 37.5515 | -0.1743 | 0.36 | No |
| May | 36.7217 | 36.8951 | -0.1734 | 0.26 | No |
| June | 47.1724 | 47.4520 | -0.2796 | 0.14 | No |
| July | 56.5906 | 57.0200 | -0.4294 | 0.06 | No |
| August | 55.5636 | 55.9080 | -0.3444 | 0.09 | No |
| September | 39.8166 | 40.1180 | -0.3014 | 0.06 | No |
| October | 32.7349 | 32.8910 | -0.1561 | 0.27 | No |
| November | 38.7242 | 38.9039 | -0.1796 | 0.35 | No |
| December | 47.4615 | 47.6704 | -0.2089 | 0.44 | No |

*Table F-8: 201503_E_GMO Cohort T-Test Results – Missouri West*

| Pre-Period Month | Treatment Group Average Daily Usage (kWh/day) | Control Group Average Daily Usage (kWh/day) | Average Daily Usage Difference (kWh/day) | P-value | Significant Difference? |
|---|---|---|---|---|---|
| January | 81.7744 | 82.1814 | -0.4070 | 0.51 | No |
| February | 79.5515 | 80.1561 | -0.6046 | 0.73 | No |
| March | 67.2979 | 67.7739 | -0.4759 | 0.30 | No |
| April | 47.8336 | 47.9805 | -0.1469 | 0.58 | No |
| May | 50.7414 | 51.0057 | -0.2642 | 0.40 | No |
| June | 60.7211 | 61.1860 | -0.4649 | 0.25 | No |
| July | 64.4258 | 64.9282 | -0.5024 | 0.23 | No |
| August | 66.5340 | 67.2465 | -0.7125 | 0.10 | No |
| September | 49.5034 | 49.7124 | -0.2090 | 0.52 | No |
| October | 42.5883 | 42.7144 | -0.1262 | 0.61 | No |
| November | 68.9942 | 69.2645 | -0.2704 | 0.57 | No |
| December | 80.2648 | 80.3783 | -0.1136 | 0.84 | No |

*Table F-9: 201604_E_GMO Cohort T-Test Results – Missouri West*

| Pre-Period Month | Treatment Group Average Daily Usage (kWh/day) | Control Group Average Daily Usage (kWh/day) | Average Daily Usage Difference (kWh/day) | P-value | Significant Difference? |
|---|---|---|---|---|---|
| January | 29.6141 | 29.9838 | -0.3696 | 0.12 | No |
| February | 26.4152 | 26.6146 | -0.1994 | 0.34 | No |
| March | 21.6187 | 21.7973 | -0.1786 | 0.49 | No |
| April | 20.5792 | 20.7066 | -0.1274 | 0.32 | No |
| May | 23.2979 | 23.4455 | -0.1476 | 0.31 | No |
| June | 36.7050 | 36.8173 | -0.1123 | 0.59 | No |
| July | 44.9489 | 45.2097 | -0.2607 | 0.28 | No |
| August | 40.1036 | 40.3747 | -0.2711 | 0.22 | No |
| September | 31.4807 | 31.7419 | -0.2613 | 0.16 | No |
| October | 21.9829 | 22.1927 | -0.2098 | 0.11 | No |
| November | 24.2762 | 24.3920 | -0.1158 | 0.48 | No |
| December | 28.4352 | 28.6275 | -0.1923 | 0.36 | No |

*Table F-10: 201706_E_GMO Cohort T-Test Results – Missouri West*

| Pre-Period Month | Treatment Group Average Daily Usage (kWh/day) | Control Group Average Daily Usage (kWh/day) | Average Daily Usage Difference (kWh/day) | P-value | Significant Difference? |
|---|---:|---:|---:|---:|:---:|
| January | 23.5408 | 23.2579 | 0.2829 | 0.39 | No |
| February | 20.6427 | 20.7044 | -0.0617 | 0.83 | No |
| March | 18.7873 | 18.7320 | 0.0553 | 0.82 | No |
| April | 17.3893 | 17.2657 | 0.1236 | 0.55 | No |
| May | 19.7006 | 19.7652 | -0.0645 | 0.78 | No |
| June | 24.7430 | 24.6022 | 0.1408 | 0.81 | No |
| July | 35.5174 | 35.6613 | -0.1439 | 0.67 | No |
| August | 31.7740 | 31.9798 | -0.2059 | 0.52 | No |
| September | 24.6964 | 24.7090 | -0.0126 | 0.96 | No |
| October | 17.7284 | 17.7185 | 0.0100 | 0.96 | No |
| November | 19.5822 | 19.5628 | 0.0194 | 0.94 | No |
| December | 24.2826 | 23.8504 | 0.4322 | 0.19 | No |

*Table F-11: 201904_E_GMO Cohort T-Test Results – Missouri West*

| Pre-Period Month | Treatment Group Average Daily Usage (kWh/day) | Control Group Average Daily Usage (kWh/day) | Average Daily Usage Difference (kWh/day) | P-value | Significant Difference? |
|---|---:|---:|---:|---:|:---:|
| January | 36.9173 | 36.9651 | -0.0478 | 0.88 | No |
| February | 36.9140 | 36.9559 | -0.0419 | 0.90 | No |
| March | 32.6973 | 32.7527 | -0.0554 | 0.85 | No |
| April | 31.2101 | 26.8430 | 4.3671 | 0.04 | Yes |
| May | 34.9601 | 35.2734 | -0.3133 | 0.16 | No |
| June | 46.3356 | 46.5787 | -0.2431 | 0.37 | No |
| July | 46.9895 | 47.0954 | -0.1059 | 0.69 | No |
| August | 41.7565 | 41.8440 | -0.0875 | 0.72 | No |
| September | 33.7087 | 33.7227 | -0.0140 | 0.94 | No |
| October | 26.0370 | 25.9427 | 0.0942 | 0.56 | No |
| November | 31.8180 | 31.8923 | -0.0743 | 0.77 | No |
| December | 35.2928 | 35.3575 | -0.0648 | 0.82 | No |

*Table F-12: 202002_E_GMO Cohort T-Test Results – Missouri West*

| Treatment Start Date | Pre-Period Month | Treatment Group Average Daily Usage (kWh/day) | Control Group Average Daily Usage (kWh/day) | Average Daily Usage Difference (kWh/day) | P-value | Significant Difference ? |
|---|---|---|---|---|---|---|
| May 2020 | January | 57.2623 | 56.1884 | 1.0739 | 0.26 | No |
| | February | 54.2086 | 53.2912 | 0.9174 | 0.31 | No |
| | March | 43.9670 | 43.3069 | 0.6602 | 0.29 | No |
| | April | 40.4278 | 39.9462 | 0.4816 | 0.43 | No |
| | May | 38.5458 | 37.9237 | 0.6220 | 0.34 | No |
| | June | 50.4854 | 50.0206 | 0.4648 | 0.54 | No |
| | July | 57.5539 | 57.1108 | 0.4431 | 0.54 | No |
| | August | 52.9462 | 52.7138 | 0.2325 | 0.71 | No |
| | September | 47.0667 | 46.6885 | 0.3782 | 0.49 | No |
| | October | 39.4212 | 39.2235 | 0.1977 | 0.67 | No |
| | November | 48.3378 | 47.9338 | 0.4040 | 0.58 | No |
| | December | 53.8975 | 53.1021 | 0.7953 | 0.34 | No |
| March 2021 | January | 42.4902 | 42.6734 | -0.1832 | 0.76 | No |
| | February | 45.9585 | 47.0465 | -1.0880 | 0.19 | No |
| | March | - | - | - | - | - |
| | April | 27.0311 | 27.3062 | -0.2752 | 0.36 | No |
| | May | 32.8410 | 33.0712 | -0.2302 | 0.46 | No |
| | June | 48.9023 | 49.0745 | -0.1721 | 0.68 | No |
| | July | 52.3716 | 52.4951 | -0.1235 | 0.78 | No |
| | August | 46.6424 | 46.7583 | -0.1159 | 0.77 | No |
| | September | 34.8560 | 34.9424 | -0.0864 | 0.77 | No |
| | October | 29.9324 | 29.7774 | 0.1551 | 0.55 | No |
| | November | 32.6427 | 32.3570 | 0.2857 | 0.42 | No |
| | December | 39.6169 | 39.3413 | 0.2757 | 0.59 | No |

| Treatment Start Date | Pre-Period Month | Treatment Group Average Daily Usage (kWh/day) | Control Group Average Daily Usage (kWh/day) | Average Daily Usage Difference (kWh/day) | P-value | Significant Difference ? |
|---|---|---|---|---|---|---|
| February 2022 | January | 44.6096 | 45.4246 | -0.8150 | 0.20 | No |
| | February | 45.0352 | 45.2550 | -0.2198 | 0.84 | No |
| | March | 32.2622 | 32.9832 | -0.7210 | 0.15 | No |
| | April | 28.9500 | 29.1974 | -0.2474 | 0.45 | No |
| | May | 32.4513 | 32.5347 | -0.0835 | 0.78 | No |
| | June | 46.7360 | 46.7231 | 0.0128 | 0.97 | No |
| | July | 51.8594 | 51.6724 | 0.1870 | 0.65 | No |
| | August | 53.7501 | 53.3644 | 0.3858 | 0.36 | No |
| | September | 42.8996 | 42.6500 | 0.2496 | 0.48 | No |
| | October | 31.1335 | 31.2910 | -0.1575 | 0.56 | No |
| | November | 32.7325 | 33.0237 | -0.2912 | 0.44 | No |
| | December | 39.9063 | 40.3596 | -0.4533 | 0.37 | No |

*Table F-13: 201407_E_High_Users Cohort T-Test Results – Missouri Metro*

| Pre-Period Month | Treatment Group Average Daily Usage (kWh/day) | Control Group Average Daily Usage (kWh/day) | Average Daily Usage Difference (kWh/day) | P-value | Significant Difference? |
|---|---|---|---|---|---|
| January | 33.6823 | 33.4150 | 0.2674 | 0.34 | No |
| February | 32.0854 | 31.7943 | 0.2912 | 0.29 | No |
| March | 27.4395 | 27.1581 | 0.2814 | 0.21 | No |
| April | 24.1043 | 23.8836 | 0.2207 | 0.20 | No |
| May | 30.0052 | 29.6493 | 0.3559 | 0.09 | No |
| June | 36.4882 | 35.8837 | 0.6044 | 0.08 | No |
| July | 45.4844 | 44.9898 | 0.4947 | 0.08 | No |
| August | 44.2431 | 43.7471 | 0.4961 | 0.07 | No |
| September | 36.7569 | 36.2374 | 0.5195 | 0.03 | Yes |
| October | 25.4120 | 25.0509 | 0.3611 | 0.04 | Yes |
| November | 28.8995 | 28.5194 | 0.3801 | 0.09 | No |
| December | 33.6924 | 33.3826 | 0.3099 | 0.26 | No |

*Table F-14: 201503_E_KMO Cohort T-Test Results – Missouri Metro*

| Pre-Period Month | Treatment Group Average Daily Usage (kWh/day) | Control Group Average Daily Usage (kWh/day) | Average Daily Usage Difference (kWh/day) | P-value | Significant Difference? |
|---|---|---|---|---|---|
| January | 31.7330 | 31.1624 | 0.5705 | 0.34 | No |
| February | 30.2542 | 30.2475 | 0.0067 | 0.99 | No |
| March | 26.4983 | 26.3713 | 0.1270 | 0.81 | No |
| April | 22.3007 | 22.5361 | -0.2354 | 0.53 | No |
| May | 27.0634 | 27.3642 | -0.3008 | 0.48 | No |
| June | 35.1749 | 35.8997 | -0.7248 | 0.18 | No |
| July | 38.2505 | 39.3346 | -1.0842 | 0.05 | No |
| August | 39.4306 | 40.2264 | -0.7959 | 0.16 | No |
| September | 28.6187 | 29.0740 | -0.4553 | 0.29 | No |
| October | 22.4154 | 22.6348 | -0.2194 | 0.54 | No |
| November | 28.9584 | 28.9071 | 0.0513 | 0.92 | No |
| December | 32.3720 | 31.7969 | 0.5751 | 0.34 | No |

*Table F-15: 201607_E_Cohort T-Test Results – Missouri Metro*

| Pre-Period Month | Treatment Group Average Daily Usage (kWh/day) | Control Group Average Daily Usage (kWh/day) | Average Daily Usage Difference (kWh/day) | P-value | Significant Difference? |
|---|---|---|---|---|---|
| January | 26.7357 | 27.1852 | -0.4496 | 0.38 | No |
| February | 24.2400 | 24.8778 | -0.6379 | 0.18 | No |
| March | 20.5146 | 20.7034 | -0.1888 | 0.61 | No |
| April | 18.2072 | 18.3941 | -0.1869 | 0.53 | No |
| May | 21.2218 | 21.3983 | -0.1765 | 0.59 | No |
| June | 30.9267 | 31.1680 | -0.2413 | 0.68 | No |
| July | 34.6581 | 34.3225 | 0.3356 | 0.49 | No |
| August | 31.6393 | 31.5141 | 0.1252 | 0.78 | No |
| September | 24.6086 | 24.5222 | 0.0864 | 0.81 | No |
| October | 18.8739 | 18.8526 | 0.0213 | 0.94 | No |
| November | 22.3327 | 22.5402 | -0.2075 | 0.60 | No |
| December | 25.9333 | 26.4991 | -0.5658 | 0.24 | No |

*Table F-16: 202002_E_KMO Cohort T-Test Results – Missouri Metro*

| Treatment Start Date | Pre-Period Month | Treatment Group Average Daily Usage (kWh/day) | Control Group Average Daily Usage (kWh/day) | Average Daily Usage Difference (kWh/day) | P-value | Significant Difference? |
|---|---|---|---|---|---|---|
| May 2020 | January | 49.5977 | 49.3402 | 0.2575 | 0.55 | No |
| | February | 46.4301 | 46.3287 | 0.1014 | 0.81 | No |
| | March | 39.1021 | 39.0311 | 0.0710 | 0.81 | No |
| | April | 36.4750 | 36.6137 | -0.1387 | 0.63 | No |
| | May | 36.7803 | 37.2074 | -0.4271 | 0.07 | No |
| | June | 50.4756 | 51.0773 | -0.6016 | 0.06 | No |
| | July | 59.1336 | 59.7468 | -0.6132 | 0.08 | No |
| | August | 54.6849 | 55.2846 | -0.5997 | 0.07 | No |
| | September | 47.8476 | 48.3365 | -0.4888 | 0.09 | No |
| | October | 37.8936 | 37.9506 | -0.0570 | 0.80 | No |
| | November | 43.5159 | 43.3987 | 0.1172 | 0.74 | No |
| | December | 47.7389 | 47.5592 | 0.1797 | 0.65 | No |
| March 2021 | January | 36.7082 | 36.9206 | -0.2123 | 0.57 | No |
| | February | 38.9704 | 38.4258 | 0.5446 | 0.30 | No |
| | March | - | - | - | - | - |
| | April | 24.9903 | 25.0160 | -0.0258 | 0.89 | No |
| | May | 31.0714 | 31.1723 | -0.1009 | 0.61 | No |
| | June | 48.5360 | 48.0542 | 0.4818 | 0.12 | No |
| | July | 51.4127 | 50.8913 | 0.5215 | 0.11 | No |
| | August | 45.9168 | 45.5381 | 0.3787 | 0.19 | No |
| | September | 32.8856 | 32.7450 | 0.1406 | 0.50 | No |
| | October | 27.7441 | 27.8324 | -0.0883 | 0.62 | No |
| | November | 29.2042 | 29.4445 | -0.2404 | 0.31 | No |
| | December | 34.4150 | 34.6504 | -0.2354 | 0.47 | No |

| Treatment Start Date | Pre-Period Month | Treatment Group Average Daily Usage (kWh/day) | Control Group Average Daily Usage (kWh/day) | Average Daily Usage Difference (kWh/day) | P-value | Significant Difference? |
|---|---|---|---|---|---|---|
| February 2022 | January | 33.9628 | 33.5842 | 0.3786 | 0.30 | No |
| | February | 33.3115 | 33.0383 | 0.2732 | 0.70 | No |
| | March | 24.9312 | 24.9068 | 0.0244 | 0.92 | No |
| | April | 23.0085 | 22.9398 | 0.0687 | 0.70 | No |
| | May | 27.1343 | 27.1808 | -0.0465 | 0.80 | No |
| | June | 41.9582 | 42.1032 | -0.1450 | 0.58 | No |
| | July | 47.2391 | 47.2534 | -0.0143 | 0.96 | No |
| | August | 49.1371 | 49.2186 | -0.0815 | 0.78 | No |
| | September | 38.1699 | 38.0994 | 0.0705 | 0.77 | No |
| | October | 26.2955 | 26.2420 | 0.0535 | 0.75 | No |
| | November | 26.0697 | 25.9765 | 0.0933 | 0.70 | No |
| | December | 30.9036 | 30.6104 | 0.2932 | 0.35 | No |

*Table F-17: 201407_E_Low_Income Cohort T-Test Results – Missouri Metro (Low-Income)*

| Pre-Period Month | Treatment Group Average Daily Usage (kWh/day) | Control Group Average Daily Usage (kWh/day) | Average Daily Usage Difference (kWh/day) | P-value | Significant Difference? |
|---|---|---|---|---|---|
| January | 34.7037 | 34.3060 | 0.3977 | 0.31 | No |
| February | 33.4167 | 33.0071 | 0.4096 | 0.29 | No |
| March | 28.2543 | 28.1432 | 0.1111 | 0.73 | No |
| April | 23.1687 | 23.0849 | 0.0838 | 0.70 | No |
| May | 27.1237 | 27.0263 | 0.0974 | 0.68 | No |
| June | 32.7687 | 32.9233 | -0.1546 | 0.70 | No |
| July | 41.6824 | 41.5355 | 0.1468 | 0.66 | No |
| August | 40.1687 | 39.9843 | 0.1844 | 0.56 | No |
| September | 33.5005 | 33.4694 | 0.0311 | 0.91 | No |
| October | 24.4007 | 24.5218 | -0.1211 | 0.57 | No |
| November | 29.6073 | 29.7714 | -0.1641 | 0.61 | No |
| December | 34.4555 | 34.3237 | 0.1318 | 0.73 | No |

A tolerance band was set allowing three months out of 12 to vary in pre-period usage at the 90 percent confidence level. All eleven cohorts (two of the cohorts each have three subgroups) passed this threshold and remained balanced at the 90 percent confidence level in the pre-period. Therefore, ADM continued to the next step and conducted linear regressions on each of the RCT cohorts.

### F.3.3 Double Counting Analysis

Participants in both the treatment and control groups participate in other Evergy residential energy efficiency programs. The double counted savings, defined in the methodology, whether positive or negative, were subtracted from the cohort's gross savings estimates from the regression analysis to get total verified savings. This section summarizes the results of the double counting analysis.

#### *Downstream Programs*

For downstream program savings, Evergy delivered tracking data for all downstream programs, including the HCHC, IEMF, PAYS, and RDR programs as part of the impact evaluation. The average treatment customer, average control customer, and average incremental savings attributed to the three residential programs for each cohort were identified and summarized.

Table F-18 displays the verified cross-participation savings to be subtracted from each group's annual program savings for each program year and evaluation period. The double counted savings analysis included all downstream savings from residential programs that occurred during PY3. It also included any downstream savings from residential program measures that occurred during PY2, if PY3 was within that measure's effective useful life (EUL).

Note that cohort kcpl_201503_e_kmo and kcp_202002_e_gmo were not included, as no statistically significant savings could be estimated for it in PY3.

*Table F-18: Downstream Double Counting Results by Cohort*

| Cohort | Average Treatment Household Annual Savings (kWh/year) | Average Control Household Annual Savings (kWh/year) | Average Household Annual Savings Adjustment (kWh/year) | Weighted Treatment Customers | Downstream Program Double Count Savings (kWh/year) |
|---|---:|---:|---:|---:|---:|
| kcpl_201309_e_gmo | 45.7633 | 48.3901 | 2.6268 | 27,127.76 | 71,259 |
| kcpl_201407_e_high_users | 35.8911 | 32.0848 | -3.8063 | 45,388.74 | -172,763 |
| kcpl_201407_e_low_income | 23.8367 | 17.5541 | -6.2826 | 7,516.84 | -47,225 |
| kcpl_201503_e_gmo | 56.6789 | 77.0021 | 20.3231 | 7,462.11 | 151,653 |
| kcpl_201604_e_gmo | 34.6370 | 24.3898 | -10.2472 | 39,933.14 | -409,203 |
| kcpl_201607_e_kmo | 31.3011 | 24.5855 | -6.7156 | 5,913.14 | -39,710 |
| kcpl_201706_e_gmo | 28.6195 | 33.8099 | 5.1903 | 12,127.86 | 62,947 |
| kcpl_201904_e_gmo | 32.9600 | 29.9700 | -2.9900 | 30,468.11 | -91,100 |
| kcpl_202002_e_kmo_re | 33.5918 | 27.6432 | -5.9486 | 33,321.91 | -198,219 |
| **Total** | **-** | **-** | **-** | **209,259.61** | **-672,360** |

The results are separated by cohort. PY3 has a total of -672,360 kWh in double counted savings. The double counted savings are the difference between the average treatment and control group savings for each household at the cohort level.

### *Upstream Programs*

For upstream program savings, the utility is unable to track savings at the customer level. Because of this, the approach to estimating program uplift differs from that of downstream programs, as it requires household surveys to be conducted. Specifically, to determine if there was a statistically significant difference in the number of incentivized lightbulbs purchased by the treatment and control groups, ADM included questions in the program's participant survey asking if participants had received a discount or rebate on any LED lightbulbs during PY3. Table F-19 shows a summary of all participants that responded to these survey questions.

*Table F-19: Summary of Discounted LED Survey Question Responses*

| Did Customer Receive a Discounted LED Bulb During PY3? | Control Group | | Treatment Group | |
|---|---:|:---:|---:|:---:|
| | Response Count | Percentage of Respondents | Response Count | Percent of Respondents |
| Yes | 66 | 19% | 61 | 17% |
| No | 244 | 71% | 250 | 70% |

ADM then performed a two-sample z-test using the responses from these questions. The results of the test yielded a z-score of -0.55, which is not statistically significant at a 90 percent confidence level. This indicated that there was no statistically significant difference in the number of incentivized lightbulbs purchased by the treatment and control groups, therefore the double counted savings removal process did not include any upstream program savings.

### F.3.4 Linear Regression Modeling Results

The PPR and D-in-D models are presented in Equation F-3 and Equation F-5 and to estimate daily consumption differences between homes that received HERs and homes that did not receive HERs. ADM noted that the PPR model was used for all waves due to its higher Adjusted R-Squared values. This section details the regression results of each of the evaluated cohort.

#### *Missouri West Results*

This section describes the linear regression results, double counting adjustments, and final household and program-level savings for each cohort within the Missouri West jurisdiction.

#### 201309_E_GMO Cohort Results:

As shown in Table F-20 below, the coefficient of interest (Treatment) is negative, indicating lower usage per month in the post-period for treatment customers. In addition, this coefficient is statically significant at the 90 percent level. This indicates a statistically significant energy savings effect resulting from members of this cohort participating in the program.

*Table F-20: 201309_E_GMO Cohort Regression Coefficients – Missouri West*

| Coefficient | Estimate | Std Error | P Value | 5% | 95% |
|---|---|---|---|---|---|
| Treatment | -0.71 | 0.05 | <0.001 | -0.79 | -0.63 |
| Pre-Usage | 0.79 | 0.00 | <0.001 | 0.78 | 0.79 |
| February | -0.20 | 0.23 | 0.38 | -0.59 | 0.18 |
| March | 0.36 | 0.23 | 0.12 | -0.03 | 0.74 |
| April | 2.71 | 0.25 | <0.001 | 2.30 | 3.11 |
| May | 5.38 | 0.27 | <0.001 | 4.94 | 5.83 |
| June | 8.64 | 0.28 | <0.001 | 8.19 | 9.10 |
| July | 11.71 | 0.29 | <0.001 | 11.23 | 12.19 |
| August | 7.05 | 0.30 | <0.001 | 6.56 | 7.53 |
| September | 5.38 | 0.28 | <0.001 | 4.92 | 5.84 |
| October | 1.83 | 0.27 | <0.001 | 1.39 | 2.27 |
| November | -2.19 | 0.25 | <0.001 | -2.60 | -1.77 |
| December | -1.65 | 0.24 | <0.001 | -2.05 | -1.25 |
| February*Pre-Usage | 0.00 | 0.00 | 0.86 | -0.01 | 0.01 |
| March*Pre-Usage | -0.10 | 0.00 | <0.001 | -0.10 | -0.09 |
| April*Pre-Usage | -0.14 | 0.01 | <0.001 | -0.15 | -0.13 |
| May*Pre-Usage | -0.10 | 0.01 | <0.001 | -0.11 | -0.09 |
| June*Pre-Usage | -0.07 | 0.01 | <0.001 | -0.08 | -0.07 |
| July*Pre-Usage | -0.13 | 0.01 | <0.001 | -0.14 | -0.12 |
| August*Pre-Usage | -0.15 | 0.01 | <0.001 | -0.15 | -0.14 |
| September*Pre-Usage | -0.11 | 0.01 | <0.001 | -0.12 | -0.10 |
| October*Pre-Usage | -0.10 | 0.01 | <0.001 | -0.11 | -0.09 |
| November*Pre-Usage | 0.07 | 0.01 | <0.001 | 0.06 | 0.08 |
| December*Pre-Usage | 0.06 | 0.00 | <0.001 | 0.06 | 0.07 |
| Adjusted R-Squared: 0.5171, P-value: <0.001 | | | | | |

The verified gross kWh savings of the HER Program for this cohort is summarized below by evaluation period and program year. Total verified kWh savings is calculated by multiplying the annual adjusted kWh savings per home by the weighted number of treatment customers in the post period (the method to calculate weighted customers is explained in Section F.3).

*Table F-21: 201309_E_GMO Cohort Verified Annual kWh Savings – Missouri West*

| Cohort | Annual Unadjusted Savings Per Home (kWh/year) | Double Counted Savings Adjustment (kWh/year) | Annual Adjusted Savings Per Home (kWh/year) | Annual Control Group Usage Per Home (kWh/year) | Annual Percent Savings Per Home |
|---|---|---|---|---|---|
| 201309_e_gmo | 257.96 | 2.63 | 260.59 | 15,029.40 | 1.73% |

This cohort displayed 1.73 percent annual household savings for PY3. The double-counted savings adjustment increased the annual household savings because the control group for this cohort exhibited greater annual savings due to downstream participation than the treatment group (see Table F-18). After adjusting for cross-participant savings found in the HCHC, IEMF, PAYS, and RDR programs, average annual household savings for treated customers in this cohort was 260.59 kWh.

### 201503_E_GMO Cohort Results:

As shown in the table below, the coefficient of interest (Treatment) is negative, indicating lower usage per month in the post-period for treatment customers. In addition, this coefficient is statically significant at the 90 percent level. This indicates a statistically significant energy savings effect resulting from members of this cohort participating in the program.

*Table F-22: 201503_E_GMO Cohort Regression Coefficients – Missouri West*

| Coefficient | Estimate | Std Error | P Value | 5% | 95% |
|---|---|---|---|---|---|
| Treatment | -0.44 | 0.11 | <0.001 | -0.62 | -0.26 |
| Pre-Usage | 0.81 | 0.01 | <0.001 | 0.80 | 0.81 |
| February | 5.06 | 1.25 | <0.001 | 3.00 | 7.11 |
| March | 1.36 | 0.67 | 0.04 | 0.26 | 2.46 |
| April | 5.57 | 0.74 | <0.001 | 4.34 | 6.79 |
| May | 6.51 | 0.70 | <0.001 | 5.35 | 7.66 |
| June | 9.49 | 0.68 | <0.001 | 8.37 | 10.61 |
| July | 11.31 | 0.69 | <0.001 | 10.18 | 12.44 |
| August | 7.11 | 0.69 | <0.001 | 5.97 | 8.24 |
| September | 4.21 | 0.68 | <0.001 | 3.09 | 5.34 |
| October | 7.66 | 0.73 | <0.001 | 6.47 | 8.85 |
| November | 2.62 | 0.67 | <0.001 | 1.52 | 3.72 |
| December | 0.43 | 0.67 | 0.52 | -0.68 | 1.53 |
| February*Pre-Usage | -0.13 | 0.01 | <0.001 | -0.15 | -0.11 |
| March*Pre-Usage | -0.12 | 0.01 | <0.001 | -0.14 | -0.11 |
| April*Pre-Usage | -0.20 | 0.01 | <0.001 | -0.22 | -0.18 |
| May*Pre-Usage | -0.23 | 0.01 | <0.001 | -0.25 | -0.21 |
| June*Pre-Usage | -0.10 | 0.01 | <0.001 | -0.12 | -0.09 |
| July*Pre-Usage | -0.08 | 0.01 | <0.001 | -0.09 | -0.06 |
| August*Pre-Usage | -0.14 | 0.01 | <0.001 | -0.16 | -0.13 |
| September*Pre-Usage | -0.14 | 0.01 | <0.001 | -0.16 | -0.12 |
| October*Pre-Usage | -0.30 | 0.01 | <0.001 | -0.32 | -0.27 |
| November*Pre-Usage | -0.15 | 0.01 | <0.001 | -0.16 | -0.14 |
| December*Pre-Usage | -0.01 | 0.01 | 0.29 | -0.02 | 0.00 |
| Adjusted R-Squared: 0.5002, P-value: <0.001 | | | | | |

The verified gross kWh savings of the HER Program for this cohort is summarized below by evaluation period and program year. The number of customers used to calculate total verified kWh savings is the number of weighted treatment customers in the post-period, which accounts for the total number of treated days a customer has in the post-period.

*Table F-23: 201503_E_GMO Cohort Verified Annual kWh Savings – Missouri West*

| Cohort | Annual Unadjusted Savings Per Home (kWh/year) | Double Counted Savings Adjustment (kWh/year) | Annual Adjusted Savings Per Home (kWh/year) | Annual Control Group Usage Per Home (kWh/year) | Annual Percent Savings Per Home |
|---|---|---|---|---|---|
| 201503_e_gmo | 160.36 | 20.32 | 180.68 | 21,452.83 | 0.84% |

This cohort displayed 0.84 percent annual household savings for PY3. The double-counted savings adjustment increased the annual household savings because the control group for this cohort exhibited greater annual savings due to downstream participation than the treatment group (see Table F-18). After adjusting for cross-participant savings found in the HCHC, IEMF, PAYS, and RDR programs, average annual household savings for treated customers in this cohort was 180.68 kWh.

### 201604_E_GMO Cohort Results:

This section describes the impact evaluation results for the 201604_E_GMO cohort within Missouri West.

As shown in the table below, the coefficient of interest (Treatment) is negative, indicating lower usage per month in the post-period for treatment customers. In addition, this coefficient is statically significant at the 90 percent level. This indicates a statistically significant energy savings effect resulting from members of this cohort participating in the program.

*Table F-24: 201604_E_GMO Cohort Regression Coefficients – Missouri West*

| Coefficient | Estimate | Std Error | P Value | 5% | 95% |
|---|---|---|---|---|---|
| Treatment | -0.47 | 0.05 | <0.001 | -0.56 | -0.38 |
| Pre-Usage | 0.75 | 0.00 | <0.001 | 0.74 | 0.75 |
| February | -0.68 | 0.17 | <0.001 | -0.96 | -0.39 |
| March | -1.98 | 0.22 | <0.001 | -2.34 | -1.61 |
| April | -0.46 | 0.19 | 0.02 | -0.77 | -0.15 |
| May | 2.95 | 0.19 | <0.001 | 2.64 | 3.26 |
| June | 5.77 | 0.20 | <0.001 | 5.44 | 6.09 |
| July | 7.00 | 0.21 | <0.001 | 6.66 | 7.34 |
| August | 4.83 | 0.20 | <0.001 | 4.50 | 5.17 |
| September | 2.32 | 0.20 | <0.001 | 1.99 | 2.64 |
| October | -0.26 | 0.19 | 0.17 | -0.59 | 0.06 |
| November | -0.70 | 0.19 | <0.001 | -1.01 | -0.40 |
| December | -0.03 | 0.18 | 0.88 | -0.33 | 0.27 |
| February*Pre-Usage | 0.07 | 0.01 | <0.001 | 0.06 | 0.08 |
| March*Pre-Usage | 0.12 | 0.01 | <0.001 | 0.11 | 0.14 |
| April*Pre-Usage | 0.02 | 0.01 | <0.001 | 0.01 | 0.04 |
| May*Pre-Usage | 0.01 | 0.01 | 0.27 | 0.00 | 0.02 |
| June*Pre-Usage | 0.01 | 0.01 | 0.02 | 0.00 | 0.02 |
| July*Pre-Usage | -0.04 | 0.01 | <0.001 | -0.05 | -0.03 |
| August*Pre-Usage | -0.03 | 0.01 | <0.001 | -0.04 | -0.02 |
| September*Pre-Usage | -0.09 | 0.01 | <0.001 | -0.10 | -0.08 |
| October*Pre-Usage | -0.06 | 0.01 | <0.001 | -0.07 | -0.05 |
| November*Pre-Usage | 0.04 | 0.01 | <0.001 | 0.03 | 0.05 |
| December*Pre-Usage | 0.04 | 0.01 | <0.001 | 0.03 | 0.05 |
| Adjusted R-Squared: 0.5020, P-value: <0.001 | | | | | |

The verified gross kWh savings of the HER Program for this cohort is summarized below by evaluation period and program year. The number of customers used to calculate total verified kWh savings is the number of weighted treatment customers in the post-period, which accounts for the total number of treated days a customer has in the post-period.

*Table F-25: 201604_E_GMO Cohort Verified Annual kWh Savings – Missouri West*

| Cohort | Annual Unadjusted Savings Per Home (kWh/year) | Double Counted Savings Adjustment (kWh/year) | Annual Adjusted Savings Per Home (kWh/year) | Annual Control Group Usage Per Home (kWh/year) | Annual Percent Savings Per Home |
|---|---|---|---|---|---|
| 201604_e_gmo | 171.16 | -10.25 | 160.91 | 11,168.67 | 1.44% |

This cohort displayed 1.44 percent annual household savings for PY3. The double-counted savings adjustment decreased the annual household savings because the treatment group for this cohort exhibited greater annual savings due to downstream participation than the control group (see Table F-18). After adjusting for cross-participant savings found in the HCHC, IEMF, PAYS, and RDR programs, average annual household savings for treated customers in this cohort was 160.91 kWh.

### 201706_E_GMO Cohort Results:

As shown in the table below, the coefficient of interest (Treatment) is negative, indicating lower usage per month in the post-period for treatment customers. In addition, this coefficient is statically significant at the 90 percent level. This indicates a statistically significant energy savings effect resulting from members of this cohort participating in the program.

*Table F-26: 201706_E_GMO Cohort Regression Coefficients – Missouri West*

| Coefficient | Estimate | Std Error | P Value | 5% | 95% |
|---|---|---|---|---|---|
| Treatment | -0.42 | 0.06 | <0.001 | -0.51 | -0.33 |
| Pre-Usage | 0.87 | 0.00 | <0.001 | 0.86 | 0.88 |
| February | -1.07 | 0.19 | <0.001 | -1.39 | -0.76 |
| March | -1.99 | 0.19 | <0.001 | -2.30 | -1.67 |
| April | -1.87 | 0.20 | <0.001 | -2.19 | -1.55 |
| May | 0.20 | 0.20 | 0.30 | -0.12 | 0.53 |
| June | 2.79 | 0.34 | <0.001 | 2.23 | 3.35 |
| July | 1.42 | 0.22 | <0.001 | 1.06 | 1.78 |
| August | 0.57 | 0.21 | 0.01 | 0.22 | 0.92 |
| September | -0.64 | 0.21 | <0.001 | -0.98 | -0.31 |
| October | -1.42 | 0.20 | <0.001 | -1.75 | -1.09 |
| November | -1.46 | 0.20 | <0.001 | -1.78 | -1.14 |
| December | -0.08 | 0.19 | 0.68 | -0.40 | 0.24 |
| February*Pre-Usage | 0.17 | 0.01 | <0.001 | 0.16 | 0.18 |
| March*Pre-Usage | 0.15 | 0.01 | <0.001 | 0.14 | 0.16 |
| April*Pre-Usage | 0.08 | 0.01 | <0.001 | 0.07 | 0.09 |
| May*Pre-Usage | 0.03 | 0.01 | <0.001 | 0.02 | 0.05 |
| June*Pre-Usage | 0.14 | 0.01 | <0.001 | 0.13 | 0.16 |
| July*Pre-Usage | -0.01 | 0.01 | 0.09 | -0.02 | 0.00 |
| August*Pre-Usage | -0.02 | 0.01 | <0.001 | -0.03 | -0.01 |
| September*Pre-Usage | -0.04 | 0.01 | <0.001 | -0.05 | -0.03 |
| October*Pre-Usage | -0.02 | 0.01 | 0.06 | -0.03 | 0.00 |
| November*Pre-Usage | 0.10 | 0.01 | <0.001 | 0.08 | 0.11 |
| December*Pre-Usage | -0.04 | 0.01 | <0.001 | -0.05 | -0.03 |
| Adjusted R-Squared: 0.6609, P-value: <0.001 | | | | | |

The verified gross kWh savings of the HER Program for this cohort is summarized below by evaluation period and program year. The number of customers used to calculate total verified kWh savings is the number of weighted treatment customers in the post-period, which accounts for the total number of treated days a customer has in the post-period.

*Table F-27: 201706_E_GMO Cohort Verified Annual kWh Savings – Missouri West*

| Cohort | Annual Unadjusted Savings Per Home (kWh/year) | Double Counted Savings Adjustment (kWh/year) | Annual Adjusted Savings Per Home (kWh/year) | Annual Control Group Usage Per Home (kWh/year) | Annual Percent Savings Per Home |
|---|---|---|---|---|---|
| 201706_e_gmo | 152.62 | -9.25 | 143.37 | 9,322.41 | 1.54% |

This cohort displayed 1.54 percent annual household savings for PY3. The double-counted savings adjustment increased the annual household savings because the control group for this cohort exhibited greater annual savings due to downstream participation than the treatment group (see Table F-18). After adjusting for cross-participant savings found in the HCHC, IEMF, PAYS, and RDR programs, average annual household savings for treated customers in this cohort was 143.37 kWh.

### 201904_E_GMO Cohort Results:

As shown in the table below, the coefficient of interest (Treatment) is negative, indicating lower usage per month in the post-period for treatment customers. In addition, this coefficient is statically significant at the 90 percent level. This indicates a statistically significant energy savings effect resulting from members of this cohort participating in the program.

*Table F-28: 201904_E_GMO Cohort Regression Coefficients – Missouri West*

| Coefficient | Estimate | Std Error | P Value | 5% | 95% |
|---|---|---|---|---|---|
| Treatment | -0.26 | 0.05 | <0.001 | -0.34 | -0.19 |
| Pre-Usage | 0.83 | 0.00 | <0.001 | 0.82 | 0.83 |
| February | 0.99 | 0.17 | <0.001 | 0.71 | 1.26 |
| March | 1.34 | 0.17 | <0.001 | 1.06 | 1.61 |
| April | 2.28 | 1.14 | 0.05 | 0.40 | 4.16 |
| May | -0.03 | 0.20 | 0.86 | -0.36 | 0.29 |
| June | 1.59 | 0.20 | <0.001 | 1.26 | 1.92 |
| July | 3.35 | 0.20 | <0.001 | 3.02 | 3.68 |
| August | 2.20 | 0.20 | <0.001 | 1.87 | 2.53 |
| September | -0.36 | 0.20 | 0.07 | -0.69 | -0.03 |
| October | -0.93 | 0.19 | <0.001 | -1.24 | -0.61 |
| November | 0.48 | 0.17 | 0.01 | 0.20 | 0.77 |
| December | -0.33 | 0.17 | 0.06 | -0.61 | -0.04 |
| February*Pre-Usage | -0.11 | 0.00 | <0.001 | -0.11 | -0.10 |
| March*Pre-Usage | -0.14 | 0.00 | <0.001 | -0.15 | -0.14 |
| April*Pre-Usage | -0.11 | 0.03 | <0.001 | -0.17 | -0.06 |
| May*Pre-Usage | -0.10 | 0.00 | <0.001 | -0.11 | -0.10 |
| June*Pre-Usage | -0.05 | 0.00 | <0.001 | -0.05 | -0.04 |
| July*Pre-Usage | 0.02 | 0.00 | <0.001 | 0.02 | 0.03 |
| August*Pre-Usage | 0.03 | 0.00 | <0.001 | 0.02 | 0.04 |
| September*Pre-Usage | 0.00 | 0.01 | 0.45 | 0.00 | 0.01 |
| October*Pre-Usage | -0.05 | 0.01 | <0.001 | -0.06 | -0.05 |
| November*Pre-Usage | -0.08 | 0.00 | <0.001 | -0.09 | -0.07 |
| December*Pre-Usage | 0.06 | 0.00 | <0.001 | 0.05 | 0.06 |
| Adjusted R-Squared: 0.6788, P-value: <0.001 | | | | | |

The verified gross kWh savings of the HER Program for this cohort is summarized below by evaluation period and program year. The number of customers used to calculate total verified kWh savings is the number of weighted treatment customers in the post-period, which accounts for the total number of treated days a customer has in the post-period.

*Table F-29: 201904_E_GMO Cohort Verified Annual kWh Savings – Missouri West*

| Cohort | Annual Unadjusted Savings Per Home (kWh/year) | Double Counted Savings Adjustment (kWh/year) | Annual Adjusted Savings Per Home (kWh/year) | Annual Control Group Usage Per Home (kWh/year) | Annual Percent Savings Per Home |
|---|---|---|---|---|---|
| 201904_e_gmo | 96.35 | -2.99 | 93.36 | 12,988.08 | 0.72% |

This cohort displayed 0.72 percent annual household savings for PY3. The double-counted savings adjustment decreased the annual household savings because the treatment group for this cohort exhibited greater annual savings due to downstream participation than the control group (see Table F-18). After adjusting for cross-participant savings found in the HCHC, IEMF, PAYS, and RDR programs, average annual household savings for treated customers in this cohort was 93.36 kWh.

### 202002_E_GMO Cohort Results:

As shown in the tables below, the coefficient of interest (Treatment) is either positive, indicating higher usage per month in the post-period for treatment customers, or not statistically significant at the 90 percent level. Given this, we are not able to estimate statistically significant energy savings effect resulting from members of this cohort participating in the program. As a result, no verified gross kWh savings were given to customers in cohort 202002_e_gmo (no matter when the treatment began in May 2020, March 2021, or February 2022) during PY3.

*Table F-30: 202002_E_GMO (Treatment Start Date in May 2020) Cohort Regression Coefficients – Missouri West*

| Coefficient | Estimate | Std Error | P Value | 5% | 95% |
|---|---|---|---|---|---|
| Treatment | 0.45 | 0.15 | <0.001 | 0.20 | 0.69 |
| Pre-Usage | 0.89 | 0.01 | <0.001 | 0.88 | 0.90 |
| February | -0.68 | 0.69 | 0.33 | -1.82 | 0.46 |
| March | -3.60 | 0.73 | <0.001 | -4.80 | -2.39 |
| April | 3.05 | 0.82 | <0.001 | 1.69 | 4.41 |
| May | 6.32 | 0.91 | <0.001 | 4.82 | 7.82 |
| June | 8.04 | 0.87 | <0.001 | 6.60 | 9.47 |
| July | 8.11 | 0.84 | <0.001 | 6.73 | 9.50 |
| August | 5.44 | 0.81 | <0.001 | 4.10 | 6.77 |
| September | 1.36 | 0.81 | 0.09 | 0.02 | 2.69 |
| October | 2.34 | 0.82 | <0.001 | 0.99 | 3.69 |
| November | 2.55 | 0.72 | <0.001 | 1.36 | 3.73 |
| December | 0.36 | 0.73 | 0.62 | -0.84 | 1.57 |
| February*Pre-Usage | 0.01 | 0.01 | 0.45 | -0.01 | 0.03 |
| March*Pre-Usage | 0.07 | 0.01 | <0.001 | 0.04 | 0.09 |
| April*Pre-Usage | -0.19 | 0.02 | <0.001 | -0.21 | -0.16 |
| May*Pre-Usage | -0.13 | 0.02 | <0.001 | -0.16 | -0.09 |
| June*Pre-Usage | -0.08 | 0.02 | <0.001 | -0.10 | -0.05 |
| July*Pre-Usage | -0.07 | 0.01 | <0.001 | -0.10 | -0.05 |
| August*Pre-Usage | -0.08 | 0.01 | <0.001 | -0.10 | -0.05 |
| September*Pre-Usage | -0.14 | 0.02 | <0.001 | -0.16 | -0.11 |
| October*Pre-Usage | -0.23 | 0.02 | <0.001 | -0.26 | -0.20 |
| November*Pre-Usage | -0.14 | 0.01 | <0.001 | -0.16 | -0.12 |
| December*Pre-Usage | 0.03 | 0.01 | 0.02 | 0.01 | 0.05 |
| Adjusted R-Squared: 0.6143, P-value: <0.001 | | | | | |

## *Table F-31: 202002_E_GMO (Treatment start date in March 2021) Cohort Regression Coefficients – Missouri West*

| Coefficient | Estimate | Std Error | P Value | 5% | 95% |
|---|---|---|---|---|---|
| Treatment | -0.08 | 0.10 | 0.37 | -0.24 | 0.07 |
| Pre-Usage | 0.85 | 0.01 | <0.001 | 0.84 | 0.86 |
| February | 4.18 | 0.43 | <0.001 | 3.47 | 4.89 |
| April | 4.41 | 0.51 | <0.001 | 3.57 | 5.25 |
| May | 7.09 | 0.51 | <0.001 | 6.25 | 7.93 |
| June | 4.80 | 0.51 | <0.001 | 3.96 | 5.64 |
| July | 4.47 | 0.53 | <0.001 | 3.61 | 5.34 |
| August | 3.63 | 0.52 | <0.001 | 2.77 | 4.50 |
| September | 2.68 | 0.52 | <0.001 | 1.82 | 3.55 |
| October | 2.16 | 0.52 | <0.001 | 1.31 | 3.01 |
| November | -0.99 | 0.46 | 0.03 | -1.74 | -0.23 |
| December | -0.49 | 0.43 | 0.26 | -1.20 | 0.22 |
| February*Pre-Usage | -0.24 | 0.01 | <0.001 | -0.26 | -0.23 |
| April*Pre-Usage | -0.13 | 0.02 | <0.001 | -0.16 | -0.11 |
| May*Pre-Usage | -0.16 | 0.01 | <0.001 | -0.18 | -0.13 |
| June*Pre-Usage | -0.06 | 0.01 | <0.001 | -0.08 | -0.04 |
| July*Pre-Usage | 0.01 | 0.01 | 0.17 | 0.00 | 0.03 |
| August*Pre-Usage | 0.01 | 0.01 | 0.23 | 0.00 | 0.03 |
| September*Pre-Usage | 0.01 | 0.01 | 0.60 | -0.01 | 0.03 |
| October*Pre-Usage | -0.14 | 0.01 | <0.001 | -0.17 | -0.12 |
| November*Pre-Usage | 0.06 | 0.01 | <0.001 | 0.04 | 0.08 |
| December*Pre-Usage | 0.08 | 0.01 | <0.001 | 0.06 | 0.09 |
| Adjusted R-Squared: 0.6788, P-value: <0.001 | | | | | |

*Table F-32: 202002_E_GMO (Treatment start date in February 2022) Cohort Regression Coefficients – Missouri West*

| Coefficient | Estimate | Std Error | P Value | 5% | 95% |
|---|---|---|---|---|---|
| Treatment | 0.21 | 0.08 | 0.01 | 0.07 | 0.35 |
| Pre-Usage | 0.47 | 0.64 | 0.46 | -0.58 | 1.53 |
| April | 2.51 | 19.86 | 0.90 | -30.17 | 35.18 |
| May | 3.64 | 19.87 | 0.85 | -29.03 | 36.32 |
| June | 1.64 | 19.87 | 0.93 | -31.03 | 34.32 |
| July | 1.76 | 19.87 | 0.93 | -30.91 | 34.44 |
| August | -1.24 | 19.87 | 0.95 | -33.92 | 31.43 |
| September | -1.22 | 19.87 | 0.95 | -33.89 | 31.46 |
| October | -2.47 | 19.87 | 0.90 | -35.15 | 30.20 |
| November | -4.28 | 19.86 | 0.83 | -36.96 | 28.39 |
| December | -5.21 | 19.86 | 0.79 | -37.89 | 27.46 |
| April*Pre-Usage | 0.29 | 0.64 | 0.65 | -0.77 | 1.34 |
| May*Pre-Usage | 0.33 | 0.64 | 0.61 | -0.73 | 1.38 |
| June*Pre-Usage | 0.42 | 0.64 | 0.51 | -0.64 | 1.48 |
| July*Pre-Usage | 0.45 | 0.64 | 0.48 | -0.61 | 1.51 |
| August*Pre-Usage | 0.36 | 0.64 | 0.58 | -0.70 | 1.41 |
| September*Pre-Usage | 0.30 | 0.64 | 0.64 | -0.76 | 1.35 |
| October*Pre-Usage | 0.34 | 0.64 | 0.60 | -0.72 | 1.39 |
| November*Pre-Usage | 0.57 | 0.64 | 0.38 | -0.49 | 1.62 |
| December*Pre-Usage | 0.60 | 0.64 | 0.35 | -0.46 | 1.66 |
| Adjusted R-Squared: 0.7114, P-value: 0.012 | | | | | |

The verified gross kWh savings of the HER Program for this cohort is summarized below by evaluation period and program year. The number of customers used to calculate total verified kWh savings is the number of weighted treatment customers in the post-period, which accounts for the total number of treated days a customer has in the post-period.

### *Missouri Metro Results*

This section describes the linear regression results, double counting adjustments, and final household and program-level savings for each cohort within the Missouri Metro jurisdiction.

**201407_E_High_Users Cohort Results:**

As shown in the table below, the coefficient of interest (Treatment) is negative, indicating lower usage per month in the post-period for treatment customers. In addition, this coefficient is statically significant at the 90 percent level. This indicates a statistically significant energy savings effect resulting from members of this cohort participating in the program.

*Table F-33: 201407_E_High_Users Cohort Regression Coefficients – Missouri Metro*

| Coefficient | Estimate | Std Error | P Value | 5% | 95% |
|---|---|---|---|---|---|
| Treatment | -0.63 | 0.05 | <0.001 | -0.71 | -0.54 |
| Pre-Usage | 0.60 | 0.00 | <0.001 | 0.60 | 0.61 |
| February | -0.31 | 0.16 | 0.05 | -0.57 | -0.05 |
| March | -2.11 | 0.16 | <0.001 | -2.37 | -1.85 |
| April | -2.92 | 0.16 | <0.001 | -3.19 | -2.65 |
| May | -0.59 | 0.17 | <0.001 | -0.86 | -0.31 |
| June | 6.42 | 0.20 | <0.001 | 6.08 | 6.75 |
| July | 6.61 | 0.18 | <0.001 | 6.32 | 6.91 |
| August | 3.60 | 0.18 | <0.001 | 3.31 | 3.89 |
| September | -0.34 | 0.17 | 0.05 | -0.63 | -0.06 |
| October | -2.35 | 0.17 | <0.001 | -2.63 | -2.08 |
| November | -1.77 | 0.16 | <0.001 | -2.04 | -1.51 |
| December | -0.39 | 0.16 | 0.02 | -0.65 | -0.12 |
| February*Pre-Usage | 0.00 | 0.00 | 0.45 | -0.01 | 0.00 |
| March*Pre-Usage | 0.07 | 0.00 | <0.001 | 0.06 | 0.08 |
| April*Pre-Usage | 0.13 | 0.01 | <0.001 | 0.12 | 0.14 |
| May*Pre-Usage | 0.09 | 0.00 | <0.001 | 0.08 | 0.10 |
| June*Pre-Usage | 0.12 | 0.01 | <0.001 | 0.11 | 0.13 |
| July*Pre-Usage | 0.11 | 0.00 | <0.001 | 0.11 | 0.12 |
| August*Pre-Usage | 0.07 | 0.00 | <0.001 | 0.06 | 0.08 |
| September*Pre-Usage | 0.03 | 0.00 | <0.001 | 0.02 | 0.04 |
| October*Pre-Usage | 0.06 | 0.01 | <0.001 | 0.05 | 0.07 |
| November*Pre-Usage | 0.05 | 0.00 | <0.001 | 0.05 | 0.06 |
| December*Pre-Usage | 0.02 | 0.00 | <0.001 | 0.01 | 0.02 |
| Adjusted R-Squared: 0.5381, P-value: <0.001 | | | | | |

The verified gross kWh savings of the HER program for this cohort is summarized below by evaluation period and program year. The number of customers used to calculate total verified kWh savings is the number of weighted treatment customers in the post-period, which accounts for the total number of treated days a customer has in the post-period.

*Table F-34: 201407_E_High_Users Cohort Verified Annual kWh Savings – Missouri Metro*

| Cohort | Annual Unadjusted Savings Per Home (kWh/year) | Double Counted Savings Adjustment (kWh/year) | Annual Adjusted Savings Per Home (kWh/year) | Annual Control Group Usage Per Home (kWh/year) | Annual Percent Savings Per Home |
|---|---|---|---|---|---|
| 201407_e_high_users | 229.67 | -3.81 | 225.86 | 11,103.27 | 2.03% |

This cohort displayed 2.03 percent annual household savings for PY3. The double-counted savings adjustment decreased the annual household savings because the treatment group for this cohort exhibited greater annual savings due to downstream participation than the control group (see Table F-18). After adjusting for cross-participant savings found in the HCHC, IEMF, PAYS, and RDR programs, average annual household savings for treated customers in this cohort was 225.86 kWh.

### 201503_E_KMO Cohort Results:

As shown in the table below, the coefficient of interest (Treatment) is positive, indicating higher usage per month in the post-period for treatment customers. However, the coefficient is not statically significant (at the 90 percent level). Given this, we are not able to estimate with confidence any impact that participating in the program had on energy usage. As a result, no verified gross kWh savings were given to customers in cohort 201503_e_kmo during PY3.

*Table F-35: 201503_E_KMO Cohort Regression Coefficients – Missouri Metro*

| Coefficient | Estimate | Std Error | P Value | 5% | 95% |
|---|---|---|---|---|---|
| Treatment | 0.08 | 0.13 | 0.51 | -0.13 | 0.29 |
| Pre-Usage | 0.70 | 0.01 | <0.001 | 0.68 | 0.71 |
| February | -0.14 | 0.70 | 0.84 | -1.29 | 1.01 |
| March | 0.01 | 0.56 | 0.99 | -0.91 | 0.93 |
| April | -2.32 | 0.58 | <0.001 | -3.29 | -1.36 |
| May | -0.28 | 0.60 | 0.64 | -1.27 | 0.71 |
| June | 4.76 | 0.62 | <0.001 | 3.75 | 5.78 |
| July | 6.98 | 0.63 | <0.001 | 5.94 | 8.02 |
| August | 3.40 | 0.64 | <0.001 | 2.35 | 4.44 |
| September | -0.28 | 0.62 | 0.65 | -1.30 | 0.74 |
| October | -2.83 | 0.61 | <0.001 | -3.83 | -1.83 |
| November | -1.08 | 0.57 | 0.06 | -2.02 | -0.13 |
| December | 0.57 | 0.58 | 0.33 | -0.39 | 1.52 |
| February*Pre-Usage | 0.00 | 0.02 | 0.99 | -0.03 | 0.03 |
| March*Pre-Usage | -0.05 | 0.02 | <0.001 | -0.08 | -0.03 |
| April*Pre-Usage | 0.07 | 0.02 | <0.001 | 0.04 | 0.10 |
| May*Pre-Usage | 0.05 | 0.02 | 0.01 | 0.02 | 0.08 |
| June*Pre-Usage | 0.09 | 0.02 | <0.001 | 0.06 | 0.11 |
| July*Pre-Usage | 0.11 | 0.02 | <0.001 | 0.08 | 0.14 |
| August*Pre-Usage | 0.04 | 0.02 | 0.01 | 0.01 | 0.07 |
| September*Pre-Usage | 0.09 | 0.02 | <0.001 | 0.06 | 0.13 |
| October*Pre-Usage | 0.06 | 0.02 | <0.001 | 0.03 | 0.10 |
| November*Pre-Usage | -0.03 | 0.02 | 0.05 | -0.06 | -0.01 |
| December*Pre-Usage | -0.04 | 0.02 | 0.03 | -0.06 | -0.01 |
| Adjusted R-Squared: 0.4932, P-value: <0.001 | | | | | |

**201607_E_KMO Cohort Results:**

As shown in the table below, the coefficient of interest (Treatment) is negative, indicating lower usage per month in the post-period for treatment customers. In addition, this coefficient is statically significant at the 90 percent level. This indicates a statistically significant energy savings effect resulting from members of this cohort participating in the program.

*Table F-36: 201607_E_KMO Cohort Regression Coefficients – Missouri Metro*

| Coefficient | Estimate | Std Error | P Value | 5% | 95% |
|---|---|---|---|---|---|
| Treatment | -0.73 | 0.09 | <0.001 | -0.88 | -0.58 |
| Pre-Usage | 0.81 | 0.01 | <0.001 | 0.80 | 0.82 |
| February | -0.36 | 0.32 | 0.26 | -0.89 | 0.17 |
| March | -1.88 | 0.32 | <0.001 | -2.41 | -1.35 |
| April | -2.29 | 0.33 | <0.001 | -2.83 | -1.75 |
| May | -0.62 | 0.34 | 0.07 | -1.17 | -0.06 |
| June | 3.13 | 0.41 | <0.001 | 2.47 | 3.80 |
| July | 3.29 | 0.35 | <0.001 | 2.71 | 3.87 |
| August | 1.88 | 0.35 | <0.001 | 1.31 | 2.46 |
| September | 0.34 | 0.34 | 0.32 | -0.22 | 0.90 |
| October | -1.52 | 0.34 | <0.001 | -2.08 | -0.96 |
| November | -0.88 | 0.33 | 0.01 | -1.42 | -0.34 |
| December | 0.29 | 0.33 | 0.38 | -0.26 | 0.83 |
| February*Pre-Usage | 0.08 | 0.01 | <0.001 | 0.07 | 0.10 |
| March*Pre-Usage | 0.19 | 0.01 | <0.001 | 0.18 | 0.21 |
| April*Pre-Usage | 0.19 | 0.01 | <0.001 | 0.17 | 0.21 |
| May*Pre-Usage | 0.10 | 0.01 | <0.001 | 0.08 | 0.12 |
| June*Pre-Usage | 0.02 | 0.01 | 0.15 | 0.00 | 0.04 |
| July*Pre-Usage | 0.04 | 0.01 | <0.001 | 0.03 | 0.06 |
| August*Pre-Usage | 0.03 | 0.01 | <0.001 | 0.02 | 0.05 |
| September*Pre-Usage | 0.02 | 0.01 | 0.12 | 0.00 | 0.03 |
| October*Pre-Usage | 0.08 | 0.01 | <0.001 | 0.06 | 0.10 |
| November*Pre-Usage | 0.10 | 0.01 | <0.001 | 0.09 | 0.12 |
| December*Pre-Usage | 0.04 | 0.01 | <0.001 | 0.03 | 0.06 |
| Adjusted R-Squared: 0.5937, P-value: <0.001 | | | | | |

The verified gross kWh savings of the HER Program for this cohort is summarized below by evaluation period and program year. The number of customers used to calculate total verified kWh savings is the number of weighted treatment customers in the post-period, which accounts for the total number of treated days a customer has in the post-period.

*Table F-37: 201607_E_KMO Cohort Verified Annual kWh Savings – Missouri Metro*

| Cohort | Annual Unadjusted Savings Per Home (kWh/year) | Double Counted Savings Adjustment (kWh/year) | Annual Adjusted Savings Per Home (kWh/year) | Annual Control Group Usage Per Home (kWh/year) | Annual Percent Savings Per Home |
|---|---|---|---|---|---|
| 201607_e_kmo | 267.17 | -6.72 | 260.45 | 10,173.42 | 2.56% |

This cohort displayed 2.56 percent annual household savings for PY3. The double-counted savings adjustment decreased the annual household savings because the treatment group for this cohort exhibited greater annual savings due to downstream participation than the control group (see Table F-18). After adjusting for cross-participant savings found in the HCHC, IEMF, PAYS, and RDR programs, average annual household savings for treated customers in this cohort was 260.45 kWh.

### 202002_E_KMO Cohort Results:

As shown in the table below, the coefficient of interest (Treatment) is negative, indicating lower usage per month in the post-period for treatment customers. In addition, this coefficient is statically significant at the 90 percent level. This indicates a statistically significant energy savings effect resulting from members of this cohort participating in the program.

### *Table F-38: 202002_E_KMO (Treatment started in May 2020) Cohort Fixed-Effects Regression Coefficients – Missouri Metro*

| Coefficient | Estimate | Std Error | P Value | 5% | 95% |
|---|---|---|---|---|---|
| Treatment | -0.21 | 0.07 | <0.001 | -0.33 | -0.09 |
| Pre-Usage | 0.81 | 0.00 | <0.001 | 0.80 | 0.81 |
| February | -0.88 | 0.37 | 0.02 | -1.48 | -0.28 |
| March | -4.74 | 0.39 | <0.001 | -5.38 | -4.10 |
| April | 0.07 | 0.46 | 0.89 | -0.69 | 0.82 |
| May | 1.98 | 0.44 | <0.001 | 1.26 | 2.70 |
| June | 3.33 | 0.44 | <0.001 | 2.61 | 4.05 |
| July | 3.64 | 0.45 | <0.001 | 2.90 | 4.37 |
| August | 1.34 | 0.44 | <0.001 | 0.61 | 2.06 |
| September | -0.67 | 0.44 | 0.12 | -1.39 | 0.05 |
| October | 0.84 | 0.44 | 0.06 | 0.10 | 1.57 |
| November | 1.51 | 0.38 | <0.001 | 0.88 | 2.13 |
| December | 0.89 | 0.39 | 0.02 | 0.25 | 1.52 |
| February*Pre-Usage | 0.02 | 0.01 | 0.01 | 0.01 | 0.03 |
| March*Pre-Usage | 0.09 | 0.01 | <0.001 | 0.08 | 0.10 |
| April*Pre-Usage | -0.11 | 0.01 | <0.001 | -0.13 | -0.09 |
| May*Pre-Usage | -0.04 | 0.01 | <0.001 | -0.06 | -0.02 |
| June*Pre-Usage | 0.03 | 0.01 | <0.001 | 0.02 | 0.05 |
| July*Pre-Usage | 0.02 | 0.01 | 0.01 | 0.01 | 0.03 |
| August*Pre-Usage | 0.00 | 0.01 | 0.64 | -0.01 | 0.02 |
| September*Pre-Usage | -0.11 | 0.01 | <0.001 | -0.12 | -0.10 |
| October*Pre-Usage | -0.21 | 0.01 | <0.001 | -0.23 | -0.20 |
| November*Pre-Usage | -0.12 | 0.01 | <0.001 | -0.13 | -0.11 |
| December*Pre-Usage | 0.01 | 0.01 | 0.19 | 0.00 | 0.02 |
| Adjusted R-Squared: 0.5801, P-value: <0.001 | | | | | |

*Table F-39: 202002_E_KMO (Treatment started in March 2021) Cohort Fixed-Effects Regression Coefficients – Missouri Metro*

| Coefficient | Estimate | Std Error | P Value | 5% | 95% |
|---|---|---|---|---|---|
| Treatment | -0.19 | 0.07 | 0.01 | -0.32 | -0.07 |
| Pre-Usage | 0.71 | 0.01 | <0.001 | 0.70 | 0.72 |
| February | 1.60 | 0.41 | <0.001 | 0.92 | 2.28 |
| March | 7.80 | 8.06 | 0.33 | -5.45 | 21.05 |
| April | 4.56 | 0.46 | <0.001 | 3.80 | 5.31 |
| May | 4.16 | 0.47 | <0.001 | 3.38 | 4.94 |
| June | 2.52 | 0.47 | <0.001 | 1.75 | 3.28 |
| July | 2.96 | 0.47 | <0.001 | 2.18 | 3.74 |
| August | 1.88 | 0.47 | <0.001 | 1.10 | 2.66 |
| September | 1.30 | 0.48 | 0.01 | 0.52 | 2.08 |
| October | 1.84 | 0.47 | <0.001 | 1.06 | 2.62 |
| November | 0.39 | 0.42 | 0.35 | -0.30 | 1.07 |
| December | 0.85 | 0.39 | 0.03 | 0.21 | 1.50 |
| February*Pre-Usage | -0.15 | 0.01 | <0.001 | -0.17 | -0.14 |
| March*Pre-Usage | -0.39 | 0.46 | 0.41 | -1.15 | 0.38 |
| April*Pre-Usage | -0.21 | 0.02 | <0.001 | -0.24 | -0.18 |
| May*Pre-Usage | -0.09 | 0.01 | <0.001 | -0.11 | -0.06 |
| June*Pre-Usage | 0.02 | 0.01 | 0.04 | 0.00 | 0.04 |
| July*Pre-Usage | 0.10 | 0.01 | <0.001 | 0.08 | 0.11 |
| August*Pre-Usage | 0.08 | 0.01 | <0.001 | 0.07 | 0.10 |
| September*Pre-Usage | 0.06 | 0.01 | <0.001 | 0.04 | 0.08 |
| October*Pre-Usage | -0.16 | 0.02 | <0.001 | -0.18 | -0.13 |
| November*Pre-Usage | -0.01 | 0.01 | 0.36 | -0.03 | 0.01 |
| December*Pre-Usage | 0.02 | 0.01 | 0.06 | 0.00 | 0.04 |
| Adjusted R-Squared: 0.5628, P-value: <0.001 | | | | | |

*Table F-40: 202002_E_KMO (Treatment started in February 2022) Cohort Fixed-Effects Regression Coefficients – Missouri Metro*

| Coefficient | Estimate | Std Error | P Value | 5% | 95% |
|---|---|---|---|---|---|
| Treatment | -0.19 | 0.06 | <0.001 | -0.30 | -0.08 |
| Pre-Usage | 0.45 | 0.78 | 0.56 | -0.82 | 1.73 |
| April | -5.15 | 17.39 | 0.77 | -33.76 | 23.46 |
| May | -2.96 | 17.39 | 0.86 | -31.57 | 25.65 |
| June | -5.21 | 17.39 | 0.76 | -33.82 | 23.41 |
| July | -6.17 | 17.39 | 0.72 | -34.79 | 22.44 |
| August | -7.69 | 17.39 | 0.66 | -36.31 | 20.92 |
| September | -8.29 | 17.39 | 0.63 | -36.90 | 20.32 |
| October | -9.37 | 17.39 | 0.59 | -37.98 | 19.24 |
| November | -9.26 | 17.39 | 0.59 | -37.87 | 19.35 |
| December | -9.92 | 17.39 | 0.57 | -38.53 | 18.69 |
| April*Pre-Usage | 0.23 | 0.78 | 0.76 | -1.04 | 1.51 |
| May*Pre-Usage | 0.27 | 0.78 | 0.72 | -1.00 | 1.55 |
| June*Pre-Usage | 0.41 | 0.78 | 0.60 | -0.87 | 1.69 |
| July*Pre-Usage | 0.47 | 0.78 | 0.55 | -0.81 | 1.74 |
| August*Pre-Usage | 0.33 | 0.78 | 0.67 | -0.94 | 1.61 |
| September*Pre-Usage | 0.27 | 0.78 | 0.72 | -1.00 | 1.55 |
| October*Pre-Usage | 0.30 | 0.78 | 0.70 | -0.98 | 1.57 |
| November*Pre-Usage | 0.45 | 0.78 | 0.57 | -0.83 | 1.72 |
| December*Pre-Usage | 0.48 | 0.78 | 0.53 | -0.79 | 1.76 |
| Adjusted R-Squared: 0.6690, P-value: <0.001 | | | | | |

The verified gross kWh savings of HER Program for this cohort is summarized below by evaluation period and program year. The number of customers used to calculate total verified kWh savings is the number of weighted treatment customers in the post-period, which accounts for the total number of treated days a customer has in the post-period.

*Table F-41: 202002_E_KMO Cohort Verified Annual kWh Savings – Missouri Metro*

| Cohort | Annual Unadjusted Savings Per Home (kWh/year) | Annual Double Counted Savings Per Home (kWh/year) | Annual Adjusted Savings Per Home (kWh/year) | Annual Control Group Usage Per Home (kWh/year) | Annual Percent Savings Per Home |
|---|---|---|---|---|---|
| 202002_e_kmo | 72.36 | -5.95 | 66.41 | 13,909.18 | 0.48% |

This cohort displayed 0.48 percent annual household savings for PY3. The double-counted savings adjustment decreased the annual household savings because the treatment group for this cohort exhibited greater annual savings due to downstream participation than the control group (see Table F-18). After adjusting for cross-participant savings found in the HCHC, IEMF, PAYS, and RDR programs, average annual household savings for treated customers in this cohort was 66.41 kWh.

### *Missouri Metro (Low-Income) Results*

This section describes the linear regression results, double counting adjustments, and final household and program-level savings for each cohort within the MO Metro Low-Income jurisdiction.

#### 201407_E_Low_Income Cohort Results:

As shown in the table below, the coefficient of interest (Treatment) is negative, indicating lower usage per month in the post-period for treatment customers. In addition, this coefficient is statically significant at the 90 percent level. This indicates a statistically significant energy savings effect resulting from members of this cohort participating in the program.

*Table F-42: 201407_E_Low_Income Cohort Regression Coefficients – Missouri Metro (Low-Income)*

| Coefficient | Estimate | Std Error | P Value | 5% | 95% |
|---|---|---|---|---|---|
| Treatment | -0.60 | 0.08 | <0.001 | -0.73 | -0.46 |
| Pre-Usage | 0.56 | 0.01 | <0.001 | 0.55 | 0.57 |
| February | -0.62 | 0.37 | 0.10 | -1.23 | -0.01 |
| March | -2.44 | 0.37 | <0.001 | -3.05 | -1.83 |
| April | -4.04 | 0.40 | <0.001 | -4.69 | -3.38 |
| May | -0.20 | 0.42 | 0.63 | -0.88 | 0.48 |
| June | 6.72 | 0.51 | <0.001 | 5.87 | 7.56 |
| July | 7.88 | 0.44 | <0.001 | 7.16 | 8.59 |
| August | 5.11 | 0.43 | <0.001 | 4.39 | 5.82 |
| September | 0.57 | 0.43 | 0.18 | -0.13 | 1.28 |
| October | -2.59 | 0.42 | <0.001 | -3.28 | -1.91 |
| November | -1.93 | 0.38 | <0.001 | -2.56 | -1.30 |
| December | -0.51 | 0.38 | 0.19 | -1.14 | 0.12 |
| February*Pre-Usage | 0.01 | 0.01 | 0.55 | -0.01 | 0.02 |
| March*Pre-Usage | 0.08 | 0.01 | <0.001 | 0.06 | 0.10 |
| April*Pre-Usage | 0.17 | 0.01 | <0.001 | 0.14 | 0.19 |
| May*Pre-Usage | 0.05 | 0.01 | <0.001 | 0.02 | 0.07 |
| June*Pre-Usage | 0.10 | 0.01 | <0.001 | 0.07 | 0.12 |
| July*Pre-Usage | 0.07 | 0.01 | <0.001 | 0.05 | 0.09 |
| August*Pre-Usage | 0.02 | 0.01 | 0.03 | 0.01 | 0.04 |
| September*Pre-Usage | -0.01 | 0.01 | 0.20 | -0.03 | 0.00 |
| October*Pre-Usage | 0.04 | 0.01 | <0.001 | 0.02 | 0.07 |
| November*Pre-Usage | 0.06 | 0.01 | <0.001 | 0.04 | 0.08 |
| December*Pre-Usage | 0.02 | 0.01 | 0.02 | 0.01 | 0.04 |
| Adjusted R-Squared: 0.4029, P-value: <0.001 | | | | | |

The verified gross kWh savings of the HER Program for this cohort is summarized below by evaluation period and program year. The number of customers used to calculate total verified kWh savings is the number of weighted treatment customers in the post-period, which accounts for the total number of treated days a customer has in the post-period.

*Table F-43: 201407_E_Low_Income Cohort Verified Annual kWh Savings – Missouri Metro (Low-Income)*

| Cohort | Annual Unadjusted Savings Per Home (kWh/year) | Double Counted Savings Adjustment (kWh/year) | Annual Adjusted Savings Per Home (kWh/year) | Annual Control Group Usage Per Home (kWh/year) | Annual Percent Savings Per Home |
|---|---|---|---|---|---|
| 201407_e_low_income | 217.59 | -6.28 | 211.31 | 10,986.86 | 1.92% |

This cohort displayed 1.92 percent annual household savings for PY3. The double-counted savings adjustment decreased the annual household savings because the treatment group for this cohort exhibited greater annual savings due to downstream participation than the control group (see Table F-18). After adjusting for cross-participant savings found in the HCHC, IEMF, PAYS, and RDR programs, average annual household savings for treated customers in this cohort was 211.31 kWh.

### *Aggregated Cohort Results*

Positive, statistically significant savings are presented for all cohorts evaluated. Regression results were adjusted with double counted savings from the downstream programs to arrive at the final program savings estimate. The following tables summarize each cohort’s annual household energy savings impact for PY3.

*Table F-44: Program Savings Summary by Cohort – Missouri West*

| Cohort | Weighted Customers | Annual Adjusted Household Savings (kWh) | Program Savings (kWh) |
|---|---|---|---|
| 201309_e_gmo | 27,128 | 260.59 | 7,069,355 |
| 201503_e_gmo | 7,462 | 180.68 | 1,348,253 |
| 201604_e_gmo | 39,933 | 160.91 | 6,425,793 |
| 201706_e_gmo | 12,128 | 143.37 | 1,738,814 |
| 201904_e_gmo | 30,468 | 93.36 | 2,844,652 |
| 202002_e_gmo | 27,800 | 0.00 | 0 |
| **Total** | **144,919** | **-** | **19,426,866** |

*Table F-45: Program Savings Summary by Cohort – Missouri Metro*

| Cohort | Weighted Customers | Annual Adjusted Household Savings (kWh) | Program Savings (kWh) |
|---|---|---|---|
| 201407_e_high_users | 45,389 | 225.86 | 10,251,455 |
| 201503_e_kmo | 2,744 | 0.00 | 0 |
| 201607_e_kmo | 5,913 | 260.45 | 1,540,103 |
| 202002_e_kmo | 33,322 | 66.41 | 2,212,829 |
| **Total** | **87,367** | **-** | **14,004,386** |

*Table F-46: Program Savings Summary – Missouri Metro (Low-Income)*

| Cohort | Weighted Customers | Annual Adjusted Household Savings (kWh) | Program Savings (kWh) |
|---|---|---|---|
| 201407_e_low_income | 7,517 | 211.31 | 1,588,363 |

### F.3.5 Demand Savings

Demand savings were estimated for each of the cohorts using the methodology presented in Section F.2. The following table displays the calculation of the demand savings for each cohort. Note that cohort kcpl_201503_e_kmo and kcpl_202002_e_gmo were not included, as no statistically significant savings could be estimated for it in PY3.

*Table F-47: Demand Savings by Cohort*

| Cohort | Savings in August (kWh) | Hours in August | Multiplier | Demand Savings per Household (kW) | Weighted Treatment Customers | Verified Demand Savings (kW) |
|---|---|---|---|---|---|---|
| kcpl_201309_e_gmo | 21.72 | 744 | 1.5 | 0.044 | 27,128 | 1,187.73 |
| kcpl_201503_e_gmo | 15.06 | 744 | 1.5 | 0.030 | 7,462 | 226.52 |
| kcpl_201604_e_gmo | 13.41 | 744 | 1.5 | 0.027 | 39,933 | 1,079.60 |
| kcpl_her_201706_e_gmo | 11.95 | 744 | 1.5 | 0.024 | 12,128 | 292.14 |
| kcpl_her_201904_e_gmo | 7.78 | 744 | 1.5 | 0.016 | 30,468 | 477.93 |
| kcpl_201407_e_high_users | 18.82 | 744 | 1.5 | 0.038 | 45,389 | 1,722.36 |
| kcpl_201607_e_kmo | 21.70 | 744 | 1.5 | 0.044 | 5,913 | 258.75 |
| kcpl_her_202002_e_kmo | 5.53 | 744 | 1.5 | 0.011 | 33,322 | 371.78 |
| kcpl_201407_e_low_income | 17.61 | 744 | 1.5 | 0.036 | 7,517 | 266.86 |
| **Total** | **-** | **-** | **-** | **-** | **209,260** | **5,883.68** |

The following table summarizes the verified demand savings compared to the expected demand savings for each cohort in the HER Program.

*Table F-48: Reported and Verified Demand Savings by Cohort*

| Cohort | Reported Demand Savings (kW) | Verified Demand Savings (kW) | Verified kW Realization Rate |
|---|---|---|---|
| kcpl_201309_e_gmo | 699.14 | 1,187.73 | 170% |
| kcpl_201503_e_gmo | 96.96 | 226.52 | 234% |
| kcpl_201604_e_gmo | 705.28 | 1,079.60 | 153% |
| kcpl_her_201706_e_gmo | 217.93 | 292.14 | 134% |
| kcpl_her_201904_e_gmo | 410.82 | 477.93 | 116% |
| kcpl_her_202002_e_gmo | -110.01 | - | - |
| kcpl_201407_e_high_users | 1399.46 | 1,722.36 | 123% |
| kcpl_201503_e_kmo | 86.74 | - | 0% |
| kcpl_201607_e_kmo | 91.60 | 258.75 | 282% |
| kcpl_her_202002_e_kmo | 178.69 | 371.78 | 208% |
| kcpl_201407_e_low_income | 112.93 | 266.86 | 236% |
| **Total** | **3,889.53** | **5,883.68** | **151%** |

### F.3.6 Attrition Analysis

ADM estimated the cumulative number of treatment and control group customer move-outs by month and cohort. The following table displays the total move-out rate for all cohorts. Attrition since inception for the entire program was 53.02 percent. This rate is within the normal range, given the duration the HERs Program has been implemented. However, attrition during PY3 was 6.07 percent.

*Table F-49: Program Moveout Rates by Program Year*

| Period | Treatment Customers | Control Customers | Treatment Moveout Percent | Control Moveout Percent |
|---|---:|---:|---:|---:|
| 2022 | 28,308 | 11,595 | 6.07 | 6.82 |
| Since Inception | 247,060 | 92,426 | 53.02 | 54.34 |

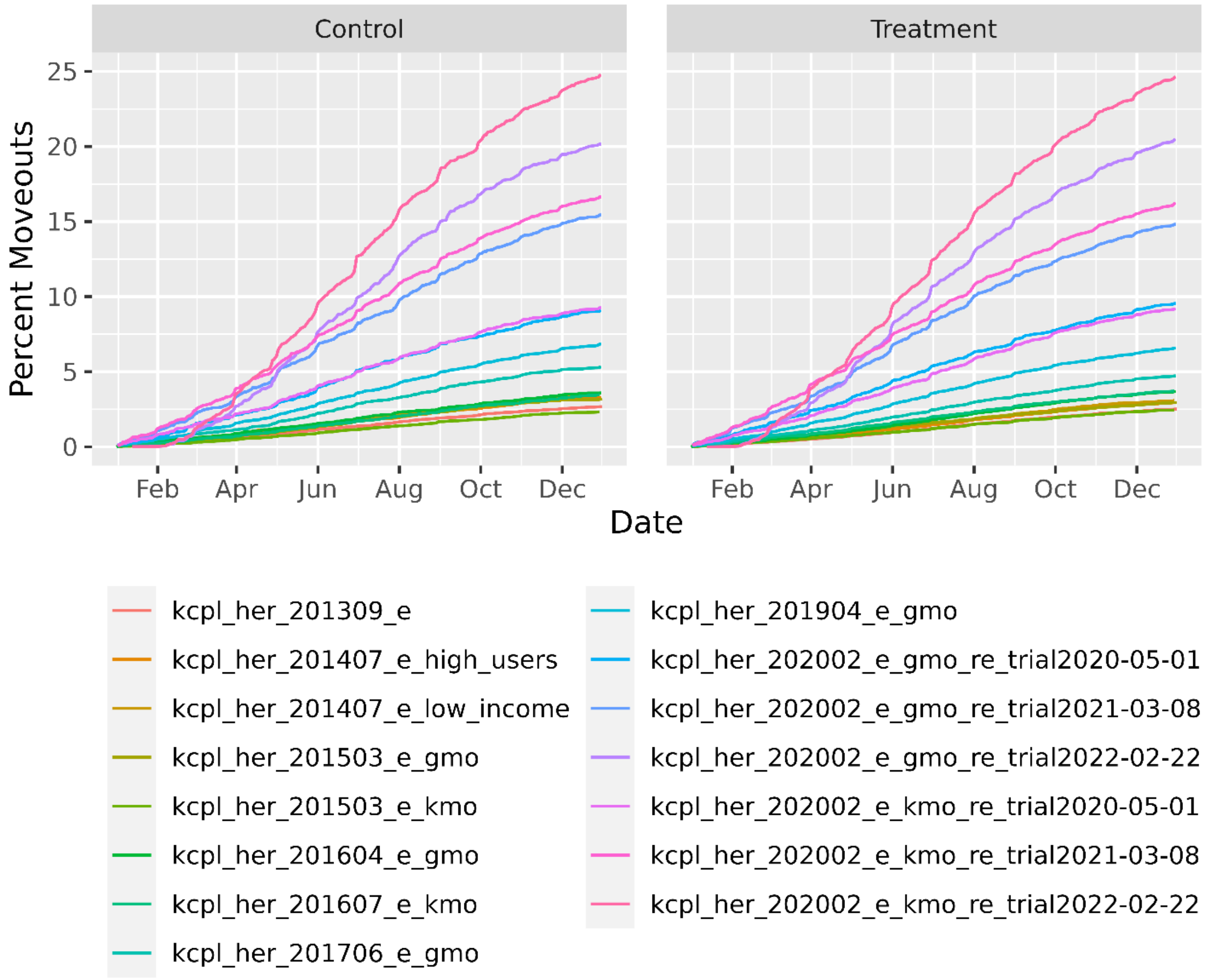
The move-out rates for each cohort during the PY3 range between roughly 2 percent and 25 percent. The two most recently formed cohorts, 202002_e_gmo and 202002_e_kmo, have move-out rates that are proportionately much larger than the corresponding rates for the other cohorts. In addition, customers with later treatment start dates within the same cohort also had a higher move-out rates. The move-out rates for each cohort in PY3 are summarized in Table F-50.

*Table F-50: Move-out Rates by Cohort*

| Cohort | | Treatment Customers | Control Customers | Treatment Move-out Customers | Control Move-out Customers | Treatment Move-out Percent | Control Move-out Percent |
|---|---|---|---|---|---|---|---|
| 201309_e_gmo | | 59,293 | 29,763 | 1,489 | 796 | 2.51% | 2.67% |
| 201407_e_high_users | | 91,342 | 12,204 | 2,698 | 402 | 2.95% | 3.29% |
| 201407_e_low_income | | 20,373 | 12,215 | 628 | 430 | 3.08% | 3.52% |
| 201503_e_gmo | | 13,239 | 9,655 | 391 | 307 | 2.95% | 3.18% |
| 201503_e_kmo | | 12,229 | 9,683 | 300 | 226 | 2.45% | 2.33% |
| 201604_e_gmo | | 77,458 | 9,716 | 2,854 | 349 | 3.68% | 3.59% |
| 201607_e_kmo | | 17,334 | 11,122 | 643 | 387 | 3.71% | 3.48% |
| 201706_e_gmo | | 25,024 | 11,606 | 1,182 | 617 | 4.72% | 5.32% |
| 201904_e_gmo | | 59,855 | 23,492 | 3,936 | 1,609 | 6.58% | 6.85% |
| 202002_e_gmo | May 2020 | 9,987 | 3,924 | 953 | 356 | 9.54% | 9.07% |
| | March 2021 | 14,985 | 5,887 | 2,221 | 909 | 14.82% | 15.44% |
| | February 2022 | 14,946 | 5,879 | 3,059 | 1,185 | 20.47% | 20.16% |
| 202002_e_kmo | May 2020 | 19,974 | 9,989 | 1,836 | 925 | 9.19% | 9.26% |
| | March 2021 | 14,982 | 7,496 | 2,432 | 1,247 | 16.23% | 16.64% |
| | February 2022 | 14,956 | 7,471 | 3,686 | 1,850 | 24.65% | 24.76% |

The following figure visualizes the cumulative move-out rates by month for each cohort and each treatment group during PY3.

*Figure F-1: Monthly Move-out Rates by Cohort and Treatment Group*



## F.4 Net Savings Evaluation Findings

For this program, the net savings estimates are equivalent to the gross savings estimates, as the net-to-gross ratio for behavioral programs is 1.00.

## F.5 Impact Evaluation - Final Savings Tables

Based on the impact evaluation results, the total verified net energy savings for the HER Program were 35,019,615 kWh, and the total verified net peak demand savings are 5,883.68 kW. A summary of gross verified energy and demand savings is shown in Table F-51.

*Table F-51: Reported and Verified Gross Energy and Demand Savings*

| Jurisdiction | Reported Energy Savings (kWh) | Reported Demand Reduction (kW) | Verified Energy Savings (kWh) | Verified Demand Reduction (kW) | Verified kWh Realization Rate | Verified kW Realization Rate |
|---|---|---|---|---|---|---|
| MO West | 17,673,336 | 2,020.12 | 19,426,866 | 3,263.93 | 110% | 162% |
| MO Metro | 15,417,818 | 1,756.49 | 14,004,386 | 2,352.89 | 91% | 134% |
| MO Metro Low-Income | 983,931 | 112.93 | 1,588,363 | 266.86 | 161% | 236% |
| **Total** | **34,075,085** | **3,889.53** | **35,019,615** | **5,883.68** | **103%** | **151%** |

## F.6 Conclusions and Recommendations

The following summarizes the key findings of the impact evaluation of the Home Energy Reports Program for PY3:

- The verified program energy savings of 35,019,615 kWh and verified program demand savings of 5,883.68 kW for PY3.
- Cohorts where statistically significant savings could be estimated displayed an average annual electric savings of between 0.48 percent and 2.56 percent of annual billed use. Typical behavioral programs display average annual electric savings between 1 percent and 3 percent.
- The two newest cohorts showed the lowest annual percent savings (one had 0.48 percent for PY3 and the other had no significant savings). Despite this cohort beginning to receive home energy reports in PY1, these cohorts were assigned many customers who were not sent HERs until PY3. It is possible that these customers have simply not had enough time to implement the behavioral changes due to the reports yet. Indeed, behavioral programs must mature.
- ADM estimated downstream double counted savings at -672,360 kWh for PY3. ADM removed this double counted savings from the regression results.
- The total attrition for the program since inception is 53.02 percent. This number is expected to be large due to the number of years the program has been deployed.

The findings from the program and implementer staff interviews, the review of program materials, and the participant and control surveys suggest the following conclusions:

- HERs participants (recipients) and non-participants (controls) are generally satisfied with Evergy and the tools it provides for learning about and reducing energy usage.
- HERs participants generally open reports and pay attention to at least some content, particularly energy saving tips and neighbor comparisons. The HERs' neighbor comparison is a source of report satisfaction but also a primary source of dissatisfaction among those who question the accuracy or basis of the comparison. In particular, some customers believe the report compares their home to others that are different in size, occupancy, fuel types, or other respects. This may partly be because more than half of report recipients do not read the report thoroughly. Recall that thoroughness of report review was strongly related to the belief that the comparison was accurate, which may suggest that belief that the comparisons are inaccurate may stem at least partly from an incomplete understanding of how the comparisons are made. We note that program staff reported that the report was revised to improve readability. However, the percentage of respondents who read at least part of the report content was lower this year than last year. Further research may be needed to determine what drives the thoroughness of report review and how to get customers to read them more thoroughly.
- Less than one-fifth of participants and just over one-quarter of nonparticipants have engaged with the Energy Analyzer. By contrast, large majorities of both groups reported having received both the Weekly Energy Analysis and Rate Coach emails, suggesting that proactive email outreach may be more effective at generating engagement than requiring customers to access the website.
- Respondents reported generally positive attitudes toward all three forms of information, with the Rate Coach receiving the most favorability, followed by Weekly Energy Analysis. This may suggest that the idea of shifting energy usage is perceived more favorably than reducing usage in general.
- Across the board, respondents were more likely to say they like a tool or that it provides useful information than to say it motivates behavior change. This may demonstrate the importance of assessing motivation or intent to engage in the recommended behaviors in addition to assessing attitudes toward the communication or tool.
- Participants and non-participants are generally familiar with Evergy energy efficiency or conservation programs. Familiarity with offerings for heating and cooling and for insulation and air sealing lags behind that for smart thermostats and LED lighting. This may simply reflect the greater number of customers that

may be considering purchase of those items. The levels of awareness of the heating/cooling and insulation/air sealing offerings are on a par with, or even somewhat higher, than the levels often found in program nonparticipant surveys.

The following recommendations are offered for continued improvement of the Home Energy Reports Program:

- **Work with ADM to include more information about when customers stop receiving reports.** Many customers are filtered out of the analysis for not having enough post-period data for the months in PY3. While it is likely that many of these customers are no longer a part of the program, it would be beneficial to include a data field that informs us of exactly when that occurs. This will help ADM perform a more robust data validation process and ensure that no customers are unintentionally removed from the analysis.
- **Evergy and Opower should continue efforts to make the information on home comparisons more salient.** Given that the recent revisions to the report did not result in more thorough review by recipients, Evergy and Opower should consider carrying out additional research to determine what drives the thoroughness of report review and how to get customers to read them more thoroughly.
- **Evergy should consider doing additional research to assess what increases motivation or intent to engage in the recommended behaviors.** That information can be used to increase the effectiveness of its various outreach efforts and tools.
- **If it has not yet done so, Opower may also consider discontinuing the practice of telling recipients (and Energy Analyzer users) they are being compared to their “neighbors”.** A one-mile radius encompasses far more homes than many individuals may consider to be a neighbor. This practice may reinforce an inaccurate interpretation of how the comparison is actually made.

# Appendix G Pay As You Save Program-Specific Methodologies

This chapter describes the evaluation activities that were performed by ADM to evaluate the Pay As You Save (PAYS) Program.

## G.1 Program Overview

The PAYS Program supports the adoption of energy efficient equipment in residential homes by offsetting the upfront cost associated with major home improvements and upgrades. Through the PAYS Program, customers can reduce their monthly electric bills while also making their home more energy efficient. Each project approved through the program is designed to be a cost-effective bundle of upgrades, meaning that the estimated savings on customer's monthly bills from the installation of the upgrades must be more than the cost to install the measures. Customers finance the upgrades through a fixed monthly PAYS charge added to their monthly bills.

In 2022, the PAYS Program financed the installation of energy efficient air conditioners, heat pumps, smart thermostats, ceiling insulation, air sealing, and duct sealing. Program participants also received direct install energy saving measures at no-cost during their initial home audits. These included a variety of light-emitting diode (LED) light bulbs, power strips, pipe insulation, faucet aerators, and low-flow shower heads.

The program ran from January 2022 through September 2022 and was extended through the end of the calendar year. Results presented herein disaggregate the initial program year from the October – December 2022 extension period. Some Evergy customers were "partial participants" who began the enrollment process and received no-cost direct install measures but did not make it through to the financing phase of the program. Savings was still attributed to these direct install measures and these customers were still surveyed. Overall, 377 homes received only direct install measures in 2022 while 158 homes were "full participants" and completed enrollment in the financing offered through the PAYS program.

Table G-1 provides a summary of program metrics for the 2022 PAYS Program. In PY3, overall program costs were $1,307,234.77 ($671,821.76 for Missouri West and $635,413.01 for Missouri Metro). Reported annual energy savings were approximately 30 percent of program projections for 2022. Overall, gross verified energy savings developed through ADM's impact evaluation equaled 94 percent of the reported savings and 102 percent of the reported demand reduction. The net energy savings realization rate was 82 percent while the net demand reduction realization rate was 89 percent.

*Table G-1: Performance Metrics – Pay As You Save Program*

| Metric | PY3 Total | MO West | MO Metro |
|---|---|---|---|
| Number of Projects Completed | 158 | 72 | 86 |
| ***Energy Impacts (kWh)*** | | | |
| Targeted Energy Savings | 4,505,148 | 2,252,574 | 2,252,574 |
| Reported Energy Savings | 1,364,394 | 725,990 | 638,404 |
| Gross Verified Energy Savings | 1,279,831 | 697,713 | 582,118 |
| Net Verified Energy Savings | 1,114,581 | 607,476 | 507,105 |
| ***Peak Demand Impacts (kW)*** | | | |
| Targeted Peak Demand Savings | 1,408.00 | 704.00 | 704.00 |
| Reported Peak Demand Savings | 275.98 | 142.22 | 133.76 |
| Gross Verified Peak Demand Savings | 281.16 | 146.24 | 134.92 |
| Net Verified Peak Demand Savings | 244.91 | 127.47 | 117.44 |
| ***Benefit / Cost Ratios*** | | | |
| Total Resource Cost Test Ratio | 0.28 | 0.29 | 0.26 |

## G.2 EM&V Methodologies

The following section details the methodologies ADM used to verify retail sales, estimate energy and peak demand impacts, and assess the performance for the PAYS program.

## G.3 Data Collection

For 2022, the primary data resource used for M&V review was program tracking data. This tracking data was used as the basis for quantifying participation and assessing program impacts. Tracking data contained the following information used for verification of program savings:

- Measure description
- Measure characteristics (square footage installed, wattage, quantity installed)
- Project dates (direct install date, weatherization upgrade date, HVAC upgrade date, etc.)
- In addition to the program tracking data, ADM received customer billing data for almost all (96 percent) of PAYS participants to support the regression-based impact analysis.

## G.4 Gross Impact Methodology

ADM's analysis included a combination of both regression-based analyses as well as an engineering analysis to determine the verified energy savings for PY3. The overall verification process included the following steps:

1. Data preparation and cleaning, including true-up, calendarization, and combination with weather data;
2. Estimation of monthly and annual billed consumption differences between pre-installation and post-installation of measures via regression modeling;
3. Estimation and removal of cross-participant savings from other programs (uplift); and
4. Engineering analysis validating savings according to the Evergy TRM.

The regression analyses as well as the engineering algorithms used are detailed in Appendix M.4.1.

Three distinct regression models were used to compare participants' pre-installation energy consumption to their post-installation consumption:

1. Mixed-model regressions of groups based on installed measures. Regression grouping consisted of participants with the following:

    a) Air Sealing + Ceiling Insulation measures
    b) Air Sealing + Ceiling Insulation + Air Conditioning measures, and c) Air Sealing + Ceiling Insulation + Heat Pump measures;

2. A full participant mixed-model regression with dummy variables for each measure in the program; and
3. A regression for each customer at the premise level, individually.

The model specification contains customer-specific dummy variables to account for the natural variation in household electricity usage that cannot be explicitly controlled for. The specification of customer specific effects allowed the model to capture much of the baseline differences across customers while obtaining reliable estimates of the impact of participation in the program.

Independent variables, such as CDD and HDD, were included to account for the impact that weather has on energy usage. ADM then fit linear regression models to estimate energy usage differences between pre-installation and post-installation energy consumption.

ADM also compared savings attributed to the retrofit measures installed through the PAYS program by validating savings according to the relevant unit energy savings methodology from the Evergy TRM. ADM's evaluation consisted of:

- Reviewing the assumptions and inputs associated with the deemed savings values
- Verifying that the deemed per-unit impacts were applied appropriately

Algorithms used can be found in Appendix M.4.2. Applied savings values were verified at the measure-level for each project completed through the PAYS program.

## G.5 Process Evaluation Methodology

To inform the process evaluation, ADM's subcontractor, Johnson Consulting, conducted an in-depth interview with program staff at Evergy and the implementation contractor. This interview provided insight into various aspects of the program and its organization. Interviewees also discussed aspects of the program operations that they considered to be successful, and the challenges faced over the course of the program year. Additional program materials, including a sample of home assessment documents, were also reviewed as part of the process evaluation.

ADM also administered an online survey to program participants, including customers considered "near participants" that received direct install measures but did not receive additional, financed upgrades. The survey was used to inform the process evaluation findings, support in-service rates for the impact analysis, and to calculate a net-to-gross ratio for the program.

The results of the process evaluation as well as the survey findings are presented in Section G.9, while survey-derived in-service rates can be found in Section G.6.1 and calculated net-to-gross ratio is reported in Section G.7.

## G.6 Gross Impact Findings

The tracking data compiled by the implementor and provided for the PAYS program identified a total of 10,230 energy efficient measures that were installed during 2022, 7,870 installed during the initial program year (January through September 2022) and 2,360 that were installed during the extension period (October through December 2022).

Table G-2 and Table G-3 show the reported quantities and impacts of each measure installed during the initial program year and the extension period, respectively.

*Table G-2: Reported Quantities and Impacts – Jan. - Sep. 2022*

| Jurisdiction | Measure | Quantity Installed | Reported kWh | Reported kW |
|---|---|---|---|---|
| MO West | Advanced Power Strips | 456 | 46,968 | 5.24 |
| | Air Sealing* | 44 | 36,415 | 6.49 |
| | Bathroom Faucet Aerators | 67 | 1,276 | 2.00 |
| | Ceiling Insulation* | 39 | 17,952 | 3.00 |
| | Central Air Conditioners | 14 | 20,591 | 22.85 |
| | Duct Sealing* | 4 | 4,875 | 0.36 |
| | Heat Pumps | 10 | 80,525 | 15.27 |
| | Kitchen Faucet Aerators | 14 | 529 | 0.11 |
| | LED Light Bulbs | 1,414 | 52,449 | 6.14 |
| | Low Flow Shower Heads | 93 | 19,291 | 2.10 |
| | Pipe Wrap** | 1,363 | 167,871 | 19.22 |
| | Smart Thermostats | 13 | 8,331 | 1.25 |
| | **Sub Total** | **3,531** | **457,073** | **84.04** |
| MO Metro | Advanced Power Strips | 614 | 63,242 | 7.06 |
| | Air Sealing* | 35 | 27,569 | 4.91 |
| | Bathroom Faucet Aerators | 104 | 1,981 | 3.11 |
| | Ceiling Insulation* | 36 | 19,659 | 3.28 |
| | Central Air Conditioners | 13 | 19,547 | 21.64 |
| | Duct Sealing* | 4 | 4,875 | 0.36 |
| | Heat Pumps | 11 | 96,849 | 16.50 |
| | Kitchen Faucet Aerators | 16 | 604 | 0.13 |
| | LED Light Bulbs | 1,652 | 59,497 | 7.15 |
| | Low Flow Shower Heads | 102 | 21,158 | 2.31 |
| | Pipe Wrap** | 1,736 | 213,811 | 24.48 |
| | Smart Thermostats | 16 | 10,549 | 1.49 |
| | **Sub Total** | **4,339** | **539,341** | **92.42** |
| **Total** | | **7,870** | **996,414** | **176.46** |

**Reported by number of homes receiving measure.*

***Reported by unit length installed.*

*Table G-3: Reported Quantities and Impacts – Extension (Oct. – Dec. 2022)*

| Jurisdiction | Measure | Quantity Installed | Reported kWh | Reported kW |
|---|---|---|---|---|
| MO West | Advanced Power Strips | 162 | 16,686 | 1.86 |
| | Air Sealing* | 25 | 19,579 | 3.49 |
| | Bathroom Faucet Aerators | 19 | 362 | 0.57 |
| | Ceiling Insulation* | 26 | 13,555 | 2.26 |
| | Central Air Conditioners | 17 | 23,445 | 25.96 |
| | Duct Sealing* | 1 | 1,219 | 0.09 |
| | Heat Pumps | 3 | 23,431 | 5.32 |
| | Kitchen Faucet Aerators | 4 | 151 | 0.03 |
| | LED Light Bulbs | 436 | 15,689 | 1.91 |
| | Low Flow Shower Heads | 20 | 4,149 | 0.45 |
| | Pipe Wrap** | 475 | 58,502 | 6.70 |
| | Smart Thermostats | 11 | 4,563 | 1.07 |
| | **Sub Total** | **1,199** | **181,331** | **49.72** |
| MO Metro | Advanced Power Strips | 162 | 21,424 | 2.39 |
| | Air Sealing* | 12 | 8,047 | 1.43 |
| | Bathroom Faucet Aerators | 33 | 628 | 0.99 |
| | Ceiling Insulation* | 17 | 8,450 | 1.41 |
| | Central Air Conditioners | 18 | 22,748 | 25.19 |
| | Duct Sealing* | 3 | 3,657 | 0.27 |
| | Heat Pumps | 3 | 33,732 | 7.18 |
| | Kitchen Faucet Aerators | 5 | 189 | 0.04 |
| | LED Light Bulbs | 349 | 12,461 | 1.50 |
| | Low Flow Shower Heads | 19 | 3,941 | 0.43 |
| | Pipe Wrap** | 524 | 64,537 | 7.39 |
| | Smart Thermostats | 16 | 6,732 | 1.56 |
| | **Sub Total** | **1,161** | **186,546** | **49.79** |
| **Total** | | **2,360** | **367,877** | **99.51** |

**Reported by number of homes receiving measure.*

***Reported by unit length installed.*

### G.6.1 Direct Install Measures

To verify the types and quantities of each direct install measure type, ADM reviewed the program tracking database to determine that the measures were claimed during the program year and that reported measure savings adhered to the Evergy TRM guidelines accurately.

ADM calculated verified energy and demand impacts based on Evergy TRM deemed savings values and applied in-service rates based on the findings of the administer program survey (see Table G-4).

*Table G-4: Direct Install Persistence Rates from PAYS Survey Participants*

| Measure | Number Installed in Surveyed Participants' Homes | Number Reported Removed | In-Service Rate |
|---|---|---|---|
| Advanced Power Strips | 115 | 1 | 99% |
| Bathroom Faucet Aerators | 11 | 0 | 100% |
| Kitchen Faucet Aerators | 2 | 0 | 100% |
| LED Light Bulbs | 637 | 12 | 98% |
| Low Flow Shower Heads | 25 | 0 | 100% |
| Pipe Wrap | 68 | 1 | 99% |

ADM found that all reported impacts were calculated in accordance with the deemed savings algorithms. Realization rates reflect the survey-reported in-service rates for each measure. Additionally, one smart power strip was reported in Evergy's total energy savings for Missouri West but was not found in the program tracking data provided to ADM; therefore, no savings were verified for that power strip. Table G-5 details the verified savings for each direct install measure.

Additionally, realization rates for LEDs, low flow showerheads and pipe wraps were impacted by a calculation error in the reported savings in which the program tracking data reflected an old primary key from the Evergy TRM specified savings. The verified savings for LEDs, low flow shower heads and pipe wraps were calculated using the Every TRM algorithms specified for 2022.

*Table G-5: Direct Install Measure Gross Impacts – Jan. - Sep. 2022*

| Jurisdiction | Measure | Reported kWh | Reported kW | Verified kWh | Verified kW | RR (kWh) | RR (kW) |
|---|---|---|---|---|---|---|---|
| MO West | Advanced Power Strips | 46,968 | 5.24 | 46,560 | 5.20 | 99% | 99% |
| | Bathroom Faucet Aerators | 1,276 | 2.00 | 1,276 | 2.00 | 100% | 100% |
| | Kitchen Faucet Aerators | 529 | 0.11 | 529 | 0.11 | 100% | 100% |
| | LED Light Bulbs | 52,449 | 6.14 | 51,818 | 6.82 | 99% | 111% |
| | Low Flow Shower Heads | 19,291 | 2.10 | 19,094 | 2.08 | 99% | 99% |
| | Pipe Wrap | 167,871 | 19.22 | 179,344 | 20.41 | 107% | 106% |
| | **Sub Total** | **288,384** | **34.82** | **298,621** | **36.62** | **104%** | **105%** |
| MO Metro | Advanced Power Strips | 63,242 | 7.06 | 62,692 | 7.00 | 99% | 99% |
| | Bathroom Faucet Aerators | 1,981 | 3.11 | 1,981 | 3.11 | 100% | 100% |
| | Kitchen Faucet Aerators | 604 | 0.13 | 604 | 0.13 | 100% | 100% |
| | LED Light Bulbs | 59,497 | 7.15 | 59,475 | 8.82 | 100% | 123% |
| | Low Flow Shower Heads | 21,158 | 2.31 | 20,942 | 2.28 | 99% | 99% |
| | Pipe Wrap | 213,811 | 24.48 | 228,424 | 26.00 | 107% | 106% |
| | **Sub Total** | **360,293** | **44.23** | **374,118** | **47.34** | **104%** | **107%** |
| **Total** | | **648,677** | **79.05** | **672,739** | **83.96** | **104%** | **106%** |

*Table G-6: Direct Install Measure Gross Impacts – Extension (Oct. - Dec. 2022)*

| Jurisdiction | Measure | Reported kWh | Reported kW | Verified kWh | Verified kW | RR (kWh) | RR (kW) |
|---|---|---|---|---|---|---|---|
| MO West | Advanced Power Strips | 16,686 | 1.86 | 16,541 | 1.85 | 99% | 99% |
| | Bathroom Faucet Aerators | 362 | 0.57 | 362 | 0.57 | 100% | 100% |
| | Kitchen Faucet Aerators | 151 | 0.03 | 151 | 0.03 | 100% | 100% |
| | LED Light Bulbs | 15,689 | 1.91 | 15,601 | 2.10 | 99% | 110% |
| | Low Flow Shower Heads | 4,149 | 0.45 | 4,106 | 0.45 | 99% | 100% |
| | Pipe Wrap | 58,502 | 6.70 | 62,501 | 7.11 | 107% | 106% |
| | **Sub Total** | **95,539** | **11.52** | **99,262** | **12.11** | **104%** | **105%** |
| MO Metro | Advanced Power Strips | 21,424 | 2.39 | 21,238 | 2.37 | 99% | 99% |
| | Bathroom Faucet Aerators | 628 | 0.99 | 628 | 0.99 | 100% | 100% |
| | Kitchen Faucet Aerators | 189 | 0.04 | 189 | 0.04 | 100% | 99% |
| | LED Light Bulbs | 12,461 | 1.50 | 12,518 | 1.96 | 100% | 130% |
| | Low Flow Shower Heads | 3,941 | 0.43 | 3,901 | 0.43 | 99% | 100% |
| | Pipe Wrap | 64,537 | 7.39 | 68,948 | 7.85 | 107% | 106% |
| | **Sub Total** | **103,180** | **12.74** | **107,422** | **13.64** | **104%** | **107%** |
| **Total** | | **198,719** | **24.26** | **206,684** | **25.75** | **104%** | **106%** |

### G.6.2 Financed Measures

To verify the types and quantities of each direct install measure type, ADM completed several different regression analyses as well as an engineering analysis. The findings are provided in the following sections.

#### *Regression Analysis*

ADM undertook three distinct regression analyses; 1) grouping customers based on installed measures and running the models for each group, 2) an analysis of all customers with dummy variables for each measure, and 3) analyses for each customer at the premise level, individually. The results of each are presented below. Details are provided in Appendix M.4.1.

*Regression 1 – Measure Grouping Regressions*

The verified gross kWh savings of the PAYS programs based on measure grouping is summarized below in Table G-7. The total verified savings for these groups is 86,539 kWh, resulting in an overall realization rate of 38 percent. The average annual household savings were 425 kWh for customers with Air Sealing and Ceiling insulation measures, 1,520 kWh for customers with Air Sealing, Ceiling Insulation and Central Air Conditioning measures and 1,926 kWh for customers with Air Sealing, Ceiling Insulation and Heat Pump measures. Savings results presented are those after removing reported savings for all other measures received.

*Table G-7: Annual Savings from Measure Grouping Regression*

| Group | Premise Count | Reported kWh | Verified kWh | RR (kWh) |
|---|---|---|---|---|
| Air Sealing + Ceiling Insulation | 51 | 65,230 | 21,673 | 33% |
| Air Sealing + Ceiling Insulation + AC | 30 | 80,844 | 45,607 | 56% |
| Air Sealing + Ceiling Insulation + Heat Pump | 10 | 84,527 | 19,259 | 23% |

As shown in Table G-8 through Table G-10, the coefficient of interest (Pre-Post) is negative, indicating lower usage per month in the post-period of installed measures. Additionally, this coefficient is statistically significant at the 90 percent level (p-value), indicating a statistically significant savings effect resulting from participation in the program. Significant coefficients are presented in bold.

*Table G-8: Air Sealing + Ceiling Insulation Regression Coefficients*

| Coefficient | Estimate | Std Error | T-Value | p-value |
|---|---|---|---|---|
| (Intercept) | 13,866.23 | 17,276.30 | 0.80 | 0.4260 |
| Pre-Post | -157.38 | 44.01 | -3.58 | 0.0004 |
| Direct Install Date | -0.63 | 0.91 | -0.69 | 0.4929 |
| Month 2 | -213.47 | 109.98 | -1.94 | 0.0526 |
| Month 3 | -422.17 | 174.56 | -2.42 | 0.0158 |
| Month 4 | -812.02 | 222.24 | -3.65 | 0.0003 |
| Month 5 | -968.69 | 290.25 | -3.34 | 0.0009 |
| Month 6 | -1,118.01 | 443.19 | -2.52 | 0.0118 |
| Month 7 | -1,001.08 | 491.07 | -2.04 | 0.0418 |
| Month 8 | -1,020.84 | 473.46 | -2.16 | 0.0313 |
| Month 9 | -1,116.33 | 357.56 | -3.12 | 0.0019 |
| Month 10 | -936.68 | 251.49 | -3.72 | 0.0002 |
| Month 11 | -534.70 | 163.39 | -3.27 | 0.0011 |
| Month 12 | -633.94 | 124.56 | -5.09 | 0.0000 |
| CDD | 70.75 | 29.95 | 2.36 | 0.0184 |
| HDD | -7.18 | 8.66 | -0.83 | 0.4073 |

*Table G-9: Air Sealing + Ceiling Insulation + AC Regression Coefficients*

| Coefficient | Estimate | Std Error | T-Value | p-value |
|---|---|---|---|---|
| (Intercept) | 84,786.83 | 19,692.20 | 4.31 | 0.0002 |
| Pre-Post | -217.48 | 49.91 | -4.36 | 0.0000 |
| Direct Install Date | -4.36 | 1.03 | -4.22 | 0.0002 |
| Month 2 | -270.07 | 115.50 | -2.34 | 0.0198 |
| Month 3 | -495.08 | 186.19 | -2.66 | 0.0081 |
| Month 4 | -590.45 | 247.67 | -2.38 | 0.0175 |
| Month 5 | -353.06 | 326.71 | -1.08 | 0.2803 |
| Month 6 | 330.05 | 519.93 | 0.63 | 0.5258 |
| Month 7 | 728.33 | 577.50 | 1.26 | 0.2078 |
| Month 8 | 635.11 | 561.23 | 1.13 | 0.2583 |
| Month 9 | -24.56 | 412.43 | -0.06 | 0.9525 |
| Month 10 | -511.95 | 283.07 | -1.81 | 0.0711 |
| Month 11 | -423.59 | 178.00 | -2.38 | 0.0177 |
| Month 12 | -537.62 | 132.63 | -4.05 | 0.0001 |
| CDD | -18.64 | 35.71 | -0.52 | 0.6019 |
| HDD | -9.27 | 9.80 | -0.95 | 0.3446 |

*Table G-10: Air Sealing + Ceiling Insulation + Heat Pump Regression Coefficients*

| Coefficient | Estimate | Std Error | T-Value | p-value |
|---|---|---|---|---|
| (Intercept) | 2,463.52 | 32,059.08 | 0.08 | 0.9404 |
| Pre-Post | -319.81 | 143.74 | -2.22 | 0.0274 |
| Direct Install Date | 0.17 | 1.69 | 0.10 | 0.9200 |
| Month 2 | -184.27 | 426.97 | -0.43 | 0.6666 |
| Month 3 | -1,808.27 | 627.76 | -2.88 | 0.0045 |
| Month 4 | -3,261.91 | 791.19 | -4.12 | 0.0001 |
| Month 5 | -4,015.37 | 1,050.05 | -3.82 | 0.0002 |
| Month 6 | -4,244.42 | 1,620.87 | -2.62 | 0.0096 |
| Month 7 | -4,057.62 | 1,781.74 | -2.28 | 0.0240 |
| Month 8 | -4,157.10 | 1,746.14 | -2.38 | 0.0184 |
| Month 9 | -4,308.89 | 1,298.69 | -3.32 | 0.0011 |
| Month 10 | -3,606.02 | 899.48 | -4.01 | 0.0001 |
| Month 11 | -2,037.42 | 589.11 | -3.46 | 0.0007 |
| Month 12 | -2,012.61 | 460.33 | -4.37 | 0.0000 |
| CDD | 48.94 | 108.43 | 0.45 | 0.6523 |
| HDD | -50.61 | 31.34 | -1.61 | 0.1082 |

### *Regression 2 – Full Model Regression*

The verified gross kWh savings of the PAYS programs based on the full regression model is summarized below in Table G-11. The average annual household savings were 2,174 kWh.

*Table G-11: Annual Savings from Full Model Regression*

| Premise Count | Reported kWh | Verified kWh | RR (kWh) |
|---|---|---|---|
| 129 | 581,892 | 280,465 | 48% |

As shown below in Table G-12, the coefficient of interest (Pre-Post) is negative, indicating lower usage per month in the post-period of installed measures. Additionally, this coefficient is statistically significant at the 90 percent level (p-value), indicating a statistically significant savings effect resulting from participation in the program. Significant coefficients are presented in bold.

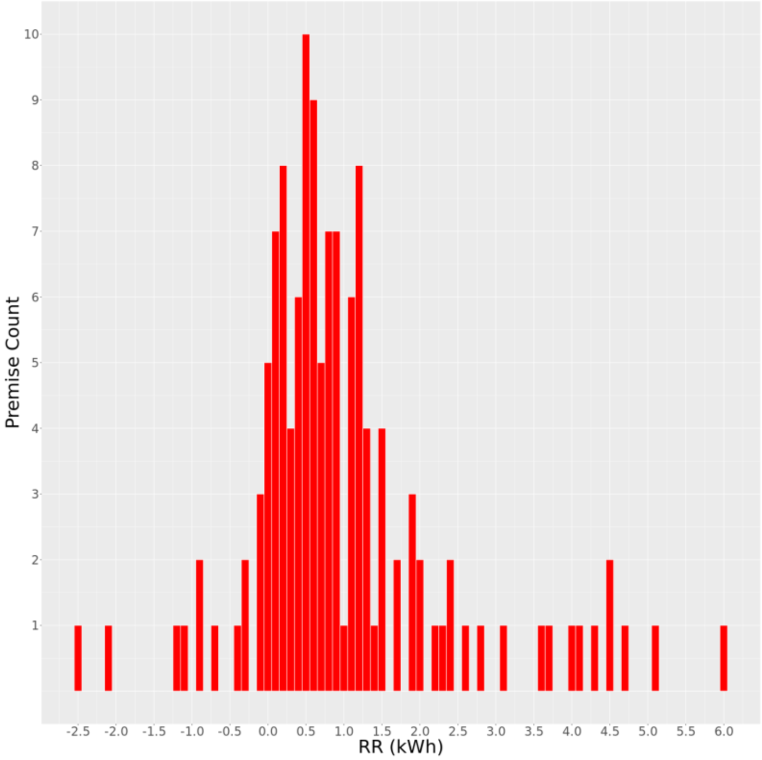
*Table G-12: Full Model Regression Coefficients*

| Coefficients | Estimate | Std Error | T-Value | p-value |
|---|---|---|---|---|
| (Intercept) | 37,608.28 | 11,003.29 | 3.42 | 0.0009 |
| Pre-Post | -182.33 | 31.93 | -5.71 | 0.0000 |
| Direct Install Date | -1.90 | 0.58 | -3.28 | 0.0014 |
| Air Sealing | 240.38 | 145.82 | 1.65 | 0.1020 |
| Ceiling Insulation | 38.33 | 143.94 | 0.27 | 0.7905 |
| Central Air Conditioners | -33.48 | 105.58 | -0.32 | 0.7517 |
| Duct Sealing | -132.42 | 182.62 | -0.73 | 0.4698 |
| Faucet Aerator | -185.45 | 119.72 | -1.55 | 0.1241 |
| Heat Pumps | 652.20 | 136.74 | 4.77 | 0.0000 |
| LED Light Bulbs | 9.30 | 45.26 | 0.21 | 0.8375 |
| Low Flow Shower Heads | 10.14 | 103.20 | 0.10 | 0.9219 |
| Pipe Insulation | 18.16 | 122.36 | 0.15 | 0.8823 |
| Smart Power Strips | 450.02 | 304.45 | 1.48 | 0.1421 |
| Smart Thermostats | -83.82 | 99.00 | -0.85 | 0.3989 |
| Month 2 | -164.21 | 78.67 | -2.09 | 0.0370 |
| Month 3 | -553.67 | 125.72 | -4.40 | 0.0000 |
| Month 4 | -989.27 | 162.72 | -6.08 | 0.0000 |
| Month 5 | -1,106.98 | 214.74 | -5.16 | 0.0000 |
| Month 6 | -1,086.15 | 333.25 | -3.26 | 0.0011 |
| Month 7 | -881.57 | 368.85 | -2.39 | 0.0169 |
| Month 8 | -911.94 | 358.11 | -2.55 | 0.0109 |
| Month 9 | -1,112.90 | 266.67 | -4.17 | 0.0000 |
| Month 10 | -1,055.17 | 185.37 | -5.69 | 0.0000 |
| Month 11 | -657.98 | 118.77 | -5.54 | 0.0000 |
| Month 12 | -693.29 | 89.73 | -7.73 | 0.0000 |
| CDD | 47.33 | 22.57 | 2.10 | 0.0361 |
| HDD | -10.93 | 6.37 | -1.71 | 0.0865 |

### *Regression 3 – Premise Level Regression*

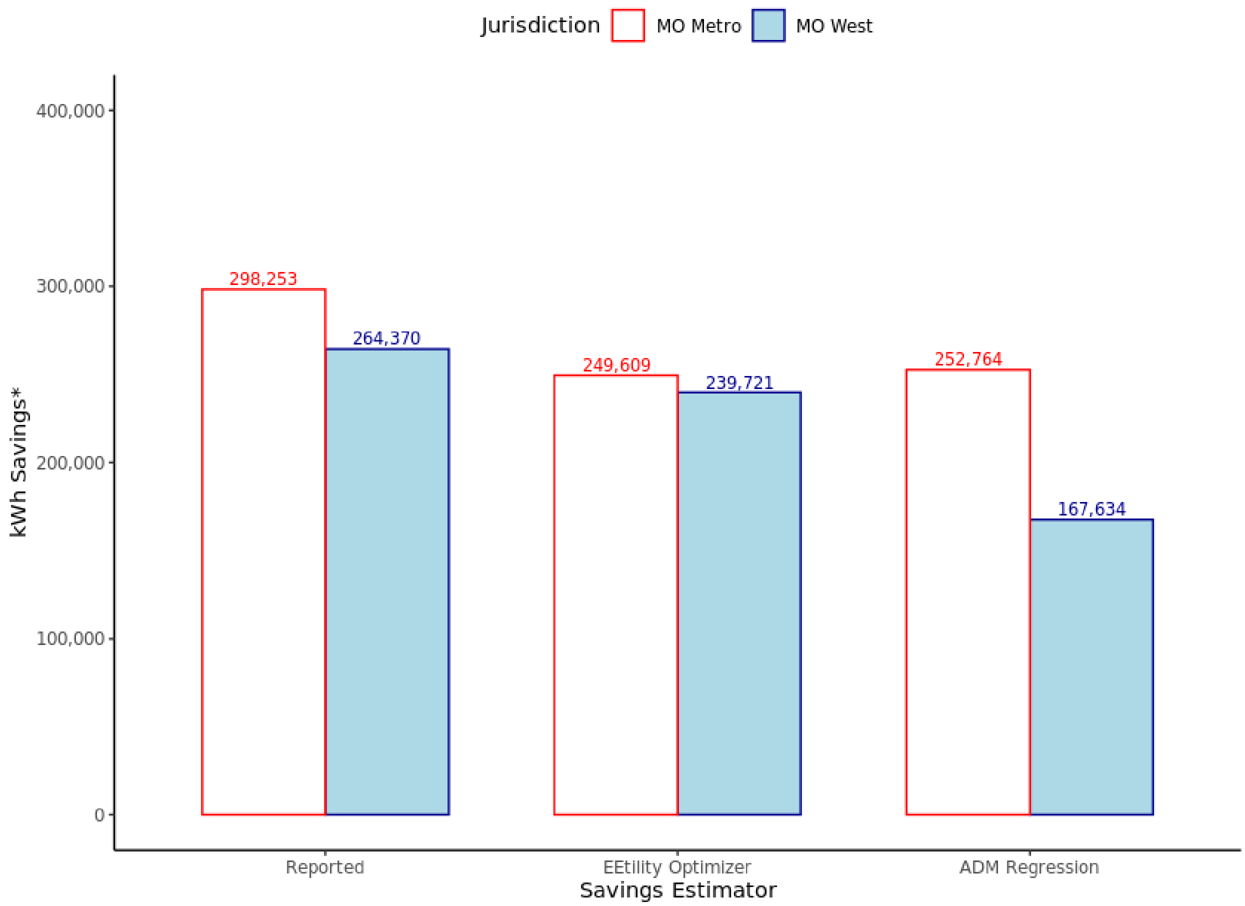
The verified gross kWh savings of the PAYS programs based on the premise level regression models was 423,925 kWh, resulting in an overall realization rate of 73 percent. The average annual household savings were 3,286 kWh. The coefficient of interest (Pre-Post) was negative for 114 of the 129 premises, indicating lower usage per month in the post-period of installed measures. Additionally, 80 of these 114 premises were statistically significant at the 90 percent confidence intervals, indicating a statistically significant savings effect resulting from participation in the program. Figure G-1, below, shows the distribution of realization rates for each premise. A total of 15 premises resulted in a negative realization rate, while a total of 47 premises resulted in a realization rate greater than 100 percent. On average, individual households had 7.8 months of post-installation data. 18 premises had less than 5 months of post installation data.

*Figure G-1: Premise Level Model Regression Realization Rates*



ADM compared the regression-derived savings to the reported savings as well as modelled savings from the implementation contractor. The comparison indicated that the implementor's modelled savings are more consistent with ADM's regression-derived savings than the reported savings. Figure G-2 shows the comparison of savings estimates for each jurisdiction. Regression savings for homes in Missouri Metro are closely aligned with the implementor's modelled savings (EEtility Optimizer). Missouri West's lower regression-derived savings is likely due to the number of homes with less than 5 months of post installation data (twice as many homes has sparse post-period data compared to Missouri Metro).

*Figure G-2: Estimated Savings Comparison*



*Savings represent a subset of the total population to reflect the 2022 homes in the regression model.

### *Interpretation of Regression Findings*

While the regression analyses for each customer individually produced the best results, numerous customers were below the 90 percent confidence intervals and lacked statistical significance. Given the low confidence of the results from the regression analyses, ADM additionally compared savings attributed to the retrofit measures installed through the PAYS Program by validating savings according to the relevant unit energy savings methodology from the Evergy TRM.

## ***Engineering Analysis***

Due to the low sample size and insufficient post-installation data, the regression analyses were not able to produce reliable results. To verify savings at the measure-level, ADM took additional steps to calculate savings in accordance with the Evergy TRM. Details are provided in Appendix M.4.2.

Realization rates for the home envelope measures (air sealing, duct sealing, and ceiling insulation) were between 22 percent and 41 percent. The verified savings for these measures was most heavily impacted by home heating fuel type – the reported electric savings included savings for both the cooling and heating seasons for all homes, whereas ADM's analysis calculated savings only for homes in which electric heating was listed as the primary space heating fuel source in the program's tracking data. Additionally, ADM only attributed 100 percent of the cooling season savings for homes tracked as having air conditioning in the program tracking data, for all other homes only 96 percent[26] of the cooling savings was attributed based on surveyed participant responses. The demand reduction realization rates for the home envelope measures were much better (between 95 and 99 percent) as TRM savings algorithm for demand reduction does not account for heating season savings.

Additionally, realization rates for heat pumps and smart thermostats were impacted by a calculation error in the reported savings in which the program tracking data reflected an old primary key from the Evergy TRM specified savings. The verified savings for heat pumps and smart thermostats were calculated using the Every TRM algorithms specified for 2022.

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[26] 96% of surveyed participants indicated either using a central air conditioner or heat pump as their primary cooling system in their homes.

*Table G-13: Financed Measure Gross Impacts – Jan. - Sep. 2022*

| Jurisdiction | Measure | Reported kWh | Reported kW | Verified kWh | Verified kW | RR (kWh) | RR (kW) |
|---|---|---|---|---|---|---|---|
| MO West | Air Sealing | 36,415 | 6.49 | 10,955 | 6.16 | 30% | 95% |
| | Ceiling Insulation | 17,952 | 3.00 | 5,136 | 2.87 | 29% | 96% |
| | Central Air Conditioners | 20,591 | 22.85 | 20,592 | 22.85 | 100% | 100% |
| | Duct Sealing | 4,875 | 0.36 | 1,805 | 0.35 | 37% | 96% |
| | Heat Pumps | 80,525 | 15.27 | 80,483 | 15.27 | 100% | 100% |
| | Smart Thermostats | 8,331 | 1.25 | 7,272 | 0.88 | 87% | 70% |
| | **Sub Total** | **168,689** | **49.23** | **126,243** | **48.38** | **75%** | **98%** |
| MO Metro | Air Sealing | 27,569 | 4.91 | 10,510 | 4.84 | 38% | 99% |
| | Ceiling Insulation | 19,659 | 3.28 | 8,157 | 3.24 | 41% | 99% |
| | Central Air Conditioners | 19,547 | 21.64 | 19,548 | 21.64 | 100% | 100% |
| | Duct Sealing | 4,875 | 0.36 | 2,828 | 0.36 | 58% | 99% |
| | Heat Pumps | 96,849 | 16.50 | 96,849 | 16.50 | 100% | 100% |
| | Smart Thermostats | 10,549 | 1.49 | 9,425 | 1.09 | 89% | 73% |
| | **Sub Total** | **179,048** | **48.19** | **147,317** | **47.67** | **82%** | **99%** |
| **Total** | | **347,737** | **97.42** | **273,560** | **96.05** | **79%** | **99%** |

*Table G-14: Financed Measure Gross Impacts – Oct. - Dec. 2022*

| Jurisdiction | Measure | Reported kWh | Reported kW | Verified kWh | Verified kW | RR (kWh) | RR (kW) |
|---|---|---|---|---|---|---|---|
| MO West | Air Sealing | 19,579 | 3.49 | 4,454 | 3.45 | 23% | 99% |
| | Ceiling Insulation | 13,555 | 2.26 | 2,951 | 2.23 | 22% | 99% |
| | Central Air Conditioners | 23,445 | 25.96 | 23,446 | 25.96 | 100% | 100% |
| | Duct Sealing | 1,219 | 0.09 | 203 | 0.09 | 17% | 99% |
| | Heat Pumps | 23,431 | 5.32 | 23,431 | 5.32 | 100% | 100% |
| | Smart Thermostats | 4,563 | 1.07 | 3,507 | 0.75 | 77% | 70% |
| | **Sub Total** | **85,792** | **38.20** | **57,992** | **37.80** | **68%** | **99%** |
| MO Metro | Air Sealing | 8,047 | 1.43 | 2,332 | 1.43 | 29% | 100% |
| | Ceiling Insulation | 8,450 | 1.41 | 2,369 | 1.40 | 28% | 99% |
| | Central Air Conditioners | 22,748 | 25.19 | 23,678 | 26.22 | 104% | 104% |
| | Duct Sealing | 3,657 | 0.27 | 1,624 | 0.27 | 44% | 99% |
| | Heat Pumps | 33,732 | 7.18 | 33,628 | 7.18 | 100% | 100% |
| | Smart Thermostats | 6,732 | 1.56 | 5,225 | 1.09 | 78% | 70% |
| | **Sub Total** | **83,366** | **37.05** | **68,856** | **37.59** | **83%** | **101%** |
| **Total** | | **169,158** | **75.25** | **126,848** | **75.39** | **75%** | **100%** |

## G.7 Net Savings Evaluation Findings

To determine a suitable NTGR, ADM included a battery of survey questions designed to evaluate free ridership as well as spillover in the participant survey. Both full participants (customers who received financed measures) as well as partial participants (customers who received only direct install measures and did not participate in additional measure financing) were surveyed. A total of 124 program participants completed the online survey, 68 partial participants and 56 full participants. The methodology used as well as findings are summarized in Appendix A.6.

### G.7.1 Net Verified Savings

The calculated NTG ratio of 86.5 percent was applied to all program measures apart from faucet aerators and showerheads, which were assigned a NTG ratio of 100.5 percent. See Table G-15 and Table G-16 for details for the initial program year and the extension period, respectively. Table G-17 provides details for all of 2022 in aggregate.

*Table G-15: Net Verified Savings – Jan. – Sep. 2022*

| Jurisdiction | Measure | Gross Verified kWh | Gross Verified kW | NTG (kWh) | Net Verified kWh | Net Verified kW |
|---|---|---|---|---|---|---|
| MO West | Advanced Power Strips | 46,560 | 5.20 | 86.5% | 40,274 | 4.50 |
| | Air Sealing | 10,955 | 6.16 | 86.5% | 9,476 | 5.33 |
| | Bathroom Faucet Aerators | 1,276 | 2.00 | 100.5% | 1,282 | 2.01 |
| | Ceiling Insulation | 5,136 | 2.87 | 86.5% | 4,443 | 2.48 |
| | Central Air Conditioners | 20,592 | 22.85 | 86.5% | 17,812 | 19.77 |
| | Duct Sealing | 1,805 | 0.35 | 86.5% | 1,561 | 0.30 |
| | Heat Pumps | 80,483 | 15.27 | 86.5% | 69,618 | 13.21 |
| | Kitchen Faucet Aerators | 529 | 0.11 | 100.5% | 532 | 0.11 |
| | LED Light Bulbs | 51,818 | 6.82 | 86.5% | 44,823 | 5.90 |
| | Low Flow Shower Heads | 19,094 | 2.08 | 100.5% | 19,189 | 2.09 |
| | Pipe Wrap | 179,344 | 20.41 | 86.5% | 155,133 | 17.65 |
| | Smart Thermostats | 7,272 | 0.88 | 86.5% | 6,290 | 0.76 |
| | **Sub Total** | **424,864** | **85.00** | **87.2%** | **370,433** | **74.12** |
| MO Metro | Advanced Power Strips | 62,692 | 7.00 | 86.5% | 54,229 | 6.06 |
| | Air Sealing | 10,510 | 4.84 | 86.5% | 9,091 | 4.19 |
| | Bathroom Faucet Aerators | 1,981 | 3.11 | 100.5% | 1,991 | 3.13 |
| | Ceiling Insulation | 8,157 | 3.24 | 86.5% | 7,056 | 2.80 |
| | Central Air Conditioners | 19,548 | 21.64 | 86.5% | 16,909 | 18.72 |
| | Duct Sealing | 2,828 | 0.36 | 86.5% | 2,446 | 0.31 |
| | Heat Pumps | 96,849 | 16.50 | 86.5% | 83,774 | 14.27 |
| | Kitchen Faucet Aerators | 604 | 0.13 | 100.5% | 607 | 0.13 |
| | LED Light Bulbs | 59,475 | 8.82 | 86.5% | 51,446 | 7.63 |
| | Low Flow Shower Heads | 20,942 | 2.28 | 100.5% | 21,047 | 2.29 |
| | Pipe Wrap | 228,424 | 26.00 | 86.5% | 197,587 | 22.49 |
| | Smart Thermostats | 9,425 | 1.09 | 86.5% | 8,153 | 0.94 |
| | **Sub Total** | **521,435** | **95.01** | **87.2%** | **454,335** | **82.96** |
| **Total** | | **946,299** | **180.01** | **87.2%** | **824,768** | **157.07** |

*Table G-16: Net Verified Savings – Extension (Oct. – Dec. 2022)*

| Jurisdiction | Measure | Gross Verified kWh | Gross Verified kW | NTG (kWh) | Net Verified kWh | Net Verified kW |
|---|---|---|---|---|---|---|
| MO West | Advanced Power Strips | 16,541 | 1.85 | 86.5% | 14,308 | 1.60 |
| | Air Sealing | 4,454 | 3.45 | 86.5% | 3,853 | 2.98 |
| | Bathroom Faucet Aerators | 362 | 0.57 | 100.5% | 364 | 0.57 |
| | Ceiling Insulation | 2,951 | 2.23 | 86.5% | 2,553 | 1.93 |
| | Central Air Conditioners | 23,446 | 25.96 | 86.5% | 20,281 | 22.46 |
| | Duct Sealing | 203 | 0.09 | 86.5% | 176 | 0.08 |
| | Heat Pumps | 23,431 | 5.32 | 86.5% | 20,268 | 4.60 |
| | Kitchen Faucet Aerators | 151 | 0.03 | 100.5% | 152 | 0.03 |
| | LED Light Bulbs | 15,601 | 2.10 | 86.5% | 13,495 | 1.82 |
| | Low Flow Shower Heads | 4,106 | 0.45 | 100.5% | 4,127 | 0.45 |
| | Pipe Wrap | 62,501 | 7.11 | 86.5% | 54,063 | 6.15 |
| | Smart Thermostats | 3,507 | 0.75 | 86.5% | 3,034 | 0.65 |
| | **Sub Total** | **157,254** | **49.91** | **86.9%** | **136,671** | **43.32** |
| MO Metro | Advanced Power Strips | 21,238 | 2.37 | 86.5% | 18,371 | 2.05 |
| | Air Sealing | 2,332 | 1.43 | 86.5% | 2,017 | 1.24 |
| | Bathroom Faucet Aerators | 628 | 0.99 | 100.5% | 631 | 0.99 |
| | Ceiling Insulation | 2,369 | 1.40 | 86.5% | 2,049 | 1.21 |
| | Central Air Conditioners | 23,678 | 26.22 | 86.5% | 20,481 | 22.68 |
| | Duct Sealing | 1,624 | 0.27 | 86.5% | 1,405 | 0.23 |
| | Heat Pumps | 33,628 | 7.18 | 86.5% | 29,088 | 6.21 |
| | Kitchen Faucet Aerators | 189 | 0.04 | 100.5% | 190 | 0.04 |
| | LED Light Bulbs | 12,518 | 1.96 | 86.5% | 10,828 | 1.70 |
| | Low Flow Shower Heads | 3,901 | 0.43 | 100.5% | 3,921 | 0.43 |
| | Pipe Wrap | 68,948 | 7.85 | 86.5% | 59,640 | 6.79 |
| | Smart Thermostats | 5,225 | 1.09 | 86.5% | 4,520 | 0.94 |
| | **Sub Total** | **176,278** | **51.23** | **86.9%** | **153,141** | **44.52** |
| **Total** | | **333,532** | **101.14** | **86.9%** | **289,812** | **87.84** |

*Table G-17: Total Net Verified Savings*

| Jurisdiction | Measure | Gross Verified kWh | Gross Verified kW | NTG (kW) | Net Verified kWh | Net Verified kW |
|---|---|---|---|---|---|---|
| MO West | Advanced Power Strips | 63,101 | 7.05 | 86.5% | 54,582 | 6.10 |
| | Air Sealing | 15,409 | 9.61 | 86.5% | 13,329 | 8.31 |
| | Bathroom Faucet Aerators | 1,638 | 2.57 | 100.5% | 1,646 | 2.58 |
| | Ceiling Insulation | 8,087 | 5.10 | 86.5% | 6,995 | 4.41 |
| | Central Air Conditioners | 44,038 | 48.81 | 86.5% | 38,093 | 42.22 |
| | Duct Sealing | 2,008 | 0.44 | 86.5% | 1,737 | 0.38 |
| | Heat Pumps | 103,914 | 20.59 | 86.5% | 89,886 | 17.81 |
| | Kitchen Faucet Aerators | 680 | 0.15 | 100.5% | 683 | 0.15 |
| | LED Light Bulbs | 67,419 | 8.92 | 86.5% | 58,317 | 7.72 |
| | Low Flow Shower Heads | 23,200 | 2.53 | 100.5% | 23,316 | 2.54 |
| | Pipe Wrap | 241,845 | 27.52 | 86.5% | 209,196 | 23.80 |
| | Smart Thermostats | 10,779 | 1.63 | 86.5% | 9,324 | 1.41 |
| | **Sub Total** | **582,118** | **134.92** | **87.1%** | **507,105** | **117.44** |
| MO Metro | Advanced Power Strips | 83,930 | 9.37 | 86.5% | 72,599 | 8.11 |
| | Air Sealing | 12,842 | 6.27 | 86.5% | 11,108 | 5.42 |
| | Bathroom Faucet Aerators | 2,609 | 4.10 | 100.5% | 2,622 | 4.12 |
| | Ceiling Insulation | 10,526 | 4.64 | 86.5% | 9,105 | 4.01 |
| | Central Air Conditioners | 43,226 | 47.86 | 86.5% | 37,390 | 41.40 |
| | Duct Sealing | 4,452 | 0.63 | 86.5% | 3,851 | 0.54 |
| | Heat Pumps | 130,477 | 23.68 | 86.5% | 112,863 | 20.48 |
| | Kitchen Faucet Aerators | 793 | 0.17 | 100.5% | 797 | 0.17 |
| | LED Light Bulbs | 71,993 | 10.78 | 86.5% | 62,274 | 9.32 |
| | Low Flow Shower Heads | 24,843 | 2.71 | 100.5% | 24,967 | 2.72 |
| | Pipe Wrap | 297,372 | 33.85 | 86.5% | 257,227 | 29.28 |
| | Smart Thermostats | 14,650 | 2.18 | 86.5% | 12,672 | 1.89 |
| | **Sub Total** | **697,713** | **146.24** | **87.1%** | **607,476** | **127.47** |
| **Total** | | **1,279,831** | **281.16** | **87.1%** | **1,114,581** | **244.91** |

## G.8 Impact Evaluation - Final Savings Tables

Based on the impact evaluation results, the total verified gross energy savings for the PAYS Program are 1,279,831kWh, and the total verified gross peak demand savings are 281.16 kW. Table G-18 summarizes the verified gross energy and demand savings for the PAYS Program during the initial program year, while Table G-19 summarizes these metrics for the extension period.

*Table G-18: Program Gross Energy Savings (kWh) and Peak Demand Reduction (kW) – Jan. - Sep. 2022*

| Jurisdiction | Reported Energy Savings (kWh) | Reported Demand Reduction (kW) | Gross Verified Energy Savings (kWh) | Gross Verified Demand Reduction (kW) | RR (kWh) | RR (kW) |
|---|---:|---:|---:|---:|---:|---:|
| MO West | 539,341 | 92.42 | 521,435 | 95.01 | 97% | 103% |
| MO Metro | 457,073 | 84.05 | 424,864 | 85.00 | 93% | 101% |
| **Totals** | **996,414** | **176.47** | **946,299** | **180.01** | **95%** | **102%** |

*Table G-19: Program Gross Energy Savings (kWh) and Peak Demand Reduction (kW) – Oct. - Dec. 2022*

| Jurisdiction | Reported Energy Savings (kWh) | Reported Demand Reduction (kW) | Gross Verified Energy Savings (kWh) | Gross Verified Demand Reduction (kW) | RR (kWh) | RR (kW) |
|---|---:|---:|---:|---:|---:|---:|
| MO West | 186,546 | 49.79 | 176,279 | 51.23 | 94% | 103% |
| MO Metro | 181,331 | 49.72 | 157,254 | 49.91 | 87% | 100% |
| **Totals** | **367,877** | **99.51** | **333,532** | **101.14** | **91%** | **102%** |

Table G-20 and Table G-21 summarize the verified net impacts of the PAYS Program from the initial program year, while Table G-22 and Table G-23 summarize the impacts of the extension period.

*Table G-20: Verified Gross and Net Annual Energy Savings (kWh) – Jan. - Sep. 2022*

| Jurisdiction | Free Ridership[27] | NTG (kWh) | Gross Verified Energy Savings (kWh) | Net Energy Savings (kWh) |
|---|---|---|---|---|
| MO West | 9.5% | 87.2% | 521,435 | 454,335 |
| MO Metro | 9.3% | 87.2% | 424,864 | 370,433 |
| **Total** | **9.4%** | **87.2%** | **946,299** | **824,768** |

*Table G-21: Verified Gross and Net Peak Demand Reduction (kW) – Jan. - Sep. 2022*

| Jurisdiction | Free Ridership | NTG (kW) | Gross Verified Energy Savings (kW) | Net Energy Savings (kW) |
|---|---|---|---|---|
| MO West | 9.5% | 87.2% | 95.01 | 82.96 |
| MO Metro | 9.3% | 87.2% | 85.00 | 74.12 |
| **Total** | **9.4%** | **87.2%** | **180.01** | **157.07** |

*Table G-22: Verified Gross and Net Annual Energy Savings (kWh) – Oct. - Dec. 2022*

| Jurisdiction | Free Ridership | NTG (kWh) | Gross Verified Energy Savings (kWh) | Net Energy Savings (kWh) |
|---|---|---|---|---|
| MO West | 10.1% | 86.9% | 176,278 | 153,141 |
| MO Metro | 10.1% | 86.9% | 157,254 | 136,671 |
| **Total** | **10.1%** | **86.9%** | **333,532** | **289,812** |

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[27] Free Ridership is a weighted average based on measure savings for a given period of time.

*Table G-23: Verified Gross and Net Peak Demand Reduction (kW) – Oct. - Dec. 2022*

| Jurisdiction | Free Ridership | NTG (kW) | Gross Verified Energy Savings (kW) | Net Energy Savings (kW) |
|---|---|---|---|---|
| MO West | 10.1% | 86.9% | 51.23 | 44.52 |
| MO Metro | 10.1% | 86.9% | 49.91 | 43.32 |
| **Total** | **10.1%** | **86.9%** | **101.14** | **87.84** |

Table G-27 summarizes the total verified gross energy and demand savings for all of 2022 in aggregate, while Table G-25 and Table G-26 summarizes the total verified net energy savings and demand reduction.

*Table G-24: Gross Energy Savings (kWh) and Peak Demand Reduction (kW) – Program Total*

| Jurisdiction | Reported Energy Savings (kWh) | Reported Demand Reduction (kW) | Gross Verified Energy Savings (kWh) | Gross Verified Demand Reduction (kW) | RR (kWh) | RR (kW) |
|---|---|---|---|---|---|---|
| MO West | 725,887 | 142.21 | 697,713 | 146.24 | 96% | 103% |
| MO Metro | 638,404 | 133.77 | 582,118 | 134.92 | 91% | 101% |
| **Total** | **1,364,291** | **275.98** | **1,279,831** | **281.16** | **94%** | **102%** |

*Table G-25: Verified Gross and Net Annual Energy Savings (kWh) – Program Total*

| Jurisdiction | Free Ridership | Spillover | NTG (kWh) | Gross Verified Energy Savings (kWh) | Net Energy Savings (kWh) |
|---|---|---|---|---|---|
| MO West | 9.7% | 0.5% | 87.1% | 697,713 | 607,476 |
| MO Metro | 9.5% | 0.5% | 87.1% | 582,118 | 507,105 |
| **Total** | **9.6%** | **0.5%** | **87.1%** | **1,279,831** | **1,114,581** |

*Table G-26: Verified Gross and Net Peak Demand Reduction (kW) – Program Total*

| Jurisdiction | Free Ridership | Spillover | NTG (kW) | Gross Verified Energy Savings (kW) | Net Energy Savings (kW) |
|---|---|---|---|---|---|
| MO West | 9.7% | 0.5% | 87.1% | 146.24 | 127.47 |
| MO Metro | 9.5% | 0.5% | 87.1% | 134.92 | 117.44 |
| **Total** | **9.6%** | **0.5%** | **87.1%** | **281.16** | **244.91** |

## G.9 Process Evaluation

This section summarizes the results from the process evaluation of the PAYS Program based on feedback from interviews with the program staff and third-party implementer as well as reviewing available program materials. The results of the participant survey are presented in this section as well.

### G.9.1 Program Operations

The findings based on an in-depth interview with Evergy program staff and the third-party implementer are presented below.

***Roles and Responsibilities***

The PAYS program is run by the Evergy Program manager and its implementer EEtility, a third-party firm that specializes in PAYS program delivery for utility clients.

Program management for both Evergy and its implementer, EEtility, changed during 2022. Evergy's new program manager took over program operations in October 2022, while EEtility's program manager was replaced earlier in the year. However, these staff changes led to minimal disruption on overall program operations.

> *"It's been a collaborative effort and everyone is pitching in to help me understand how the pilot has been performing." (Evergy Program Staff)*
>
> *"We pulled in an experienced program manager to step-in temporarily and take over all operations for the state of Missouri." (Implementer Program Staff)*

The primary responsibilities of the implementation contractor are to:

- Conduct the home energy analysis to determine the cost-effectiveness of potential measures. Three data collectors conduct the energy audits; however, EEtiliy is currently looking for an additional data collector.
- Back office and IT staff manage the enrollment process and provide customer support.

### *Changes in Program Design*

During 2022, there were several modifications to the current PAYS Program which included:

- Joint collaboration and rollout with Spire, Missouri's largest natural gas supplier.
- Revising the tariff to reflect the addition of natural gas customers. The tariff now proportionately splits savings by measure and fuel source (i.e., natural gas or electricity).

Although this did create some initial customer confusion, the program staff reported that now customers have a much better understanding of the savings mix between electric and gas measures.

- Spire worked with Evergy to develop a joint PAYS program rollout in mid-2022. This joint implementation required Evergy to:
    - Modify the program documentation materials,
    - Update the program savings models to reflect gas savings, and
    - Change customer messaging to reflect its new dual-fuel focus.
- The Missouri Public Service Commission also approved the following changes:
    - Adding duct sealing as an eligible measure for program participants.
    - Extending the program period to 2023. October to December 2022 will be viewed as a "bridge year:" and the PAYS program period will extend to all of 2023.
- In late 2022, the EEtility partnered with a third-party auditing firm to increase the overall capacity of its data collection efforts.

Gathering the necessary customer information through energy audits has been an ongoing challenge for the implementer since program launch. In 2021, the implementer created a work-around to increase the number of energy auditors and accelerate the data collection and modeling process.

However, the program implementer explained that adding in a new data collection partner addresses the operational challenges in 2021, which included higher-than-anticipated customer demand combined with a shortage of in-house data collectors.

> *"We wanted to increase the flexibility (to meet the increased customer demand)….(This addition) keeps the lead time to less than three weeks because we are staffed for it. (Program Implementer)*

### *Marketing and Outreach*

The joint utility program implementation also required modifying the marketing and outreach materials to promote dual-fuel installations. These modifications included “slight tweaking to explain the upfront costs,” however, all of the mass marketing materials are now co-branded.

These changes also reflected the new marketing strategy used for each utility. Evergy targets electric-only customers and thus has focused on high electric users. Spire is targeting dual-fuel customers.

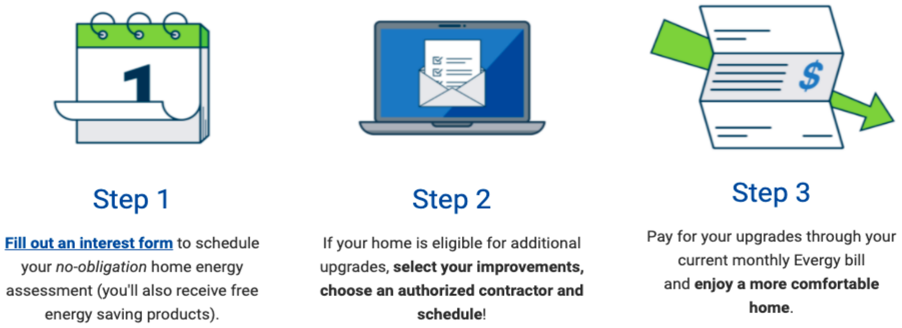
During PY2, the marketing efforts focused on reaching a “combination of early adopters and mass marketing which created a challenge in the first year”. In PY3, Evergy modified the language to avoid “speculating on the size of savings. The language focuses on PAYS as providing energy efficiency financing assistance to help offset upfront costs as a way to manage customer expectations.

As the Evergy program staff explained, the new program language “allows us to keep the mass marketing focus and we are not just limited to reaching low-income customers.”

### *Enrollment Process*

The program is open to all Evergy and Spire’s Missouri residential homeowners and renters who receive the landlord’s consent. Interested customers complete an online interest form, answer a few questions about their homes, and schedule an in-person energy audit. The following graphic illustrates the enrollment process for the customer.

*Figure G-3: PAYS Enrollment Process*[28]



Step 1

**Fill out an interest form** to schedule your *no-obligation* home energy assessment (you'll also receive free energy saving products).

Step 2

If your home is eligible for additional upgrades, **select your improvements, choose an authorized contractor and schedule**!

Step 3

Pay for your upgrades through your current monthly Evergy bill and **enjoy a more comfortable home**.

In 2022, program enrollment increased steadily throughout the year.

> *“We have been having 45-50 enrollments a week, and it’s been a pretty consistent flow for the past couple of months.” (Program Implementer)*

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[28] Source: https://www.evergy.com/ways-to-save/programs-link/research-and-pilot-program/pays

### *Effectiveness of Program Operations*

During 2022, despite the staff turnover and program changes, the program met most of its participation goals. Although there were not specific goals established in 2022, the implementer explained that the program is “hitting its stride” with the addition of Spire.

As of October 10, 2022, 84 audits had been completed for Evergy and have another 14 to 18 audits from Spire customers.

> *“In the first year we had to hit aggressive goals despite supply side issues. We are extremely happy with Spire’s program” (Program Implementer)*
>
> *“The original goals were not established nor were driven by the Commission. We didn’t expect to achieve the original goals.” (Evergy Program Staff)*

Evergy staff reported that the joint collaboration with Spire increased their workload and some co-delivery issues needed to be addressed. Furthermore, the Evergy program staff indicated that factors “outside of their control” such as material and labor shortages, affected its ability to have cost-effective projects.

> *“Changes are being driven outside of our control. EEutility is getting some lesser price points for HVAC upgrades but having that inflated cost makes it difficult (to make the) required cost-comparison-required to have the 20 percent positive change (required) by the program licensing.” (Evergy Program Staff)*

It is too soon to tell how the new customer messages have resonated with program participants. There was some customer frustration earlier in the program, which led Evergy to revise and clarify the PAYS program approach.

According to Evergy program staff, the Commission views these changes as marketing changes and Evergy can still finance the full cost of measures installed in all-electric heat homes.

### *Customer Feedback*

Program participants have reported a variety of customer feedback based on their experiences. Of note, most program participants were pleased with Evergy, although some customers still needed timely status updates.

Unfortunately, some customers drop out of the program due to concerns that the PAYS program is too good to be true.

> *“Some customers are skeptical and the more they learn about the program more and then drop out. They enroll go through multiple communication attempts but never follow through.” (Program Implementer)*

Another 26 percent of homes do not qualify for the program as their residences are not structurally sound.

To date, there are no program defaults nor late payments from program participants.

Evergy has also created an internal process for customer transitions, such as move-in/move-outs. The account is flagged when the electric service is terminated, and when the new occupant moves, the participant is notified about the PAYS tariff before they receive electric service.

#### *Program Tracking and Reporting*

In 2022, the program implementation staff addressed some of the program tracking issues identified in the 2021 program evaluation. Specifically, the staff built a new auditing app that Evergy launched which helps increase the “accuracy and efficiency with the data collection.”

Evergy staff also created Quality Control reports within the larger Evergy database which performs quality control checks on the energy audit data and also helped EEtility with “faster and more accurate data loading into the larger Resource Innovations database.” Evergy staff explained that this preQC process has “helped tremendously” and had led to more accurate data uploads and better tracking.

The implementer provides uploads each month and is required to address any variances within three business days.

The PAYS service agreements are now processed within 45 days which creates the billing record into the Resource Innovations database.

### G.9.2 Participant Survey

A total of 124 program participants completed the online survey, 68 partial participants and 56 full participants. Considering these sample sizes, the survey findings are significant at the 90 percent confidence level with a 10 percent margin of error for partial participants and an 8.89 percent margin of error for full participants. Results covering in-service rates, free ridership, and spillover are covered in Appendix A.6. Additional results are summarized below.

#### *Participant Homes*

Surveyed participants were asked about the systems used to heat and cool their homes. Seventy-five percent of participants indicated that their homes are heated using a natural gas furnace, 14 percent are heated using heat pumps, and 5 percent use electric resistance heating (n = 124).[29] Ninety percent of participants reported having central air conditioning in their homes, 6 percent use a heat pump as their primary cooling source,

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[29] Five percent listed other sources or didn’t know, 1 percent use a natural gas boiler and another 1 percent use a propane furnace.

3 percent indicated other types of cooling such as window air conditioners, and 1 percent reported no cooling system in their home (n =124).

Participants were also asked which fuel they primarily relied on for water heating. Sixty-seven percent reported using natural gas, 31 percent use electricity, 1 percent oil, and 1 percent did not know (n = 124).

### *Participant Demographics*

The survey asked respondents if their annual household income was above or below 200 percent of the specified Federal Poverty Income Guidelines (FPIG) based on the number of people they reported living in the home. As shown in Table G-27, 23 percent of surveyed participants reported incomes below 200 percent FPIG; however, only 16 percent of full PAYS participants would qualify as income eligible.

*Table G-27: Income Eligibility Reported by Survey Participants*

| Income Level | Partial Participants (n=62) | Full Participants (n=44) | Overall (n=106) |
|---|---|---|---|
| Over 200% FPIG | 73% | 84% | 77% |
| Under 200% FPIG | 27% | 16% | 23% |

## G.10 Conclusions and Recommendations

The following summarizes the key findings from the evaluation of the Pay As You Save Program.

- A total of 158 projects were completed through the PAYS program in 2022. Ninety-eight were completed from January through September and 60 were completed during the program extension (October through December). These projects resulted in a total verified net annual energy savings of 1,077,254 kWh and a total net peak demand reduction of 238.25 kW.
- The PAYS program staff implemented additional strategies to generate a consistent enrollment rate throughout the program year. This included adding a new auditing app which streamlines data collection.
- Evergy staff successfully integrated its program with Spire to provide a dual-fuel financing program that reached out to customers across the state.
- The program implementation staff worked with Evergy to update and clarify its customer messaging and reduce customer confusion.
- Evergy staff also created internal Quality Control reports within the larger Evergy database which has improved overall program tracking and simplified program data uploads.

- The survey responses suggest that free ridership is relatively low (14 percent) and is offset only marginally by participant spillover (0.5 percent). However, the free ridership rates may increase if customers install additional measures on their own at lower rates in future years. This may become an issue with rising labor and supply costs.

ADM recommends the following are considered to support the continued improvement and development of Evergy’s Pay As You Save Program:

- **Continue to refine and expand program tracking metrics.** Improved program tracking metrics could provide Evergy staff with enhanced clarity of overall program operations as well as increase data available for M&V.

  Additional metrics that the implementer could include in quarterly reports are:

    - Number of completed audits
    - Conversion rate (audits/number of participants)
    - Number of program dropouts
    - Program enrollment processing time
    - Average loan amounts for Evergy customers

  Additional information that would benefit M&V activities include:

    - Blower door test ratings before and after installations
    - Efficiency ratings of old and new equipment
    - R-values before and after installations
    - Complete tracking of heating fuel type
    - Tracking of premises for which program installations will yield significant changes in electric consumption (e.g., tracking of premises without cooling equipment prior to program installation).

- Update reported savings calculations to account for heating fuel type as well as the presence of cooling equipment.
- Provide implementation’s modelled home energy savings estimates to ADM for review. Comparisons to implementation’s modeled savings as well as input variables would enable beneficial benchmarking of the reported, TRM-derived savings as well as of the impact evaluation findings.
- Continue to monitor regression-derived savings estimates. As the program continues to enroll more participants and as more post-installation billing data is available for participants from the 2022 program year, the regression analysis will likely improve in validity.

- Review the participant application process to ensure that income eligible participants are aware of other low-cost options available to them. Twenty-three percent of surveyed participants (and 16 percent of full participants) reported income levels that would qualify their families for other income-qualified programs offered by Evergy.
- Continue to monitor free ridership and spillover rates to ensure that the program is continuing to reach its critical target markets.

# Appendix H Business Demand Response Program-Specific Methodologies

This chapter describes the evaluation activities that were performed by ADM to evaluate the Business Demand Response (BDR) Program.

## H.1 Program Overview

The BDR Program is designed to reduce participant load during peak periods to improve system reliability, offset forecasted system peaks that could result in future generation capacity additions, and/or provide a more economical option to generation or purchasing energy in the wholesale market. The program can call events from June 1 to September 30 within the designated curtailment hours of 12:00 p.m. to 8:00 p.m., Monday through Friday excluding holidays.

The BDR Program provides an incentive for those commercial customers who reduce their electrical load during events. The incentive for customers enrolled in the program for one year is calculated as:

*Equation H-1: One Year Incentive Calculation*

$$Incentive = \$28.00 \times kW\ Enrolled \times Percentage\ of\ Enrolled\ kW\ Achieved$$

For incentive purposes, “kW Enrolled” refers to the electrical load that participants, with assistance from Evergy, have identified that can be eliminated or shifted (curtailed) during demand response events. After events, Evergy estimates what the electric load would have been if an event had not taken place and subtracts the actual energy usage to determine the demand reduction (kW) achieved during events. This “kW achieved” is then divided by the “kW enrolled” to calculate the “Percentage of Enrolled kW Achieved”.

The incentive for customers enrolled in the program for multiple years is calculated as:

*Equation H-2: Multi-Year Incentive Calculation*

$$Incentive = \$30.00 \times kW\ Enrolled \times Percentage\ of\ Enrolled\ kW\ Achieved$$

### Expected Energy Savings and Demand Reduction

Energy and demand impact goals for the Business Demand Response program years 2020 - 2022 are shown in the tables below (Table H-1 and Table H-2). These goals were provided in the KCP&L filing EO-2019-0132.

*Table H-1: Program Goal Savings by Year – Missouri Metro*

| Program Year | Energy Savings Goal (kWh) | Peak Demand Reductions Goal (kW) |
|---|---|---|
| 2020 | 0 | 15,000 |
| 2021 | 0 | 15,000 |
| 2022 | 0 | 15,000 |
| **Total** | **0** | **45,000** |

*Table H-2: Program Goal Savings by Year – Missouri West*

| Program Year | Energy Savings Goal (kWh) | Peak Demand Reductions Goal (kW) |
|---|---|---|
| 2020 | 0 | 49,488 |
| 2021 | 0 | 52,092 |
| 2022 | 0 | 54,834 |
| **Total** | **0** | **156,414** |

Table H-3 below provides a summary of program metrics for the PY3 for the BDR Program.

*Table H-3: Performance Metrics – Business Demand Response Program*

| Metric | PY3 Total | MO West | MO Metro |
|---|---|---|---|
| Number of Participants* | 160 | 142 | 18 |
| ***Energy Savings (kWh)*** | | | |
| Targeted Energy Savings | 0 | 0 | 0 |
| Reported Energy Savings | 0 | 0 | 0 |
| Gross Verified Energy Savings | 0 | 0 | 0 |
| Net Verified Energy Savings | 0 | 0 | 0 |
| ***Peak Demand Reduction (kW)*** | | | |
| Targeted Peak Demand Reduction | 69,834.00 | 54,834.00 | 15,000.00 |
| Nominated Peak Demand Reduction[30] | 80,790.25 | 58,494.25 | 22,296.00 |
| Reported Peak Demand Reduction | 66,244.32 | 45,962.01 | 20,282.31 |
| Gross Verified Peak Demand Reduction | 65,618.90 | 45,354.36 | 20,264.54 |
| Net Verified Peak Demand Reduction | 65,618.90 | 45,354.36 | 20,264.54 |
| ***Benefit / Cost Ratios*** | | | |
| Total Resource Cost Test Ratio | 2.46 | 2.47 | 2.43 |

*Represents the number of unique account numbers in the program.

## H.2 EM&V Methodologies

In evaluating the PY3 Business Demand Response Program, ADM implemented a variety of impact evaluation practices that include estimates of gross and net peak demand reductions (kW) as framed by the following research questions:

- How many Evergy customers participated in the program?
- What are the demand savings achieved by participants, according to the reported energy savings DERMS customer baselines (CBLs)?
- Can the Distributed Energy Resource Management System (DERMS) CBL estimates and incentive payments be independently reproduced?
- Which baseline estimation technique produces the least error and bias in estimating loads during non-event days?
- What is the average load (kW) reduction during event hours compared to the baseline?

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[30] Evergy reports based on the kW Enrolled at the beginning of the season.

- Demand Response Events in 2022

### H.3 Sampling Plan

ADM evaluated a census of participants for the impact evaluation. For the process evaluation, ADM attempted to survey 50 participants.

### H.4 Data Collection

Data used for this evaluation include:

- Program tracking data. This data identifies which customers participated in the program and contains data fields such as contract curtailment amount, hourly usage, hourly baseline estimate used to calculate the incentive, CBL method used to make baseline estimate, and other relevant data fields.
- 15-minute interval meter data (AMI) for each customer participating in the BDR Program
- A full schedule of BDR Program events, including the time of the event
- Weather Data: ADM collected recorded weather data from the National Oceanographic and Atmospheric Administration (NOAA) to estimate the impact of weather on usage and for use in weather adjustments for a portion of CBLs tested on each site. Data was collected from the Kansas City International Airport.
- ADM reviewed the data tracking systems associated with the program to ensure that the data provided sufficient information to calculate energy and demand impacts. ADM determined that all the relevant data fields were included in the tracking data. In addition, ADM was able to replicate the following data:
    - Hourly usage in tracking data
    - Hourly baseline estimates
    - Incentive payment calculation

### H.5 Gross Impact Methodology

This section describes the impact evaluation activities and methodology that ADM performed for Evergy’s PY3 Business Demand Response Program. Based on Missouri regulations, ADM used method 1a and protocol 2a to evaluate the BDR program. Evergy does not claim energy savings for DRI; thus, the evaluation team did not calculate energy savings. ADM assumes energy loads to be mostly shifted to times outside of the event period. The methodology in the following sections describes ADM’s approach for the calculation of demand reduction.

### H.5.1 Program Activity

As shown in Table H-4, there were seven BDR events called in 2022. The curtailment events began at 1400 CDT and ended at 1800 CDT.

*Table H-4: DR Events in 2022*

| Event Date | Time |
|---|---|
| June 14th | 2-6 PM |
| June 21st | 3-7 PM |
| July 6th | 3-7 PM |
| July 19th | 2-6 PM |
| July 21st | 2-6 PM |
| August 2nd | 2-6 PM |
| September 20th | 2-6 PM |

Table H-5 provides a count of service point IDs for Evergy utilities. Many participants had several service point IDs enrolled in the program.

*Table H-5: Device Types by Jurisdiction*

| Jurisdiction | Number of Service Point IDs | Number of Participants |
|---|---|---|
| MO West | 439 | 145 |
| MO Metro | 95 | 17 |
| **Total** | **534** | **162** |

### H.5.2 Gross Energy Savings and Demand Reduction

***Estimating Evaluation Impacts – Customer Baseline (CBL)***

In the evaluation of demand response programs, peak demand reductions are estimated by comparing a participant's load shape during a demand response event with a baseline load shape. This baseline load is assumed to be a good estimate of the counterfactual load—that is, the load that would have manifested had there not been an event called that day.

In general, determining this baseline is a non-trivial task, especially in the context of commercial and industrial customers whose energy usage could theoretically be a function of the weather, the number of orders received, shift schedules, economic trends, and any number of variables that cannot always be explicitly modeled. Due to the intractability of modeling energy usage at this level of detail, baselines are typically estimated using heuristic rules applied to historical usage data. For example, if an event were called for Tuesday afternoon, a very simple heuristic would be to use Monday afternoon's load profile as the Tuesday event's baseline.

While the above baseline rule seems overly simplistic, it could perform adequately for a certain kind of business, such as one whose energy needs do not change from day to day. However, for most businesses, these assumptions do not hold, and this simple baseline rule would not be adequate. Both Evergy and ADM employed more sophisticated techniques to estimate counterfactual baseline usage.

The following terms are used for describing Evergy and ADM estimates and are referenced in the tables in the sections below.

- **Lookback Window** – Days prior to the event day that are eligible for inclusion in the CBL. The quantity of days and type of day included are determined by Day Type and Days in Lookback Window which are described below.
- **Day Type** – One of the eligibility requirements for a day to be included in the Lookback Window for the CBL.
- **Any Weekday** – CBLs use any non-holiday, non-event weekdays.
- **Similar Day of Week** – CBLs use any non-holiday, non-event days that are a similar day to the event. For Evergy and ADM CBLs, Monday and Friday are defined as similar. Tuesday, Wednesday, and Thursday are also defined as similar days.
- **Same Day of Week** – CBLs use any non-holiday, non-event days that are the same day of the week as the event.
- **Days in Lookback Window** – Number of days in the lookback window. These days will be ranked by usage during the hours determined by Hours Used to Determine Baseline Day Selection.
- **Hours Used to Determine Baseline Day Selection** – The hours that are selected for averaging usage and ranking days in the lookback window.
- **Days Selected from Lookback Window** – Number of days selected from the lookback window. The highest ranked are selected.
- **Unadjusted Baseline** – Once the days are selected from the lookback window, they are averaged across hours to create the Unadjusted Baseline.
- **Load Adjustment** – The Unadjusted Baseline can be adjusted to account for weather or usage prior to the event.
- **Weather based** – A weather adjustment is made by comparing historic customer usage and weather data. For example, ADM uses a linear correction term with facility demand as the dependent variable and the dry bulb temperature as the independent variable.

- **Usage based – Multiplicative** – If the load prior to event notification on the event day is different than the unadjusted baseline, the unadjusted baseline is multiplied by event day usage / unadjusted baseline usage.
- **Usage based – Additive** – If the load prior to event notification on the event day is different than the unadjusted baseline, the sum of the difference between the event day usage and the unadjusted baseline is added to the unadjusted baseline.
- **Load Adjustment Min** – This is the lower bound for the Load Adjustment. A downward adjustment is capped at the Load Adjustment Min multiplied by the unadjusted baseline.
- **Load Adjustment Max** – This is the upper bound for the Load Adjustment. An upward adjustment is capped at the Load Adjustment Max multiplied by the unadjusted baseline.
- **Proxy Event Day** – The highest system usage non-holiday weekdays where no event was called. CBLs are tested against these days as they serve as a good proxy for actual event days.

### *Customer Baseline Selection*

Evergy selected one of the CBL scenarios in Table H-6 to apply to each of the participants in the BDR Program. The CBL results were used for calculating “Percentage of Enrolled kW Achieved” for the incentive calculation and for expected kW.

*Table H-6: Baselines*

| Days in Lookback Window | Days Selected from Lookback Window | Day Type | Hours Used to Determine Baseline Day Selection | Load Adjustment | Load Adjustment Min | Load Adjustment Max |
|---|---|---|---|---|---|---|
| 10 | 5 | Any weekday | 12-3pm | Usage based - Multiplicative | - | - |
| 7 | 5 | Any weekday | 12-8pm | None | - | - |
| 4 | 3 | Same day of week | 2-6pm | Usage based - Additive | - | - |
| 5 | 3 | Similar day of week | 2-6pm | None | - | - |
| 3 | 3 | Same day of week | 12-8pm | Usage based - Additive | - | - |
| 8 | 2 | Similar day of week | 12-3pm | Usage based - Multiplicative | - | - |
| 2 | 2 | 12-3pm | 2-6pm | Usage based - Additive | - | - |
| 7 | 5 | Similar day of week | 2-6pm | Usage based - Multiplicative | - | - |
| 6 | 4 | Similar day of week | 12-8pm | Usage based - Multiplicative | 0.8 | 1.2 |
| 9 | 2 | Any weekday | 2-6pm | None | - | - |

The selection for appropriate CBL for each participant was made using a four-step process:

1. Select proxy event days (e.g., the top 12 highest load, non-event, non-holiday, weekdays for each month during the DR season (June – September).
2. Calculate all CBLs above for each customer on the proxy event days.
3. Screen for bias. Any model which underpredicts load on proxy event days greater than 70 percent of the time, or less than 30 percent of the time is eliminated.
4. Rank-order remaining models for accuracy by RRMSE and choose the top three best performing models (lowest RRMSE) and calculate a weighted baseline with the weight being each model’s RRMSE.

Calculate bias on proxy event days and adjust the weighted baseline to account for any remaining bias: adjusted baseline = weighted baseline / (1+bias).

### *Evaluation Customer Baseline Selection*

In the case of evaluating demand reduction impacts associated with the BDR Program, CBLs should represent what participants’ usage would have been if the event had not occurred. ADM tested multiple baseline models and selected the best fitting models (i.e., models that produced load profiles which best represented participant's usage in absence of the program as determined by a statistical test) for each customer. The list of CBLs can be found in Table H-7.

*Table H-7: BDR Savings Summary*

| Days in Lookback Window | Days Selected from Lookback Window | Day Type | Hours Used to Determine Baseline Day Selection | Load Adjustment | Load Adjustment Min | Load Adjustment Max |
|---|---|---|---|---|---|---|
| 5 | 5 | Any weekday | 2-6pm | None | - | - |
| 5 | 5 | Any weekday | 2-6pm | Usage based - Multiplicative | 0.8 | 1.2 |
| 5 | 5 | Any weekday | 2-6pm | Usage based - Multiplicative | 0.7 | 1.3 |
| 5 | 5 | Any weekday | 2-6pm | Usage based - Multiplicative | - | - |
| 5 | 5 | Any weekday | 2-6pm | Usage based - Additive | 0.8 | 1.2 |
| 5 | 5 | Any weekday | 2-6pm | Usage based - Additive | 0.7 | 1.3 |
| 5 | 5 | Any weekday | 2-6pm | Usage based - Additive | - | - |
| 5 | 5 | Any weekday | 2-6pm | Weather Based | - | - |
| 10 | 10 | Any weekday | 2-6pm | None | - | - |
| 10 | 10 | Any weekday | 2-6pm | Usage based - Multiplicative | 0.8 | 1.2 |
| 10 | 10 | Any weekday | 2-6pm | Usage based - Multiplicative | 0.7 | 1.3 |
| 10 | 10 | Any weekday | 2-6pm | Usage based - Multiplicative | - | - |
| 10 | 10 | Any weekday | 2-6pm | Usage based - Additive | 0.8 | 1.2 |
| 10 | 10 | Any weekday | 2-6pm | Usage based - Additive | 0.7 | 1.3 |

| Days in Lookback Window | Days Selected from Lookback Window | Day Type | Hours Used to Determine Baseline Day Selection | Load Adjustment | Load Adjustment Min | Load Adjustment Max |
|---|---|---|---|---|---|---|
| 10 | 10 | Any weekday | 2-6pm | Usage based - Additive | - | - |
| 10 | 10 | Any weekday | 2-6pm | Weather Based | - | - |
| 5 | 5 | Similar day of week | 2-6pm | None | - | - |
| 5 | 5 | Similar day of week | 2-6pm | Usage based - Multiplicative | 0.8 | 1.2 |
| 5 | 5 | Similar day of week | 2-6pm | Usage based - Multiplicative | 0.7 | 1.3 |
| 5 | 5 | Similar day of week | 2-6pm | Usage based - Multiplicative | - | - |
| 5 | 5 | Similar day of week | 2-6pm | Usage based - Additive | 0.8 | 1.2 |
| 5 | 5 | Similar day of week | 2-6pm | Usage based - Additive | 0.7 | 1.3 |
| 5 | 5 | Similar day of week | 2-6pm | Usage based - Additive | - | - |
| 5 | 5 | Similar day of week | 2-6pm | Weather Based | - | - |
| 10 | 10 | Similar day of week | 2-6pm | None | - | - |
| 10 | 10 | Similar day of week | 2-6pm | Usage based - Multiplicative | 0.8 | 1.2 |
| 10 | 10 | Similar day of week | 2-6pm | Usage based - Multiplicative | 0.7 | 1.3 |
| 10 | 10 | Similar day of week | 2-6pm | Usage based - Multiplicative | - | - |
| 10 | 10 | Similar day of week | 2-6pm | Usage based - Additive | 0.8 | 1.2 |
| 10 | 10 | Similar day of week | 2-6pm | Usage based - Additive | 0.7 | 1.3 |
| 10 | 10 | Similar day of week | 2-6pm | Usage based - Additive | - | - |

| Days in Lookback Window | Days Selected from Lookback Window | Day Type | Hours Used to Determine Baseline Day Selection | Load Adjustment | Load Adjustment Min | Load Adjustment Max |
|---|---|---|---|---|---|---|
| 10 | 10 | Similar day of week | 2-6pm | Weather Based | - | - |
| 5 | 5 | Same day of week | 2-6pm | None | - | - |
| 5 | 5 | Same day of week | 2-6pm | Usage based - Multiplicative | 0.8 | 1.2 |
| 5 | 5 | Same day of week | 2-6pm | Usage based - Multiplicative | 0.7 | 1.3 |
| 5 | 5 | Same day of week | 2-6pm | Usage based - Multiplicative | - | - |
| 5 | 5 | Same day of week | 2-6pm | Usage based - Additive | 0.8 | 1.2 |
| 5 | 5 | Same day of week | 2-6pm | Usage based - Additive | 0.7 | 1.3 |
| 5 | 5 | Same day of week | 2-6pm | Usage based - Additive | - | - |
| 5 | 5 | Same day of week | 2-6pm | Weather Based | - | - |
| 10 | 10 | Same day of week | 2-6pm | None | - | - |
| 10 | 10 | Same day of week | 2-6pm | Usage based - Multiplicative | 0.8 | 1.2 |
| 10 | 10 | Same day of week | 2-6pm | Usage based - Multiplicative | 0.7 | 1.3 |
| 10 | 10 | Same day of week | 2-6pm | Usage based - Multiplicative | - | - |
| 10 | 10 | Same day of week | 2-6pm | Usage based - Additive | 0.8 | 1.2 |
| 10 | 10 | Same day of week | 2-6pm | Usage based - Additive | 0.7 | 1.3 |
| 10 | 10 | Same day of week | 2-6pm | Usage based - Additive | - | - |
| 10 | 10 | Same day of week | 2-6pm | Weather Based | - | - |

ADM identified CBL “best fits” for each customer using residual root mean squared error (RRMSE) scores from the event window (12-8PM) during test days. These days serve as a good proxy for event days as they were days when an event was close to being called and will be referred to as “proxy event days.”

It has been ADM’s experience that CBL construction methods often produce generally consistent results, but in some cases CBLs may produce divergent results. To minimize calculation bias, ADM employed the same bias screen described in step 3 in Section H.5.2 above. In addition, ADM combined results as a weighted average of the best three models for each customer. The weights were the inverse squares of the model RRMSEs. For example, of three models having RRMSEs of 5 percent, 11 percent, and 52 percent respectively, their relative weights will be 82 percent, 17 percent, and 1 percent, respectively.

#### *Estimating Gross Peak Demand Reductions (kW)*

Peak demand reduction from the BDR Program events is estimated on a customer-by-customer basis. The customer demand reduction is calculated as the average load shed (in kW) during the duration of all events. The program peak demand reduction is equal to the sum of each customer’s demand reduction. Hourly load shed is calculated by subtracting hourly usage from the CBL baseline calculated for each customer for each event.

## H.6 Gross Impact Evaluation Findings

The following sections provide the results of the impact evaluation for the BDR Program.

### H.6.1 Peak Demand Reduction from Demand Response Events

Peak demand reduction (kW) was determined as the average hourly difference between event hours and a counterfactual non-event period. The method used to determine the counterfactual baseline is described in the methodology section of this chapter (Section H.5). The figure below (Figure H-1) provides the aggregate load shapes on event days. Figure H-2 provides the load shape for the June 21st event. A significant reduction in consumption is present during the event periods.

*Figure H-1: BDR Load Shape, All Events*

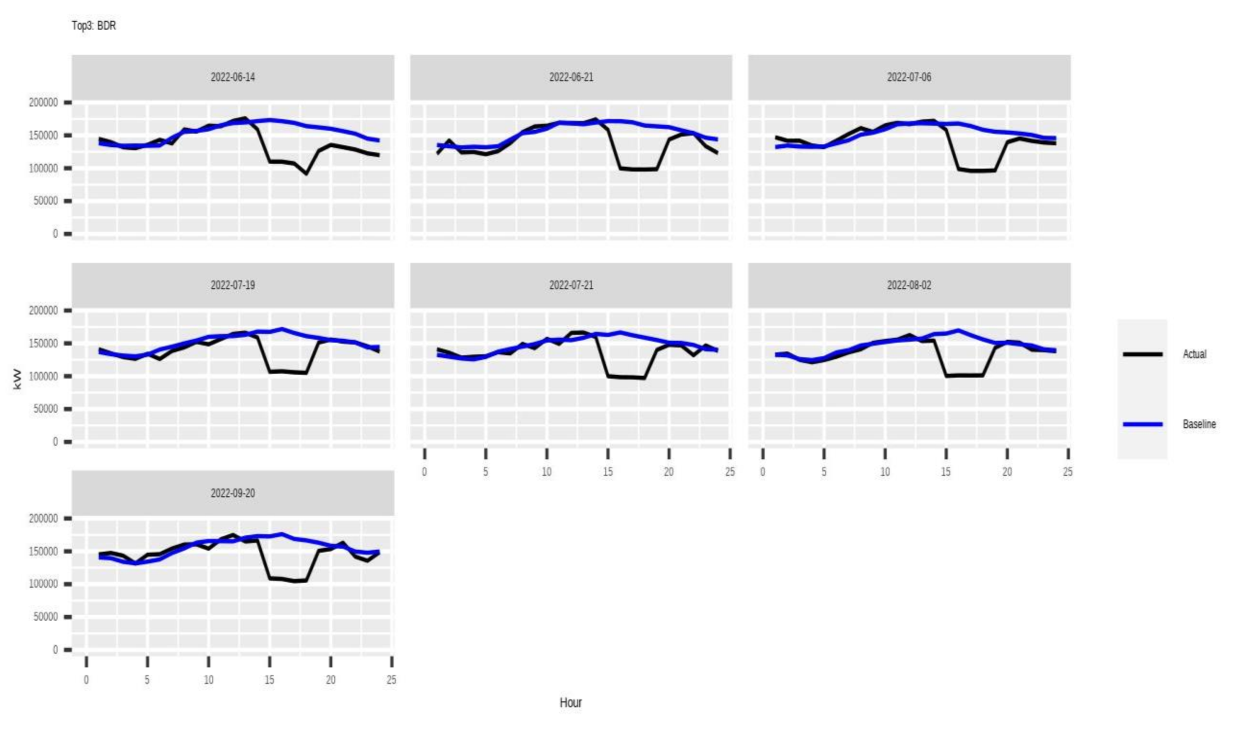


*Figure H-2: BDR Load Shape, Example Event (June 21)*

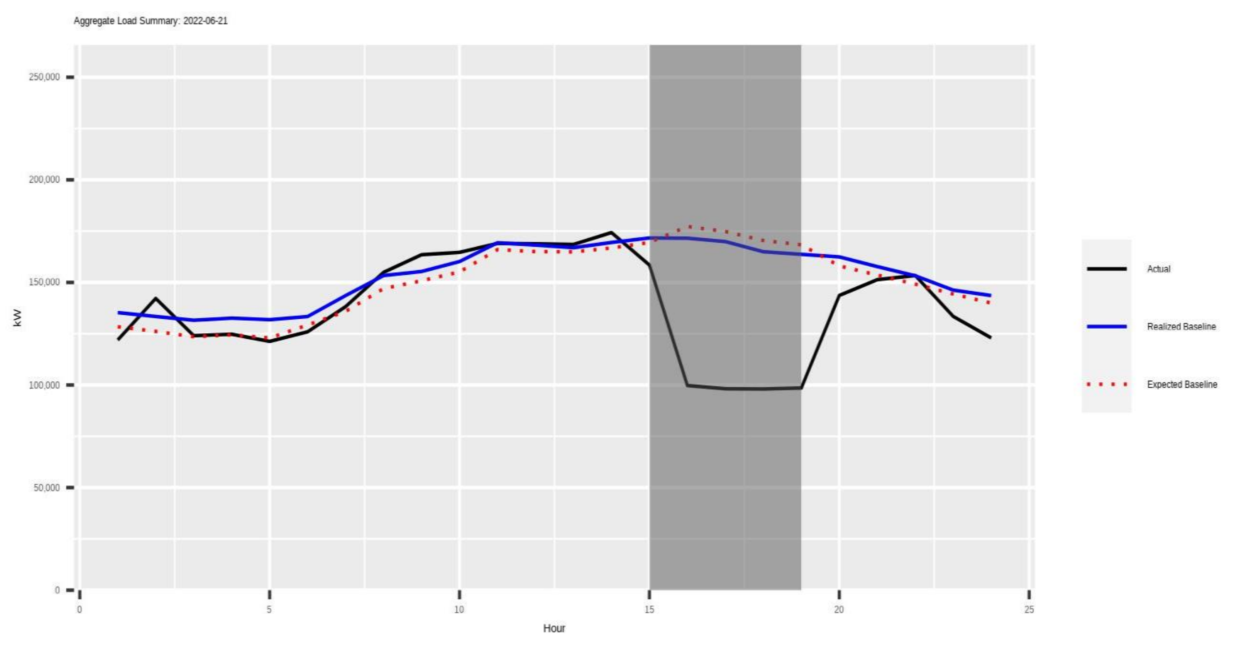


Table H-8 provides impact results for all BDR events called in PY3. The DR events resulted in a peak demand reduction representing 94 percent of the program goal and 99 percent of the expected reduction. The average kW reduction for Missouri Metro participants during the DR season was 1,192 while Missouri West participants averaged 313 kW.

*Table H-8: BDR Savings Summary*

| Jurisdiction | # of Customers | # of Service Point IDs | Expected kW | Realized kW | Realization Rate |
|---|---|---|---|---|---|
| MO West | 145 | 439 | 45,962.01 | 45,354.36 | 99% |
| MO Metro | 17 | 95 | 20,282.31 | 20,264.54 | 100% |
| **Total** | **162** | **534** | **66,244.32** | **65.618.90** | **99%** |

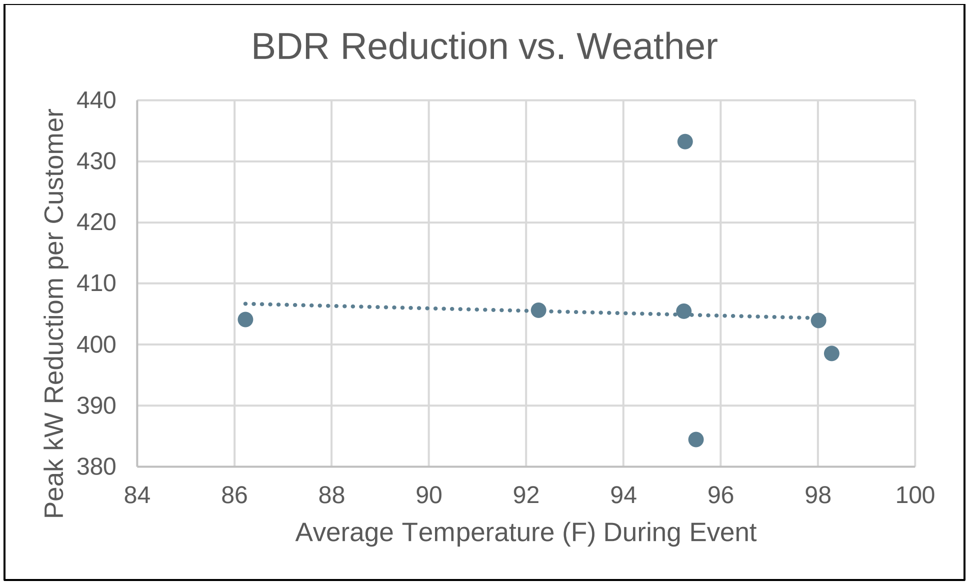
In addition to testing CBLs that incorporated weather data on each participant, ADM analyzed weather's impact on the program overall. Table H-9 provides DR event savings versus weather during event hours.

*Table H-9: DR Event Savings vs. Weather*

| Jurisdiction | Event Date | Realized kW | Avg. Temp (ºF) Event Hours |
|---|---|---|---|
| MO Metro | 6/14/2022 | 23,045 | 92.26 |
| MO Metro | 6/21/2022 | 21,324 | 95.27 |
| MO Metro | 7/6/2022 | 21,355 | 86.23 |
| MO Metro | 7/19/2022 | 21,416 | 95.50 |
| MO Metro | 7/21/2022 | 17,919 | 95.24 |
| MO Metro | 8/2/2022 | 16,923 | 98.29 |
| MO Metro | 9/20/2022 | 19,871 | 98.02 |
| MO West | 6/14/2022 | 42,666 | 92.26 |
| MO West | 6/21/2022 | 48,864 | 95.27 |
| MO West | 7/6/2022 | 44,108 | 86.23 |
| MO West | 7/19/2022 | 40,869 | 95.50 |
| MO West | 7/21/2022 | 47,763 | 95.24 |
| MO West | 8/2/2022 | 47,642 | 98.29 |
| MO West | 9/20/2022 | 45,568 | 98.02 |

Figure H-3 shows BDR event reduction and average temperature on event days. Many of the customers usage is process driven, and ADM found little relationship between event time temperature and savings.

*Figure H-3: BDR Savings vs. Weather*



## H.7 Net Impact Evaluation Findings

In demand response programs, it is typically assumed that there are neither spillover effects (customers are not expected to curtail without participating), nor free ridership. Although customers can find workarounds to make up for lost productivity due to demand response events, they are compensated only if they reduce their load during the peak demand window, the primary program goal. As such, the net-to-gross ratio for this program is assumed to be one (1).

## H.8 Impact Evaluation – Final Savings Tables

Table H-10 summarizes the verified peak demand reduction for the Business Demand Response Program. Evergy does not claim energy savings for DRI; thus, the evaluation team did not calculate energy savings.

*Table H-10: Peak Demand Reduction (kW)*

| Jurisdiction | # of Customers | # of Service Point IDs | Expected kW | Realized kW | Realization Rate |
|---|---|---|---|---|---|
| MO West | 145 | 439 | 45,962.01 | 45,354.36 | 99% |
| MO Metro | 17 | 95 | 20,282.31 | 20,264.54 | 100% |
| **Total** | **162** | **534** | **66,244.32** | **65.618.90** | **99%** |

## H.9 Process Evaluation

This section summarizes the findings from the process evaluations for Evergy's Business Demand Response (BDR) Program. The findings from in-depth interviews conducted with Evergy program staff and its implementer, CLEAResult, and the results of participant surveys are included.

### H.9.1 Program Operations

The BDR program is managed by Evergy's product manager, who coordinates the external program operations with the third-party implementer, CLEAResult, and manages the internal operations with Evergy's marketing team. Evergy's program manager also reviews and processes the incentive checks and bill credits for each program participant at the end of the season.

Mid-year 2022, program management changed for both Evergy and CLEAResult. However, senior management from both the utility and the implementer took over daily program management. Staff from both organizations indicated that despite the changes, there were no effects on the program roles and responsibilities.

> *"There were no changes in general operations and divided up CORE activities. We also worked with another consultant for the DERMS system." (Program Staff)*

The program manager's primary responsibility is "to make sure that all the data are flowing" between CLEAResult and the database manager who works with DERMS. The program manager also facilitates program recruitment by coordinating marketing and outreach activities to recruit business customers into the program.

CLEAResult's team includes the program manager, who coordinates all program operations, including recruitment, and a data scientist who develops the curtailment plans for each program participant. Two additional senior staff from CLEAResult provide guidance and strategic direction for this program.

#### *Program Design*

The BDR program was designed based on the specific tariff requirements for Evergy's business customers. The program design has remained consistent during the past three years for the Missouri West jurisdiction and the Missouri Metro jurisdiction. The goals for the Missouri West jurisdiction have increased yearly, while the focus of Missouri Metro has been to maintain program participation rates. Activities in Missouri West continue to focus on increasing enrollments to achieve more significant kW savings.

> *"The number one goal of the program design is the protection of ratepayer funds. It is a Pay-For-Performance program design but C&I customers can enroll in the program, and participate as they can with no penalties. We are not paying for any lost kW (kilowatts)." (Program Staff)*

The current program design assumes that the participant’s load will remain constant throughout the summer. If the implementer determines that the participant’s load is going up and operating higher than expected, then Evergy will lower the customer’s baseline to achieve energy savings. However, customers may not always understand the reasons for this adjustment.

### ***Program Enrollment***

The customer enrollment process and the journey are the same as last year as well. Once a customer indicates an interest in the program, then the implementer works with the participant to design a curtailment plan, which determines the amount of kW available that could be shed during an event. The curtailment plan describes the specific actions the customer will take during a DR event, the types of notifications that the customers will receive, the length of the agreement and the amount of the incentives.

> *“Having a tailored curtailment plan for each facility helps guide us, the outreach team, and the engineering team. The plan is co-written by the facility managers.” (Program Implementer).*

The curtailment plans shifted from strategies that shut down the core activities to ways that participants could shed load through periphery strategies. For example, the curtailment plans recommended shutting off the roof-top air conditioning systems rather than stopping the production line.

Customers are recruited throughout the winter months; they are not officially enrolled until June 1.

The timeline from the initial meeting to enrollment is about four weeks, on average. The implementation staff was also pleased with the relatively small turnover from the first year.

> *“We haven’t had much turnover- a small batch of drop offs. We also had a renewal conversation at the end of the season. We haven’t heard any negative feedback.” (Program Implementer)*

In 2022, Evergy started with an enrolled base of 130 customers. However, the implementation staff worked closely with the customers this year to explain the baseline used for each customer and communicate with the customer about how they would earn the incentives. Enrollment increased to 162 customers for 2022 while 12 to 15 customers dropped out of the program.

### ***Program Participation***

The participation goals remained consistent from last year.

After each curtailment event, the program implementation staff reviews the results with each participant. They also follow up with customers who did not participate or those who were having difficulty participating in these DR events to increase DR participation in the future.

> *"We meet every week to determine if Evergy is going to call an event. If so, we send out a warning email to try to give (the participants) two to three hours' notice." (Program Implementer).*

Curtailment typically aligns with the hottest day of the week during the summer months. Evergy called seven events in 2022.

Evergy also coordinated its marketing and outreach activities with the program implementer, so marketing expanded to include mailers and postcards in addition to email blasts. The BDR program was also cross promoted with Evergy's Business Energy Efficiency Program, managed by another implementation contract.

### *Communication*

The Evergy and CLEAResult staff have established an effective communications approach in which they share documents and information to improve overall program performance. The two teams have developed a productive working relationship.

### *Data Tracking and Quality Assurances and Controls (QA/QC)*

The program implementation team works closely with the Evergy staff in conducting Quality Assurance/Quality Control activities. The program documentation is updated annually. The team has also created a "pre-season checklist" to ensure that all reporting and tracking steps are identified and followed.

Evergy and CLEAResult noted that "tracking and reporting has gone well for event dispatch." Evergy staff automated many data processing functions to improve the coordination and workflow between the DEMS program and the workflow system.

> *"We are continuing to refine the data, but we think the process is going well." (Program Staff)*

These improvements also led to faster processing time for each event, streamlining the reporting and QA/QC process. Evergy also continues to look for additional ways by creating dashboards to enhance the reporting process.

### *Challenges for Program*

However, program staff identified some ongoing challenges for this program:

- **Establishing baselines:** The program design relies on establishing a baseline which requires communicating clearly with each participant. The participants must understand when the curtailment period starts and how their savings will be calculated.

- **Reaching out to rural customers:** This remains an ongoing challenge for the Missouri West jurisdiction, which has less commercial and industrial facilities compared to Missouri Metro. However, the implementation staff works to identify and retain customers.

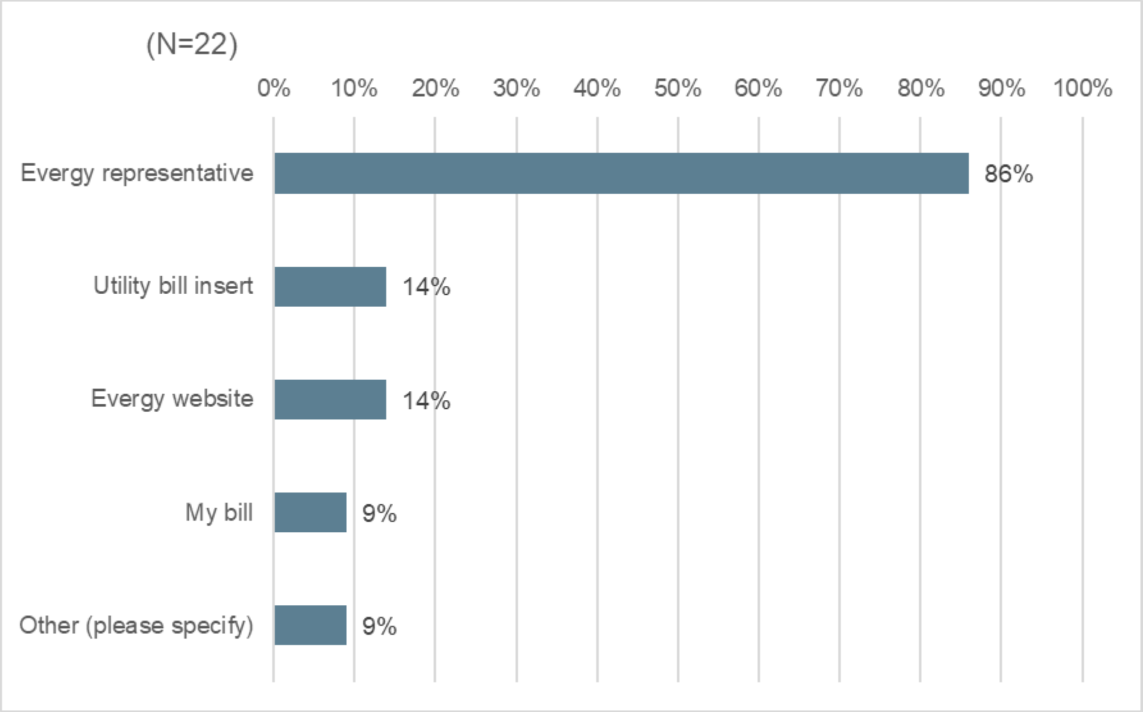
### H.9.2 Participant Survey

A total of 22 participants completed the online survey (14 percent of the total number of participants). The key findings are summarized next; however, due to the low response rates these findings should be viewed as qualitative rather than statistically representative of the entire participant population.

#### *Sources of Awareness*

Most respondents learned about this program directly from an Evergy representative (86 percent). A few survey participants mentioned learning about the program from other sources, such as bill inserts (14 percent) or the Evergy website (14 percent) as Figure H-4 shows.

*Figure H-4: How BDR Participants Learned about the DR Program*

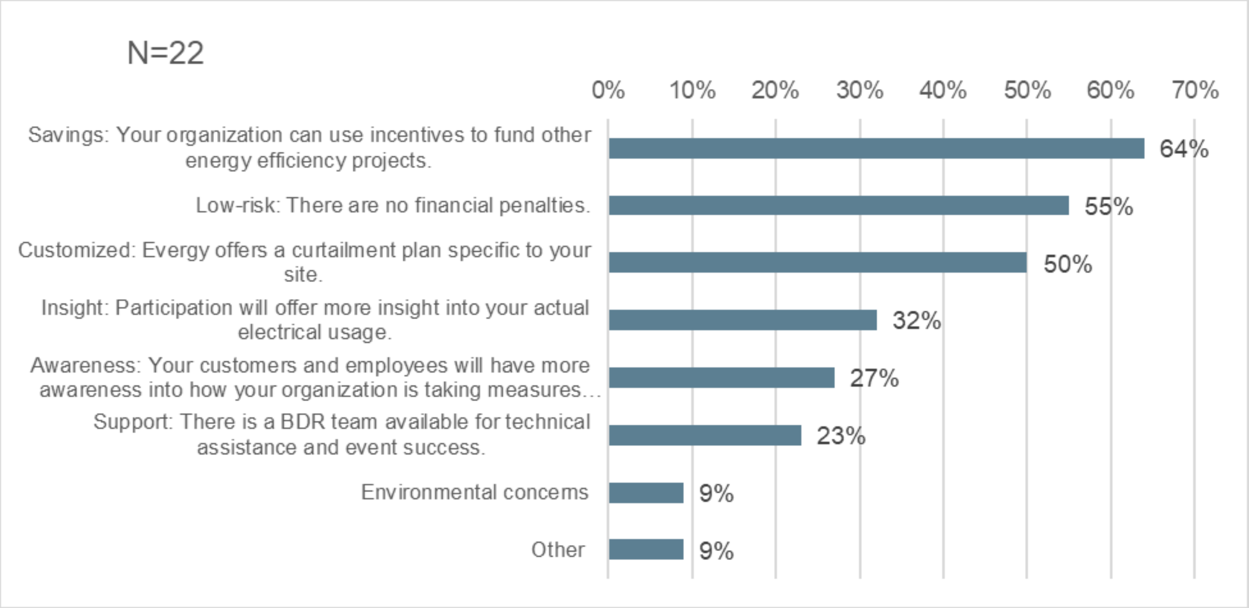


*Note: Percentages may exceed 100% due to respondents being able to select more than one response.*

#### *Reasons for Participating in the BDR Program*

Cost savings was the most frequently mentioned reason for participating in the program (64 percent), followed by the low risk of not facing any penalties (54 percent). The customized curtailment plan was another draw to the program, mentioned by 50 percent of the respondents. One respondent wanted to participate in the program to “be better stewards of God’s resources.” Figure H-5 summarizes these responses.

*Figure H-5: Reasons for Participating in the BDR Program*



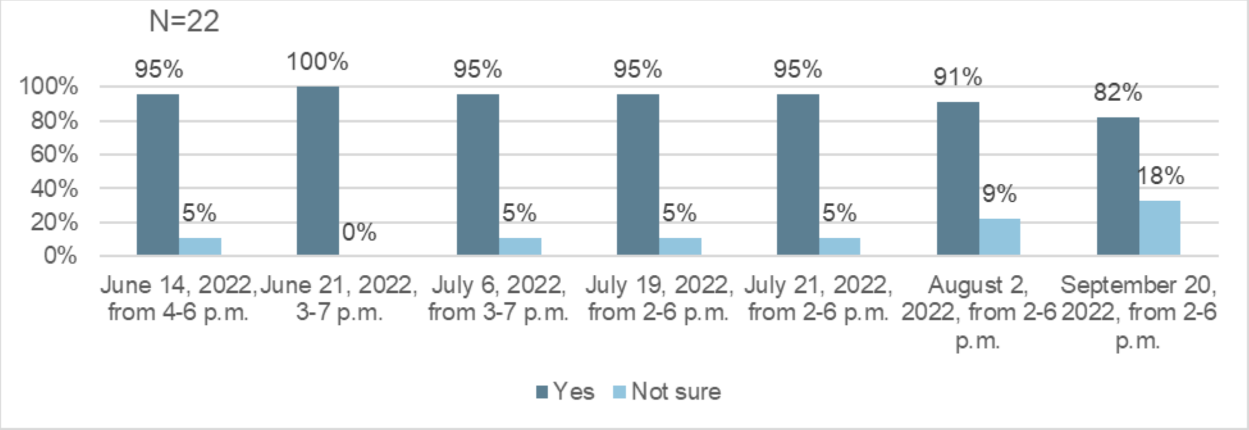
*Note: Percentages may exceed 100% due to respondents being able to select more than one response.*

More than three-quarters of the respondents (77 percent) recalled receiving a curtailment plan from Evergy while 14 percent said they did not receive a curtailment plan, and 9 percent were unsure.

### *Participation in DR Events*

Nearly all the survey respondents recalled participating in each DR event. However, the participation rates reached 100 percent for the June 21st event, and dropped to 82 percent for the September 20th event (see Figure H-6).

*Figure H-6: Participating Rate in Each DR Event*

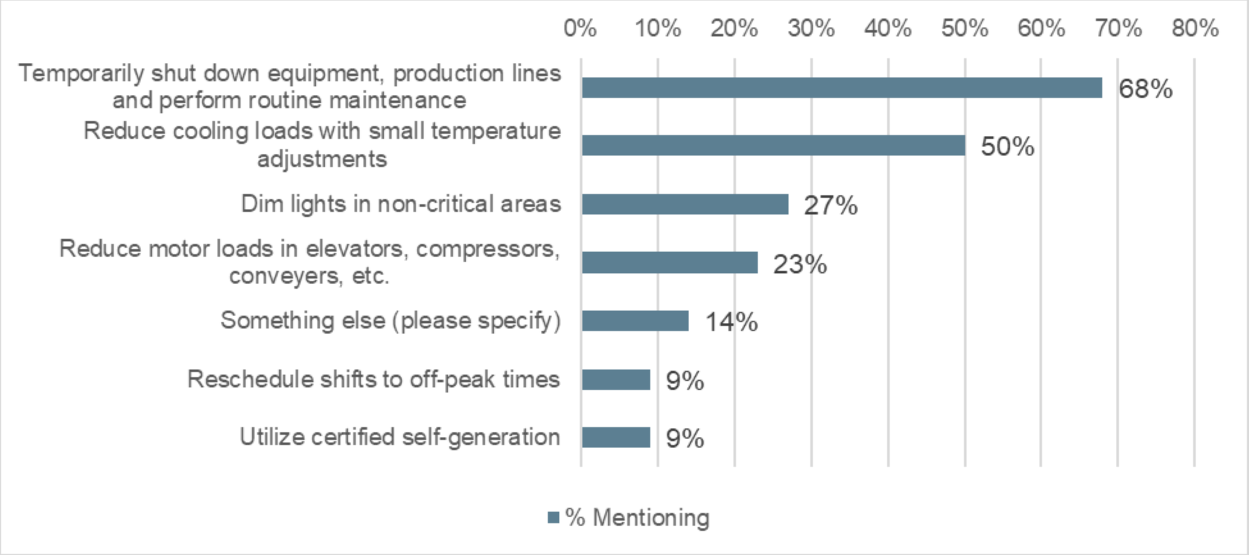


One respondent explained that their school did not participate in the September 20th event, as it would interfere with other school operations. However, they did curtail usage at the end of the school day.

### *Actions to Curtail Energy During DR Events*

Turning off the production line and performing routine maintenance was the most frequently mentioned curtailment strategy by the survey respondents (68 percent) while 50 percent mentioned reducing cooling loads during the DR event. Approximately one quarter dimmed lights (27 percent) or reduced motor loads in elevators or compressors (23 percent). Figure H-7 summarizes these findings. All the survey respondents recalled receiving notification for each event.

*Figure H-7: Actions Taken to Curtail Energy Load during Peak Events*



*Note: Percentages may exceed 100% due to respondents being able to select more than one response.*

### *Satisfaction with the BDR Program Components*

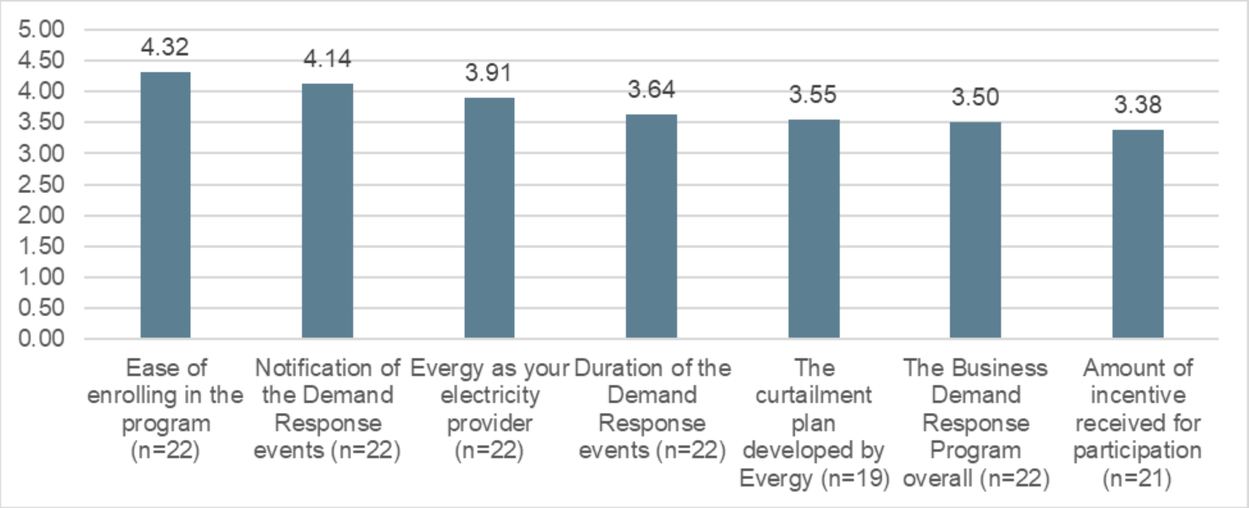
The survey respondents also rated their satisfaction with the various BDR program components. The program components that survey respondents were most satisfied with (given a rating of “4” or “5” on a 1 – 5 scale) were overall ease of program enrollment (86 percent) and the notification of DR events (77 percent). The program components that survey respondents were least satisfied with (given a rating of “4” or “5” on a 1 – 5 scale) were the curtailment plan (65 percent), the duration of DR events (59 percent), and the amount of the incentive offered by the BDR program (62 percent) (see Table H-11).

*Table H-11: Satisfaction Ratings for the Residential DR Program Components*

| Program Component | % "Very Dissatisfied " "1" | "2" | "3" | "4" | % "Very Satisfied" "5" |
|---|---|---|---|---|---|
| The curtailment plan developed by Evergy (n = 20) | 10% | 10% | 15% | 45% | 20% |
| Ease of enrolling in the program (n = 22) | 5% | 0% | 9% | 32% | 55% |
| Notification of the Demand Response events (n = 22) | 5% | 0% | 18% | 32% | 45% |
| Duration of the Demand Response events (n = 22) | 9% | 0% | 32% | 36% | 23% |
| Amount of incentive received for participation (n = 21) | 19% | 10% | 10% | 38% | 24% |
| The Business Demand Response Program overall (n = 22) | 18% | 0% | 14% | 50% | 18% |
| Evergy as your electricity provider (n = 22) | 5% | 14% | 5% | 41% | 36% |

Figure H-8 displays the average satisfaction rating for each BDR component. These results are consistent with the findings in Table H-11.

*Figure H-8:Average Satisfaction Ratings with BDR Program Components*



Some respondents also explained their rationale for each satisfaction rating. Several of these comments are extracted below and show the qualitative drivers of satisfaction and dissatisfaction.

***Positive Feedback***

> *"Cost saving all year."*
>
> *"I like the outreach and services."*
>
> *"There was good communication giving us time to inform our customers that we would be taking steps such as turning the AC off."*
>
> *"The duration of the events was during times that allowed (us) to work with our loads on campus. While the total number of events was a bit to handle, Evergy was good to work with in regard to communicating their needs. Additionally, the flexibility recently added to the program in regard to the payout goals was I believe beneficial to (us)."*

***Negative Feedback***

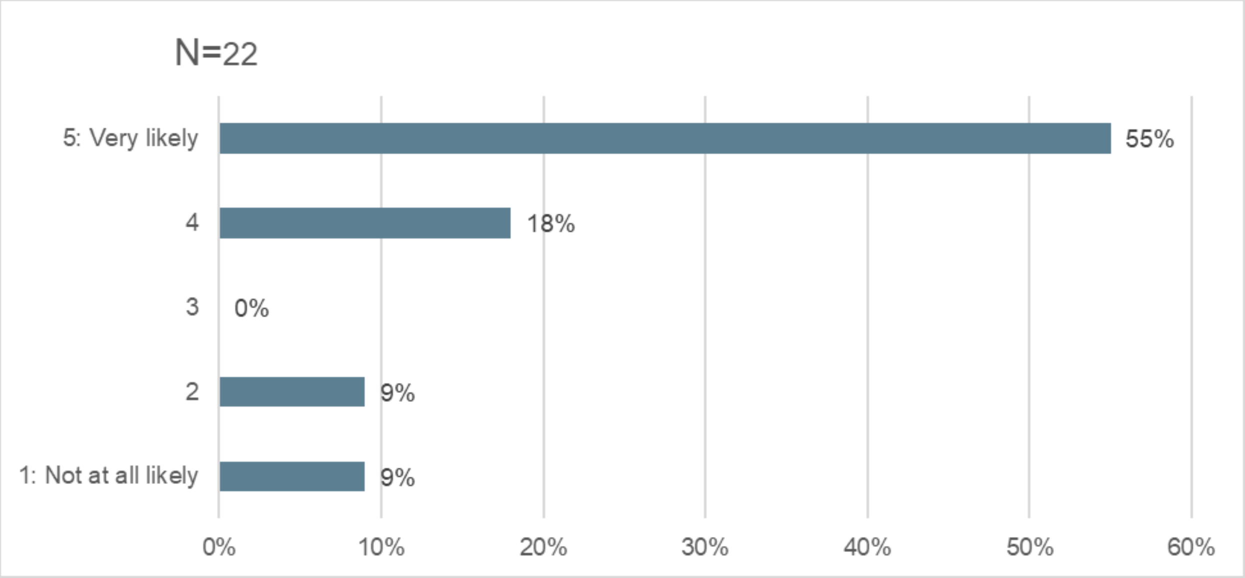
> *"For our business, the effort to follow the recommended response was more of a business and customer inconvenience and burden than any value received by the program. The demand response times were too long, and there were too many episodes."*
>
> *"The duration of the events was during times that allowed us to work with our loads on campus. While the total number of events was a bit to handle, Evergy was good to work with in regard to communicating their needs. Additionally, the flexibility recently added to the program in regard to the payout goals was I believe beneficial to NW."*
>
> *"We need a better-customized plan for incentives. We can't save more during the program and shut things off when our trend is already to shut things off at 4 p.m."*

> *"The program is generally pretty good, but the length of the events is a little excessive."*
>
> *"The majority of our use is during times where Evergy will not schedule a BDR, so our incentive is small."*
>
> *"The savings check did not outweigh the diesel fuel bill."*

### *Likelihood of Recommending the BDR Program to Others*

The participants also rated their likelihood of recommending the program to others using a five-point scale where "1" means "Not at all Likely and "5" means "Very Likely." The findings, summarized in Figure H-9, indicate that nearly three-quarters of survey respondents (73 percent) would recommend this program to others (i.e., a rating of "4" or "5) to others. In contrast, only 18 percent are "Unlikely" to recommend the BDR program to others.

*Figure H-9: Likelihood of Recommending the BDR Program to Others*



### *Business Firmographics*

The survey participants represented a broad range of businesses including a steel manufacturer, a chemical plant, a data center, and a health club. A quarter of the survey respondents also were in the education sector and 19 percent were religious facilities (see Table H-12).

*Table H-12: Types of Businesses*

| Type of Business | Count of Respondents (n = 21) | Percent of Responses |
|---|---|---|
| Other (please specify) | 6 | 29% |
| School / College / University | 5 | 24% |
| Religious / House of Worship | 4 | 19% |
| Retail store | 2 | 10% |
| Hospital | 2 | 10% |
| Office | 1 | 5% |
| Warehouse | 1 | 5% |

Most survey participants had one location (82 percent) while 14 percent preferred not to answer this question. Furthermore, 86 percent of the owned their buildings while 9 percent lease their facilities.

As Table H-13 shows, most of the respondents (72 percent) did not provide information about their annual gross revenues while 18 percent indicated annual sales of more than $1 million.

*Table H-13: Approximate Gross Annual Revenues in 2022*

| Approximate Gross Annual Revenue | Count of Respondents (n = 11) | Percent of Responses |
|---|---|---|
| $100,001-$250,000 | 1 | 9% |
| More than $1 million | 2 | 18% |
| Not sure | 5 | 45% |
| Prefer not to answer | 3 | 27% |

## H.10 Conclusions and Recommendations

ADM performed a process evaluation that assessed program documentation and primary data collected from program stakeholders. The evaluation included fielding one customer survey and conducting in-depth interviews with the utility and third-party implementation staff.

The following summarizes the key findings of the process evaluation of the BDR Program:

- The BDR program had a successful program year. Program participants also reported high satisfaction rates overall for most program elements. In addition, nearly three-quarters (73 percent) of program participants would recommend this program to others.

- Significant barriers to program participation remain, including:
    - Challenges in recruiting participants in the Missouri West jurisdiction, which typically has fewer industrial and manufacturing customers;
    - Customer confusion concerning whether load baselines are changed due to increased operating loads.
    - Some dissatisfaction with the current curtailment plans developed for some facilities.
    - Some dissatisfaction with the duration of events and the number of DR events called.

The following recommendations are offered for continued improvement of the BDR Program:

- The program implementer should continue to look for creative ways to market this program to smaller commercial and industrial customers by scaling the kW enrollment targets. This approach may be especially effective at reaching smaller customers in the Missouri West jurisdiction.
- The program implementer should continue to develop customized tailored curtailment plans with facility managers. However, these plans may need to be reviewed during the DR season if customer usage changes unexpectedly. The program implementer should clarify for customers when load baselines are expected to change to minimize customer confusion and dissatisfaction.

# Appendix I Residential Demand Response Program-Specific Methodologies

This chapter describes the evaluation activities that were performed by ADM to evaluate the Residential Demand Response (RDR) Program.

## I.1 Program Overview

The RDR Program uses automatic event call technology to curtail energy use during peak demand periods. Eligible customers are provided an incentive to participate in curtailment events.

Participation Channels:

- Customers can purchase devices and install the device themselves.
- Customers can receive devices provided at a discounted price and receive professional installation.
- Customers can enroll their eligible existing device.

Called upon devices (in PY3) will increase a customer's setpoint between 2- and 5-degrees Fahrenheit. Pre-cooling occurs prior to an event and the customer receives notification via their smart device application.

### I.1.1 Expected Energy Savings and Peak Demand Reduction

Targeted energy and demand impact for the Residential Demand Response program years 2020 - 2022 are shown in the tables below (Table I-1 and Table I-2). These Targeted savings are taken from KCP&L filing EO-2019-0132.

*Table I-1: Program Goal Savings by Year – Missouri Metro*

| Program Year | Energy Savings Goal (MWh) | Peak Demand Reductions Goal (MW) |
|---|---:|---:|
| 2020 | 1,171 | 8.68 |
| 2021 | 1,330 | 9.96 |
| 2022 | 1,466 | 11.14 |
| **Total** | **3,967** | **29.78** |

*Table I-2: Program Goal Savings by Year – Missouri West*

| Program Year | Energy Savings Goal (MWh) | Peak Demand Reductions Goal (MW) |
|---|---|---|
| 2020 | 1,221 | 9.22 |
| 2021 | 1,402 | 10.60 |
| 2022 | 1,549 | 11.17 |
| **Total** | **4,172** | **30.99** |

Table I-3 below provides a summary of program metrics for the PY3 for the RDR Program.

*Table I-3: Performance Metrics – Residential Demand Response Program*

| Metric | PY3 Total | MO West | MO Metro |
|---|---|---|---|
| Number of Participants | 6,343 | 3,095 | 3,248 |
| ***Energy Savings (kWh)*** | | | |
| Targeted Energy Savings | 3,015,616 | 1,549,459 | 1,466,157 |
| Reported Energy Savings | 1,485,774 | 730,279 | 755,495 |
| Gross Verified Energy Savings | 1,395,270 | 685,795 | 709,475 |
| Net Verified Energy Savings | 1,395,270 | 685,795 | 709,475 |
| ***Peak Demand Reduction (kW)*** | | | |
| Targeted Peak Demand Reduction | 22,908.84 | 11,773.80 | 11,135.04 |
| Reported Peak Demand Reduction | 10,229.50 | 4,928.36 | 5,301.14 |
| Gross Verified Peak Demand Reduction | 11,317.28 | 5,558.28 | 5,758.99 |
| Net Verified Peak Demand Reduction | 11,317.28 | 5,558.28 | 5,758.99 |
| ***Benefit / Cost Ratios*** | | | |
| Total Resource Cost Test Ratio | 1.67 | 1.57 | 1.78 |

## I.2 EM&V Methodologies

This chapter describes the impact evaluation activities and methodology that ADM performed for Evergy's 2022 Residential Demand Response Program. Table I-4 provides a summary of the savings approach by program year.

*Table I-4: Savings Approaches by Program Year*

| Program Year | Peak Demand Reductions (Demand Response) | kWh Savings |
|---|---|---|
| 2020 | Calculated | Evergy TRM |
| 2021 | Calculated | Calculated |
| 2022 | Calculated | PY2 Value |

In evaluating the 2022 Residential Demand Response Program, ADM implemented a variety of impact evaluation exercises including estimation of gross and net energy savings (kWh) as well as peak demand reductions (kW) as framed by the following research questions:

- How many Evergy customers participated in the program? What is the quantity and type of measures incentivized/rebated?
- What is the energy savings for each incentivized measure?
- What is the peak demand reduction for each incentivized measure?
- What percentage of gross savings is directly attributable to the program (net savings analysis)?

### I.2.1 Demand Response Events in 2022

As shown in Table I-5, there were 12 demand response events called in 2022 falling in the months of June, July, August, and September. Curtailment events were called between the hours of 3 p.m. through 6 p.m. CDT, with most events lasting two hours.

*Table I-5: Demand Response Events in 2022*

| Date | Hours Called | Jurisdiction |
|---|---|---|
| 6/13/2022 | 4-6 PM | MO West/MO Metro |
| 6/14/2022 | 4-6 PM | MO West/MO Metro |
| 6/21/2022 | 4-6 PM | MO West/MO Metro |
| 7/5/2022 | 4-6 PM | MO West/MO Metro |
| 7/6/2022 | 4-6 PM | MO West/MO Metro |
| 7/19/2022 | 4-6 PM | MO West/MO Metro |
| 7/21/2022 | 4-6 PM | MO West/MO Metro |
| 8/2/2022 | 4-6 PM | MO West/MO Metro |
| 8/3/2022 | 4-6 PM | MO West/MO Metro |
| 9/7/2022 | 3-6 PM | MO West/MO Metro |
| 9/19/2022 | 4-6 PM | MO Metro |
| 9/20/2022 | 4-6 PM | MO West |

### I.2.2 Smart Thermostat Devices

Table I-6 provides the quantity of devices for each device type and jurisdiction.[31] More participants installed Google thermostats compared to ecobee thermostats for the Missouri Metro jurisdiction, while ecobee's were installed more for Missouri West. Table I-7 provides the quantity of devices for each device subtype and jurisdiction.

*Table I-6: Device Types by Jurisdiction*

| Jurisdiction | Device Type | # of Devices |
|---|---|---:|
| MO West | ecobee | 1,750 |
| MO West | Google Nest | 1,501 |
| MO Metro | ecobee | 1,445 |
| MO Metro | Google Nest | 2,022 |

---

[31] Counts include all devices present in PY3 tracking data, with the exclusion of devices that were removed or returned in PY3.

*Table I-7: Device Subtypes by Jurisdiction*

| Jurisdiction | Device Type | # of Devices |
|---|---|---:|
| MO West | ecobee Smart Thermostat Premium | 141 |
| MO West | ecobee SmartThermostat with voice control | 216 |
| MO West | ecobee3 | 10 |
| MO West | ecobee3 Lite | 1,371 |
| MO West | ecobee4 | 12 |
| MO West | Google Nest 1st Gen | 3 |
| MO West | Google Nest 2nd Gen | 21 |
| MO West | Google Nest Learning Thermostat | 660 |
| MO West | Google Nest Thermostat | 795 |
| MO West | Google Nest Thermostat E | 22 |
| MO Metro | ecobee Smart Thermostat Premium | 131 |
| MO Metro | ecobee SmartThermostat with voice control | 171 |
| MO Metro | ecobee3 | 4 |
| MO Metro | ecobee3 Lite | 1,115 |
| MO Metro | ecobee4 | 24 |
| MO Metro | Google Nest 2nd Gen | 41 |
| MO Metro | Google Nest Learning Thermostat | 854 |
| MO Metro | Google Nest Thermostat | 1,076 |
| MO Metro | Google Nest Thermostat E | 51 |

Table I-8 provides the number of Smart Thermostat units installed and the number of customers for each measure type.[32] Do-it-yourself (DIY) installations were the most frequent measure type for the RDR program and accounted for 50 percent of installations in 2022. In addition, Professional (PRO) installations accounted for 35 percent of device installations while Bring-Your-Own-Thermostat (BYOT) installations accounted for the remaining 15 percent of installed units.

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[32] Counts include all devices present in PY3 tracking data, with the exclusion of devices that were removed or returned in PY3.

*Table I-8: Smart Thermostat Installations by Measure Type*

| Jurisdiction | Measure Type | # of Smart Thermostat Units | # of Customers |
|---|---|---:|---:|
| MO West | BYOT Installation | 437 | 414 |
| MO West | DIY Installation | 1,748 | 1,747 |
| MO West | PRO Installation | 1,066 | 941 |
| MO Metro | BYOT Installation | 583 | 528 |
| MO Metro | DIY Installation | 1,596 | 1,593 |
| MO Metro | PRO Installation | 1,288 | 1,138 |

## I.3 Sampling Plan

ADM evaluated each participating thermostat for each event. An extrapolated peak demand reduction value from the analyzed thermostats was applied to thermostats with installation after all events took place.

## I.4 Data Collection

Data used for this evaluation include:

- Program tracking data for 2022. This data identifies which customers participated in the program and contains data fields such as thermostat installation date, number of devices installed, thermostat device type, measure type, and other relevant data fields.
- 15-minute interval meter data (AMI) for each participating customer.
- A full schedule of program events, including the time of the event.
- ADM collected recorded weather data from the NOAA to estimate the impact of weather on usage.

ADM reviewed the data tracking systems associated with the program to ensure that the data provides sufficient information to calculate energy and demand impacts. ADM determined that all the relevant data fields were included in the tracking data and savings reported in the tracking system complied with energy savings calculations and guidelines set by the Evergy TRM.

ADM collected two types of weather data for the evaluation: 1) actual recorded weather from the National Oceanographic and Atmospheric Administration (NOAA) and 2) 30-year weather normal or Typical Meteorological year (TMY) weather data. Actual weather data was used when fitting the models and TMY data was used to extrapolate savings (if appropriate).

ADM collected hourly Heating Degree Hours (HDH) and Cooling Degree Hours (CDH) from NOAA.gov for use in the regression analysis. Data was collected from the nearest available weather stations and assigned to each customer based on customer zip code. Daily HDDs are calculated as the sum of hourly average temperature values under the heating setpoint (65°F) on each day, while daily CDDs are calculated as the sum of hourly average temperature values over the cooling setpoint (65°F) on each day. The setpoint values for HDDs and CDDs were determined by running regressions with multiple setpoints from 60°F - 80°F and choosing the setpoint combination with the highest adjusted R-squared value (i.e., best fit).

ADM collected Typical Meteorological Year (TMY) data[33] from the nearest relevant weather station/s to extrapolate estimated annual savings, as shown in Table I-9.

*Table I-9: TMY for Kansas City International Airport*

|  | HDD | CDD |
|---|---|---|
| **Annual TMY** | 5,581 | 1,461 |

## I.5 Gross Impact Methodology

This section describes the impact evaluation activities and methodology that inform the savings values for Evergy's PY3 Residential Demand Response Program. For PY3, peak demand reductions were calculated using estimates from PY1 and PY2, accounting for average temperature (F) during event hours in PY3. Annual energy savings (kWh) in PY3 are based on estimates from PY2.

### I.5.1 Gross Energy Savings and Demand Reduction

***Demand Response Demand Reduction (kW) Methodology***

Demand savings for the demand response portion of the program was estimated using a weather-adjusted Linear Fixed Effects Regression (LFER) model. The model uses customers' 15-minute AMI data on non-event baseline days and extrapolates the model to event days to estimate the impact on energy demand. The LFER model specifies energy demand as a function of temperature and other variables that influence usage. ADM identified non-event baseline days during the same month as demand response events whose weather pattern most closely matches the weather pattern on event days, and these days served as the counterfactual baseline. ADM defined baseline days as those with a maximum daily temperature greater than or equal to the minimum observed maximum temperature during all demand response events.

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[33] https://rredc.nrel.gov/solar/old_data/nsrdb/1991-2005/tmy3/by_state_and_city.html

When fitting regression models, ADM tested correlations between explanatory variables, statistical significance of variables, and the impact of each variable on model fit. The final form of the model is shown below.

*Equation I-1: Linear Fixed Effects Regression Model*

$$
\begin{aligned}
Usage\ (kWh)_{it} \\
&= \alpha_0 + \sum_{m=1}^{12} \alpha_m\, Month_{it} + \sum_{w=1}^{7} \alpha_w\, DOW_{it} + \beta_3 CDH_{it} + \beta_4 MA24CDH_{it} \\
&+ \sum_{h=1}^{24} \alpha_h\, Hour_{it,h} * \sum_{i=1}^{n} \alpha_i\, Customer_{it} + \epsilon_{it}
\end{aligned}
$$

Where:

$\alpha_0$ = *intercept term*

*m* = *index for month m*

*w* = *index for day of the week m*

*t* = *time interval*

*i* = *index for customer i*

*n* = *number of sampled smart thermostat households*

$Usage(kWh)$ = *average usage during the time interval for customer i*

$\beta_k, \alpha_m, \alpha w_i, \alpha_h, \alpha_i$ = *vectors of coefficients*

$Month$ = *vector of dummy variables for each month m*

$DOW$ = *vector of dummy variables for each day of the week w*

$CDH$ = *cooling degree hours*

$MA24CDH$ = *moving average of the last 24 hours CDH*

$Hour$ = *vector of dummy variables for each hour of the day*

$Customer$ = *vector of dummy variables for each customer i*

$\epsilon$ = *error term*

ADM estimated savings rates kW/unit separately for both Missouri Metro and Missouri West.

Prior to running the model, ADM removed devices that fail to meet certain criteria, including:

- Missing zip code for a device/customer (due to inability to map to correct weather data)
- Incomplete or missing data during the DR season (<1 percent of households)
- Average usage of 0 during the DR season (<1 percent of households)
- Devices that were returned or removed before the end of the DR season

### *Classification of Non-Contributing Devices Using AMI Billing Data*

ADM identified non-contributing households to assess its impact on demand reductions. Example reasons why a household may be a non-contributor includes:

- Non-responding devices (NRD) are devices that not responsive to the curtailment signal.
- Opt-outs are customer who opt-out of a DR event.
- Customers that are not running their AC (i.e., they away on vacation or at work during the event).

A device is considered a “non-responding device” (NRD) if it is not responsive to the curtailment signal. This would indicate that the switch communications were not working.

Switch communications may be interrupted for a variety of reasons: the A/C unit may not be powered on, the switch may become disconnected or defective, or the participant’s household wiring may prevent communication. In some cases, it may be difficult for utilities to determine the reason the switch is not communicating.

Opt-outs are different than non-responding devices, though the resulting observations are similar. Opt-outs occur when a customer chooses not to participate in the curtailment event. In most cases, when a customer chooses to opt-out, the customer is declining to participate in all subsequent events, rather than a single event. Opt-outs are similar to non-responding devices in that AMI meter data for the household displays no demand reductions during the curtailment event. However, opt-outs can be categorized as opt-outs using customer communication records, or program tracking of opt-out customers.

Customers who are not running their AC unit during the DR event will have a load shape similar to NRD and opt-out customers and appear to not have a demand reduction. For instance, the customer may be on vacation, away at work, or have an AC unit problem.

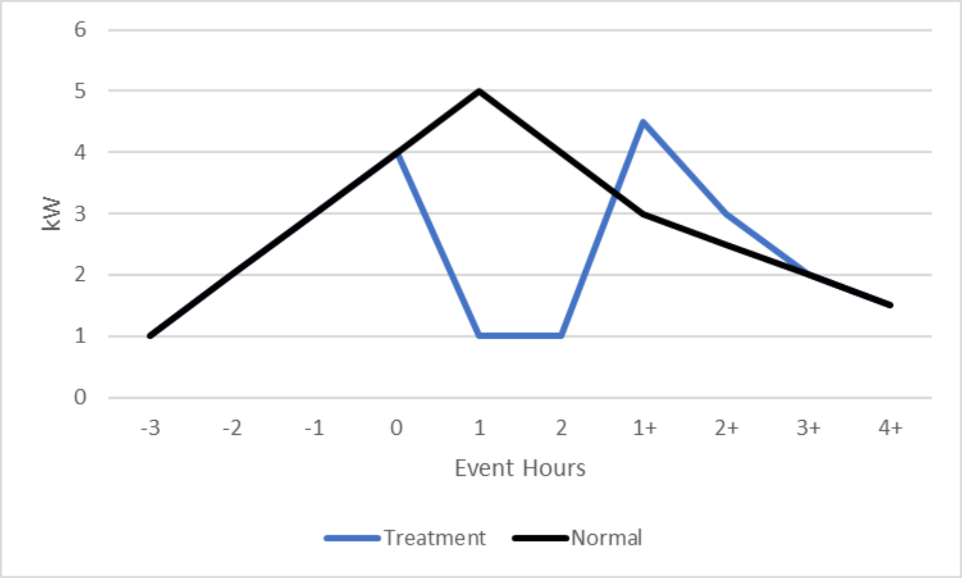
ADM attempted to quantify a separate opt-out rate for the program; however, information on customer opt-outs was not available for the program. As such, a rate that includes all non-contributing households was calculated.

ADM identified non-contributing households using a combination of two algorithms:

1. A cumulative sum (CSUM) change in slope analysis
2. A linear 10 percent decrease in load detection

When a DR event is called, each device is sent curtailment instructions that result in a significant load drop over the duration of the event. This drop is illustrated in Figure I-1, which provides an example event and an example of a typical or “baseline” usage curve[34].

*Figure I-1: Example of Site-Level Load Shapes During Event Hours*



ADM defines the methodology applied for each algorithm in the following sections.

**CSUM Analysis:**

The CSUM smoothing technique is a rolling sum defined as:

$$x = (a, b, c, \dots, z)\ CSUM(x) = (a, a + b, a + b + c, \dots, a + \dots + z)$$

Where:

$x$ = a vector of kWh measures taken at increasing one-hour intervals during the event day

A smoothed, increasing curve is created by taking the CSUM of each treatment site during the demand response period (Figure I-2).

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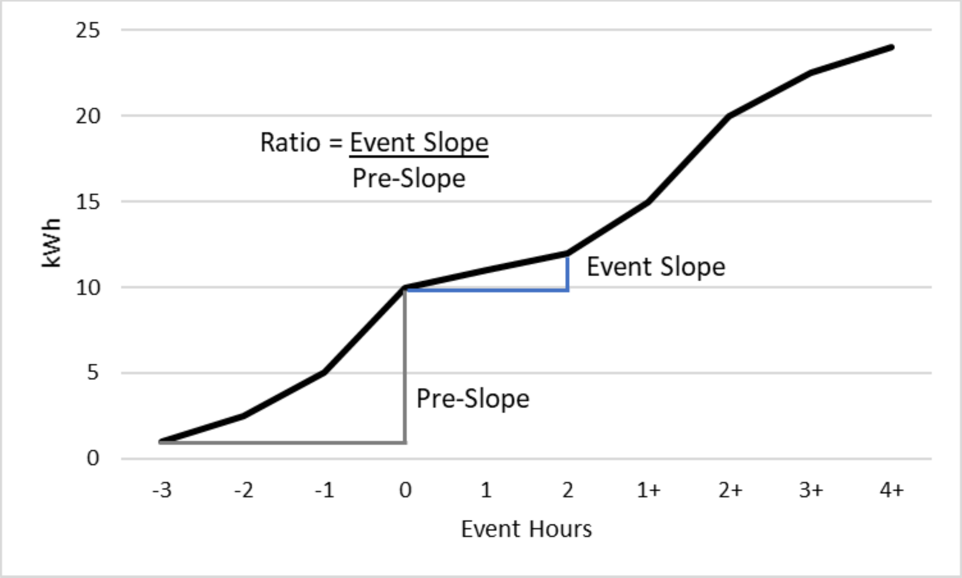
[34] The figure is illustrative only and does not show an actual event for the program.

*Figure I-2: Example of Site-Level CSUM Slope Changes During Event Hours*



The slopes of this curve for the three hours prior to the start of the event and the hours during the event are calculated (Figure I-2). The ratio of the event period slope divided by the pre-period slope was calculated to test if there is a significant change in the slope due to the demand response event. A contributing device is detected by a decrease in the line slope. Therefore, the ratio is less than one. Using this test, ADM defined sites with a slope less than one to be a contributing device, which indicates a decrease in demand during the demand response event.

**Linear 10 Percent Decrease Analysis:**

In parallel with the CSUM analysis, a linear test for 10 percent reduction in consumption during the demand response event is also employed. For each unique device, the consumption for the hour prior to the event is compared to the consumption during the first hour of the event (Figure I-2) to detect a reduction in demand greater than 10 percent with the following equation:

*Equation I-2: Non-Contributing Device for 10 Percent Decrease Analysis*

$$\text{Non} - \text{Contributing Device} = T1_{kWh} \leq T2_{kWh}$$

Where:

$T1_{kWh}$ = $PriorHr_{kWh} - EventHr_{kWh}$

$T2_{kWh}$ = $PriorHr_{kWh} * 10\%$

$PriorHr_{kWh}$ = *Demand displayed during the hour prior to the demand response event*

$EventHr_{kWh}$ = *Demand displayed during the first hour of the demand response event*

By taking advantage of the processing speed of vectorized programming in the R-Studio environment, every individual site in the program is tested per event.

### *Annual Energy Savings (kWh) Methodology*

Annual energy savings for smart thermostat customers were estimated using a weather-adjusted Post Period Regression (PPR) ordinary least-squares (OLS) model. A matched comparison group was created using a Propensity Score Matching (PSM) approach. With the PSM approach, a propensity score is estimated for treatment customers (i.e., those who received program services) and a group of customers who did not receive program services using a logit model. Customers in the treatment and control groups are matched based on seasonal pre-period usage (e.g., summer, spring, fall, and winter) and zip code (or other factors such as rate code). In addition, demand response event days are removed from the data to avoid creating bias.

Control group customers were selected from customers who have not participated in any demand response or energy efficiency programs. In addition, the PPR model utilized post period data only. Data for control customers was restricted to the post period timeframe for their matched participant (to ensure the same number of observations in the post period). After creating a matched comparison group, the program impacts were estimated with the following regression. The final form of the model is shown below.

*Equation I-3: RDR Final Model*

$$Usage\ (kWh)_{it} = \alpha_0 + \sum_{m=1}^{12} \alpha_m\, Month_{m,t} * \sum_{p=1}^{4} \alpha_p\, Pre - Period\ Usage_{p,it} + \beta_1 * Treatment_{it} + \beta_2 * HDH_{it} + \beta_3 * CDH_{it} + \beta_4 * Treatment_{it} * HDH_{it} + \beta_5 * Treatment_{it} * CDH_{it} + \epsilon_{it}$$

Where:

$\alpha_0$ = *intercept term*

*t* = *index for the time interval*

*i* = *index for the customer*

*m* = *index for month of the year*

*p* = *index for season of the year (spring, summer, fall, winter)*

*Month* = *dummy variable for month of the year*

*Pre-Period Usage* = *average pre-period usage for season p (spring, summer, fall, winter) for customer i*

*Treatment* = *dummy variable*

= *1 if in the treatment group, and 0 otherwise*

$HDH_{it}$ = *average heating degree hours for time interval t*

$CDH_{it}$ = *average cooling degree hours for time interval t*

$\epsilon_{it}$ = *error term*

$\alpha, \beta$ = *parameters to be estimated by the model.* $\beta_1, \beta_4, and\ \beta_5$ *are the parameters of interest for estimating the reduction in kWh usage*

The total annual energy savings (kWh) for the program is calculated by taking the estimated kWh savings/unit and multiplying by the number of thermostat units considered part of the program in 2022.

### *Estimating Net Savings*

In demand response programs, it is typically assumed that there are neither spillover effects nor free ridership (only participating customers are expected to curtail usage). As such, the net-to-gross ratio for this program is assumed to be 1.00.

## I.6 Gross Impact Evaluation Findings

The following sections provide the results of the impact evaluation for the Residential Demand Response Program.

### I.6.1 Peak Demand Reduction from Demand Response Events

ADM obtained peak demand reductions in PY3 by estimating the relationship between weather and peak demand reduction in prior program years (PY1/PY2). The following equations provide the estimated relationship between peak demand reduction (kW/unit) and average temperature (F) during event hours.

*Equation I-4: MO Metro Peak Demand Reduction*

$$Peak\ demand\ reduction\ \left(\frac{kW}{unit}\right) = 0.56101 + 0.008402 * Average\ Temperature\ (F)\ During\ Event\ Hours$$

*Equation I-5: MO West Peak Demand Reduction*

$$Peak\ demand\ reduction\ \left(\frac{kW}{unit}\right) = -0.93039 + 0.023892 * Average\ Temperature\ (F)\ During\ Event\ Hours$$

Table I-10 provides weather normalized peak demand reductions for each jurisdiction over a range of temperatures (F).

*Table I-10: Weather Normalized Peak Demand Reduction*

| Average Temperature (F) During Event Hours | MO West (kW/Unit) | MO Metro (kW/Unit) |
|---|---|---|
| 83 | 1.26 | 1.05 |
| 84 | 1.27 | 1.08 |
| 85 | 1.28 | 1.10 |
| 86 | 1.28 | 1.12 |
| 87 | 1.29 | 1.15 |
| 88 | 1.30 | 1.17 |
| 89 | 1.31 | 1.20 |
| 90 | 1.32 | 1.22 |
| 91 | 1.33 | 1.24 |
| 92 | 1.33 | 1.27 |
| 93 | 1.34 | 1.29 |
| 94 | 1.35 | 1.32 |
| 95 | 1.36 | 1.34 |
| 96 | 1.37 | 1.36 |
| 97 | 1.38 | 1.39 |
| 98 | 1.38 | 1.41 |
| 99 | 1.39 | 1.43 |
| 100 | 1.40 | 1.46 |
| 101 | 1.41 | 1.48 |
| 102 | 1.42 | 1.51 |
| 103 | 1.43 | 1.53 |
| 104 | 1.43 | 1.55 |
| 105 | 1.44 | 1.58 |

The following columns are referenced in the tables below:

- **Jurisdiction** – This column describes which service area the results cover.
- **Event Date** – This column contains the date of each DR event.
- **% Non-Contributing Devices** – This column contains the percent of non-contributing devices on DR event days.
- **Expected Peak Demand Reduction per Unit** – This column contains the expected DR event peak demand reductions per unit = 1.40.

- **Realized Peak Demand Reduction per Unit** – This column contains the realized average DR event peak demand reductions per unit.
- **Expected kWh/Unit Savings** – This column contains the expected annual kWh/Unit savings = 197.
- **Realized kWh/Unit Savings** – This column contains the realized annual kWh/Unit savings.
- **% Non-Contributing Households** – This column contains the percentage of households with non-contributing devices.
- **Eligible Units** – This column contains the number of devices eligible for savings. For kWh savings, a device is deemed eligible if the measure type is Do-it-Yourself (DIY) or Professional (PRO); Bring-Your-Own-Thermostat (BYOT) is ineligible for annual kWh savings as the assumption is that these customers would have installed the device in the absence of the program. In addition, to be eligible, the device must have been installed in PY3 and not returned or removed.[35] For kWh eligible units, devices must have been installed but do not have to be available for DR events. For kW devices, the device must be enrolled in the DR program during the program year and be available for curtailment events.
- **Expected Peak Demand Reductions** – This column contains the total expected DR Peak Demand Reductions = Expected Peak Demand Reduction per Unit*Eligible Units.
- **Realized Peak Demand Reductions** – This column contains the total DR Peak Demand Reductions = Realized Peak Demand Reduction per Unit * Eligible Units.
- **Expected kWh Savings** – This column contains the total expected annual kWh savings = Expected kWh/Unit Savings*Eligible Units.
- **Realized kWh Savings** – This column contains the total realized annual kWh savings = Realized kWh/Unit Savings*Eligible Units.

Table I-11 provides impact results for each RDR demand response event called in 2022.

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[35] Evergy also removes devices returned or removed in PY3 that were available or installed in prior program years. The Eligible Unit counts reflect these annual adjustments.

*Table I-11: RDR Peak Demand Reductions by Event Date*

| Event Date | Peak Demand Reduction per Unit, MO West | Peak Demand Reduction per Unit, MO Metro |
|---|---|---|
| 6/13/2022 | 1.36 | 1.35 |
| 6/14/2022 | 1.33 | 1.26 |
| 6/21/2022 | 1.36 | 1.35 |
| 7/5/2022 | 1.36 | 1.35 |
| 7/6/2022 | 1.33 | 1.23 |
| 7/19/2022 | 1.37 | 1.38 |
| 7/21/2022 | 1.38 | 1.38 |
| 8/2/2022 | 1.37 | 1.39 |
| 8/3/2022 | 1.28 | 1.11 |
| 9/7/2022 | 1.27 | 1.09 |
| 9/19/2022 | - | 1.35 |
| 9/20/2022 | 1.36 | - |
| **Average kW/Unit** | **1.34** | **1.29** |

Table I-12 shows the average percentage of devices across all DR events that were non-contributing utilizing ADM's classification detailed in the "Classification of Non-Contributing Devices Using AMI Billing Data" section. In addition, the percentage of opt-out and offline devices are also provided utilizing data obtained from ecobee and Google[36].

*Table I-12: Average Percent Non-Contributing Devices Across Events*

| Jurisdiction | Device | % Non-Contributing Households (ADM Estimate) | % Non-Contributing (Manufacturer Estimate) | % Opt-Out (All Devices) | % Offline (All Devices) |
|---|---|---|---|---|---|
| MO West | ecobee | 25% | 29% | 16% | 13% |
| MO West | Google | 28% | 34% | 23% | 11% |
| MO Metro | ecobee | 27% | 23% | 13% | 10% |
| MO Metro | Google | 29% | 32% | 23% | 9% |

---

[36] Both ecobee and Google opt-out estimates are based on whether a customer ever opted out of the event (i.e., the percentage includes partial opt-outs).

The following figures (Figure I-3 through Figure I-6) provide ADM's estimate of the percent of non-contributing households by device and jurisdiction over the course of the demand response season using AMI data[37]. A slight upward trend occurs for ecobee due to a spike in the rate on August 2nd. No trend occurs for Google devices.

*Figure I-3: Ecobee Percent Non-Curtailed Households, MO West*

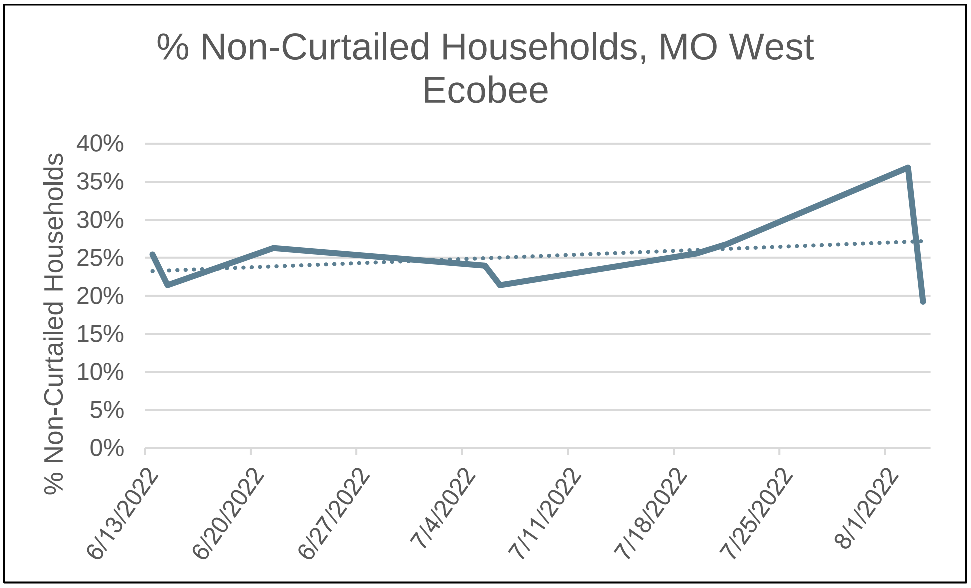
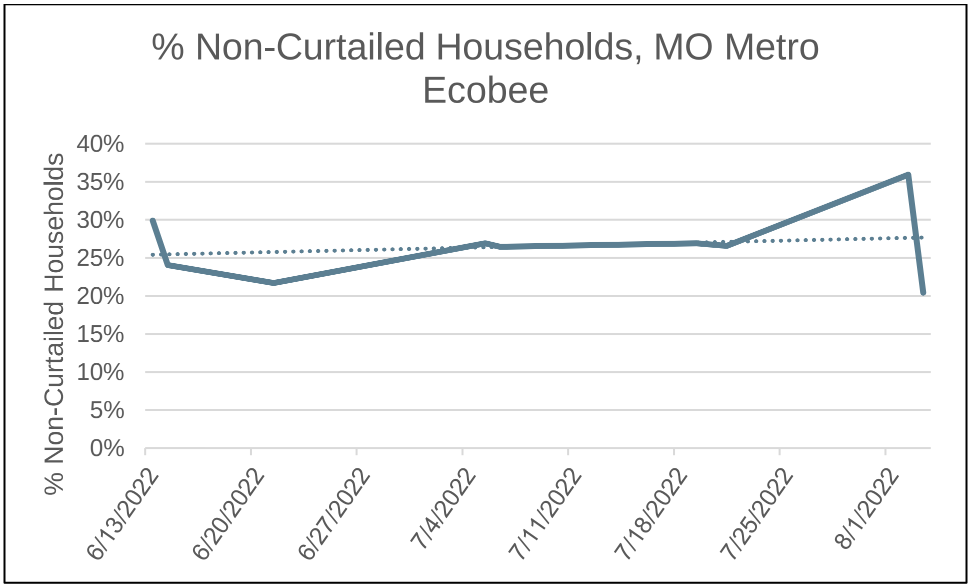


*Figure I-4: Ecobee Percent Non-Curtailed Households, MO Metro*



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[37] September events were excluded from the comparison because the first September event started during different times for ecobee and Google devices and the other September events were called on different days for each jurisdiction.

*Figure I-5: Google Percent Non-Curtailed Households, MO West*

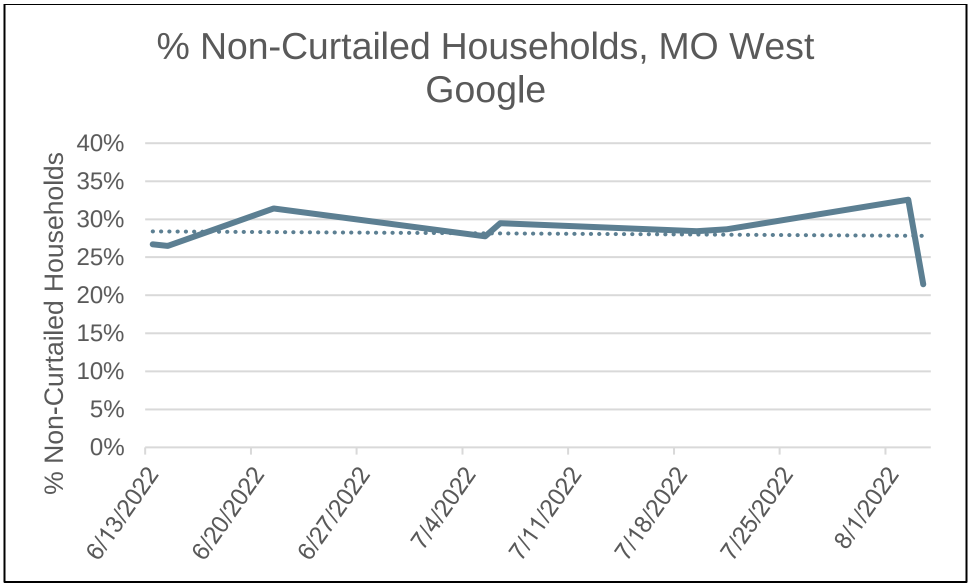
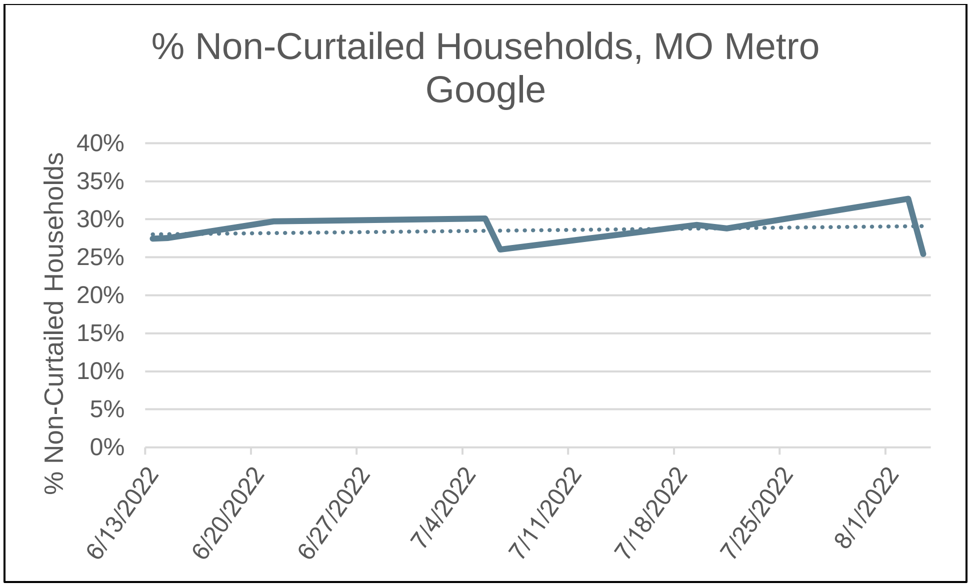


*Figure I-6: Google Percent Non-Curtailed Households, MO Metro*



The following table (Table I-13) provides information on Ecobee full opt-out, partial opt-out, and offline rates by jurisdiction using opt-out data provided by Ecobee. The opt-out data included an opt-out time stamp for each event which ADM used to compare with DR event times. A full opt-out is classified as a device that opted out before the start of an event. A partial opt-out is a device that opted out during the event time. Offline rates represent the share of devices that were not found when the event dispatch call was sent.

Most customers who opt-out of an event do so during the event (~95 percent) and are classified at partial opt-outs. A slight positive trend in the share of opt-outs occurred over the course of the DR season, while no change was seen in the percentage off offline devices.

*Table I-13: Ecobee Opt-out and Offline Rates*

| **Jurisdiction** | **Event Date** | **% Partial Opt-out** | **% Full Opt-out** | **% Opt-out** | **% Offline** | **% Non-Contributing Devices (Opt-out + Offline)**[38] |
|---|---|---|---|---|---|---|
| MO Metro | 6/13/2022 | 6% | 0% | 7% | - | - |
| MO Metro | 6/14/2022 | 15% | 1% | 16% | - | - |
| MO Metro | 6/21/2022 | 13% | 2% | 15% | - | - |
| MO Metro | 7/5/2022 | 7% | 0% | 7% | - | - |
| MO Metro | 7/6/2022 | 14% | 1% | 14% | - | - |
| MO Metro | 7/19/2022 | 16% | 1% | 16% | - | - |
| MO Metro | 7/21/2022 | 17% | 1% | 17% | - | - |
| MO Metro | 8/2/2022 | 13% | 1% | 14% | 13% | 26% |
| MO Metro | 8/3/2022 | 8% | 0% | 9% | 13% | 21% |
| MO Metro | 9/7/2022 | 16% | 0% | 16% | 13% | 29% |
| MO Metro | 9/19/2022 | 15% | 1% | 17% | 13% | 29% |
| MO West | 6/13/2022 | 12% | 1% | 12% | - | - |
| MO West | 6/14/2022 | 18% | 1% | 19% | - | - |
| MO West | 6/21/2022 | 13% | 2% | 15% | - | - |
| MO West | 7/5/2022 | 8% | 0% | 9% | - | - |
| MO West | 7/6/2022 | 19% | 1% | 20% | - | - |
| MO West | 7/19/2022 | 19% | 1% | 20% | - | - |
| MO West | 7/21/2022 | 18% | 1% | 18% | 11% | 29% |
| MO West | 8/2/2022 | 13% | 1% | 14% | 10% | 24% |
| MO West | 8/3/2022 | 11% | 0% | 11% | 10% | 21% |
| MO West | 9/7/2022 | 19% | 0% | 19% | 11% | 30% |
| MO West | 9/20/2022 | 17% | 1% | 18% | 11% | 29% |

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[38] The data field identifying offline devices was not present in the ecobee opt-out data for most of the DR season.

Table I-14 provides event time temperature (F) during events by jurisdiction.

*Table I-14: RDR DR Event Weather*

| Year | Event Date | Average Event Time Temperature (F), MO West | Average Event Time Temperature (F), MO Metro |
|---|---|---|---|
| 2022 | 6/13/2022 | 95.26 | 95.51 |
| | 6/14/2022 | 91.62 | 91.49 |
| | 6/21/2022 | 95.58 | 95.58 |
| | 7/5/2022 | 95.14 | 95.32 |
| | 7/6/2022 | 91.42 | 90.50 |
| | 7/19/2022 | 96.60 | 96.64 |
| | 7/21/2022 | 97.03 | 96.67 |
| | 8/2/2022 | 96.83 | 97.03 |
| | 8/3/2022 | 85.36 | 85.60 |
| | 9/7/2022 | 83.80 | 84.48 |
| | 9/19/2022 | 95.53 | 95.26 |
| | 9/20/2022 | 95.43 | 95.62 |
| **Average** | | **93.30** | **93.31** |

Reported and verified peak demand reductions for the RDR Program are shown in Table I-15 below. The realization rate for peak demand reductions is 94 percent.

*Table I-15: RDR Peak Demand Reduction*

| Jurisdiction | Reported Peak Demand Reduction per Unit | Verified Peak Demand Reduction per Unit | Eligible Units | Reported Peak Demand Reductions | Verified Peak Demand Reductions | RR (kW) |
|---|---|---|---|---|---|---|
| MO West | 1.19 | 1.34 | 4,138 | 4,928.36 | 5,558.28 | 113% |
| MO Metro | 1.19 | 1.29 | 4,451 | 5,301.14 | 5,758.99 | 109% |
| **Total** | | | **8,589** | **10,229.50** | **11,317.28** | **111%** |

### I.6.2 Annual Energy Savings (kWh)

Annual energy savings (kWh) per unit for smart thermostats of 185 kWh were derived from the PY2 analysis, which utilized Propensity Score Matching (PSM) to create a matched cohort. The results of the PY2 analysis are provided below for reference.

ADM was successful in creating a matched cohort and the results of Propensity Score Matching (PSM) and the annual consumption estimate for RDR are summarized below.

ADM used nearest neighbor, 2 to 1 ratio matching with replacement for control customers and had a considerable pool of control customers to draw upon, as shown in Table I-16. Customers were matched on their average monthly pre-period usage. Prior to matching, customers were required to have at least 6 months of post-period data. In addition, demand response event days were removed from the post-period to avoid creating bias.

*Table I-16: PSM Customer Matches*

| Status | Control | Treated |
|---|---:|---:|
| All | 6,752 | 881 |
| Matched | 1,463 | 878 |
| Unmatched | 5,289 | 3 |

Table I-17 presents the propensity score covariate summary of pre-period usage for treatment and control customers before and after matching.[39] The standardized mean difference prior to matching is often over 0.1 for many covariates; however, after matching the absolute value of the standardized mean difference is less than 0.1, which is an ideal outcome.

*Table I-17: PSM Covariate Summary*

| Variable | Before Matching | | | After Matching | | |
|---|---:|---:|---:|---:|---:|---:|
| | Mean Treated | Mean Control | Standardized Mean Difference | Mean Treated | Mean Control | Standardized Mean Difference |
| Distance | 0.132 | 0.113 | 0.289 | 0.129 | 0.129 | 0.000 |
| Pre-period Jan | 34.578 | 34.335 | 0.008 | 34.501 | 33.355 | 0.039 |
| Pre-period Feb | 31.840 | 32.092 | -0.010 | 31.782 | 30.813 | 0.038 |
| Pre-period Mar | 25.979 | 25.073 | 0.057 | 25.995 | 25.627 | 0.023 |
| Pre-period Apr | 25.627 | 23.954 | 0.105 | 25.661 | 25.725 | -0.004 |
| Pre-period May | 27.352 | 24.060 | 0.192 | 27.420 | 27.534 | -0.007 |
| Pre-period June | 51.604 | 44.468 | 0.310 | 51.693 | 51.703 | 0.000 |
| Pre-period July | 51.646 | 45.946 | 0.252 | 51.737 | 52.054 | -0.014 |
| Pre-period Aug | 44.286 | 39.248 | 0.246 | 44.364 | 44.695 | -0.016 |
| Pre-period Sept | 42.765 | 37.773 | 0.248 | 42.846 | 43.089 | -0.012 |
| Pre-period Oct | 24.900 | 23.571 | 0.092 | 24.926 | 24.631 | 0.020 |
| Pre-period Nov | 29.097 | 28.670 | 0.020 | 29.080 | 28.399 | 0.033 |
| Pre-period Dec | 32.886 | 32.275 | 0.025 | 32.853 | 31.995 | 0.036 |

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[39] PSM covariate summary results for each Rate code and 3-digit Zip code have been omitted for the sake of brevity.

Table I-18 provides results for a t-test which helps determine the success of matching. The test measures whether there are statistically significant differences in average daily consumption used between the treatment and comparison groups in the pre-period by month. Statistically significant differences are defined as a p-value of less than 0.05 at the 95 percent significance level. As shown below, the p-value is greater than 0.05 for each month tested. This result further indicates propensity score matching performed well because the differences between the treatment and comparison groups are not statistically significant.

*Table I-18: Post-Matching T-Test of Difference in Pre-Period Usage by Month*

| Month | Average Daily kWh Control | Average Daily kWh Treatment | T Stat | Std Error | P-Value | Reject Null? |
|---|---|---|---|---|---|---|
| Jan | 33.489 | 34.501 | -0.805 | 1.257 | 0.421 | No |
| Feb | 30.955 | 31.782 | -0.744 | 1.113 | 0.457 | No |
| Mar | 25.451 | 25.995 | -0.759 | 0.715 | 0.448 | No |
| Apr | 25.336 | 25.661 | -0.471 | 0.691 | 0.637 | No |
| May | 26.911 | 27.420 | -0.696 | 0.731 | 0.486 | No |
| June | 50.735 | 51.693 | -0.933 | 1.027 | 0.351 | No |
| July | 51.120 | 51.737 | -0.604 | 1.022 | 0.546 | No |
| Aug | 43.783 | 44.364 | -0.630 | 0.921 | 0.529 | No |
| Sept | 42.240 | 42.846 | -0.676 | 0.896 | 0.499 | No |
| Oct | 24.381 | 24.926 | -0.863 | 0.632 | 0.388 | No |
| Nov | 28.362 | 29.080 | -0.797 | 0.900 | 0.425 | No |
| Dec | 32.037 | 32.853 | -0.772 | 1.056 | 0.440 | No |

Figure I-7 displays the density of seasonal pre-period usage, before conducting matching. Figure I-8 displays the density of seasonal pre-period usage, after conducting matching.

*Figure I-7: Seasonal Pre-Period Usage Before Matching*

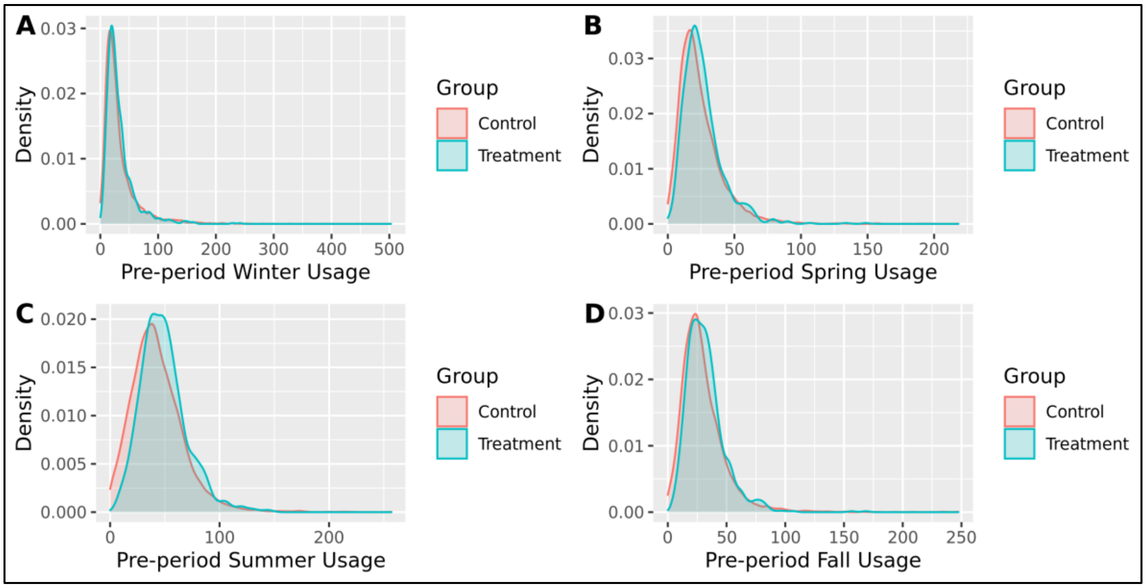
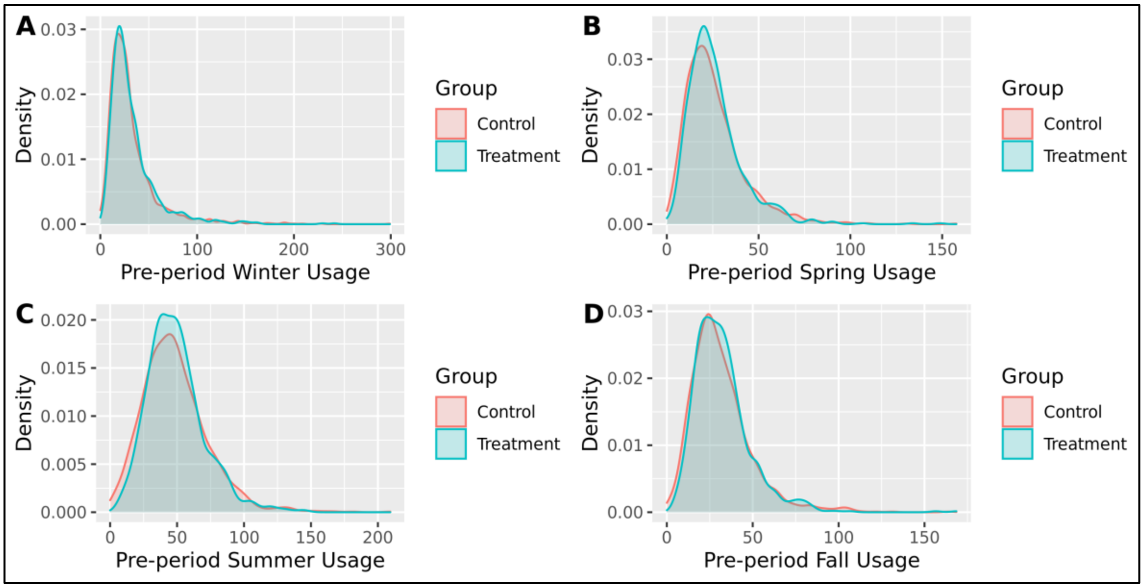


*Figure I-8 Seasonal Pre-Period Usage After Matching*



Lastly, the joint chi-square test for covariate balance had a p-value of 1.00, meaning we failed to reject the null hypothesis of covariate imbalance (i.e., the treatment and comparison group are similar).

Table I-19 provides regression results for annual energy savings (kWh) savings post matching. Interaction variables between pre-period usage and month have been omitted for the sake of brevity.

*Table I-19: Annual Energy Savings (kWh) Regression Results*

| Variable | Estimate | Std Error | T Statistic | P Value | 95% CI Lower | 95% CI Upper |
|---|---|---|---|---|---|---|
| (Intercept) | -10.312 | 6.351 | -1.624 | 0.104 | -20.760 | 0.135 |
| Pre-Period Usage Fall | 0.490 | 0.046 | 10.642 | 0.000 | 0.414 | 0.566 |
| Pre-Period Usage Winter | -0.034 | 0.019 | -1.821 | 0.069 | -0.065 | -0.003 |
| Pre-Period Usage Summer | 0.255 | 0.022 | 11.509 | 0.000 | 0.219 | 0.292 |
| June | -11.641 | 11.123 | -1.047 | 0.295 | -29.937 | 6.655 |
| July | -12.261 | 12.673 | -0.967 | 0.333 | -33.108 | 8.586 |
| Aug | -12.973 | 13.778 | -0.942 | 0.346 | -35.637 | 9.691 |
| Sept | -4.664 | 6.244 | -0.747 | 0.455 | -14.935 | 5.607 |
| Oct | 2.344 | 2.818 | 0.832 | 0.406 | -2.292 | 6.980 |
| Nov | -1.982 | 11.732 | -0.169 | 0.866 | -21.280 | 17.316 |
| Dec | -5.265 | 15.206 | -0.346 | 0.729 | -30.278 | 19.748 |
| Treatment | -0.338 | 0.570 | -0.592 | 0.554 | -1.276 | 0.600 |
| CDD | 2.045 | 1.340 | 1.526 | 0.127 | -0.159 | 4.248 |
| HDD | 0.823 | 0.903 | 0.912 | 0.362 | -0.662 | 2.309 |
| Treatment*CDD | -0.090 | 0.052 | -1.735 | 0.083 | -0.176 | -0.005 |
| Treatment*HDD | 0.011 | 0.035 | 0.306 | 0.760 | -0.046 | 0.068 |
| Adjusted R2 = 0.79, Sample Size = 878 | | | | | | |

The kWh savings were derived using the following equation:

*Equation I-6: Energy Savings (kWh) for RDR Program*

$$\begin{aligned}&Annual\ kWh\ Savings\\ &\quad = Treatment * 365.25 + Treatment{:}CDH * 1{,}461 + Treatment{:}HDH\\ &\quad * 5{,}581\end{aligned}$$

Where:

*Treatment* = *dummy variable*

= *1 if in the treatment group, and 0 otherwise*

$HDH_{it}$ = *average heating degree hours for time interval t*

$CDH_{it}$ = *average cooling degree hours for time interval t*

The kWh savings estimate for RDR is statistically significant at the 99 percent level and the PPR model provided a good fit for the data (adjusted R2 = 0.79).

Annual kWh savings per thermostat are equal to the annual kWh savings estimate (196.22) divided by the average number of thermostat units per customer (1.059), as shown in the equation below.

$$\begin{aligned} &Annual\ kWh\ Savings\ per\ Unit \\ &\qquad = ((-0.338 * 365.25) + (-0.090 * 1{,}461) + (0.011 * 5{,}581))/1.059 \end{aligned}$$

Table I-20 shows annual expected and realized energy savings for Residential Demand Response.

*Table I-20: RDR Annual kWh Savings*

| Jurisdiction | Expected kWh/Unit Savings | Realized kWh/Unit Savings | Eligible Units | Expected kWh Savings | Realized kWh Savings | RR (kWh) |
|---|---|---|---|---|---|---|
| MO West | 197 | 185 | 3,707 | 730,279 | 685,795 | 94% |
| MO Metro | 197 | 185 | 3,835 | 755,495 | 709,475 | 94% |
| **Total** | | | **7,542** | **1,485,774** | **1,395,270** | **94%** |

## I.7 Impact Evaluation – Final Savings Tables

Based on the impact evaluation results, the total verified net energy savings for the Residential Demand Response Program are 1,395,270 kWh, and the total verified net peak demand savings are 11,317.28 kW.

Table I-21 and Table I-22 summarize the verified net energy and peak demand reduction for the Residential Demand Response Program.

*Table I-21: RDR Peak Reduction (kW)*

| Jurisdiction | Reported Peak Demand Reduction per Unit | Verified Peak Demand Reduction per Unit | Eligible Units | Reported Peak Demand Reductions | Verified Peak Demand Reductions | RR (kW) |
|---|---|---|---|---|---|---|
| MO West | 1.19 | 1.34 | 4,138 | 4,928.36 | 5,558.28 | 113% |
| MO Metro | 1.19 | 1.29 | 4,451 | 5,301.14 | 5,758.99 | 109% |
| **Total** | | | **8,589** | **10,229.50** | **11,317.28** | **111%** |

*Table I-22: RDR Annual Energy Savings (kWh)*

| Jurisdiction | Reported kWh/Unit Savings | Verified kWh/Unit Savings | Eligible Units | Reported kWh Savings | Verified kWh Savings | RR (kWh) |
|---|---|---|---|---|---|---|
| MO West | 197 | 185 | 3,707 | 730,279 | 685,795 | 94% |
| MO Metro | 197 | 185 | 3,835 | 755,495 | 709,475 | 94% |
| **Total** | | | **7,542** | **1,485,774** | **1,395,270** | **94%** |

## I.8 Process Evaluation

According to the program staff, the Residential Demand Response (RDR) and the Business Smart Thermostat (BST) programs operate identically but target two different customer groups: residential customers and small business customers. This section summarizes the findings from the process evaluations for Evergy's RDR and BST Programs. The findings from in-depth interviews conducted with Evergy program staff and its implementer, CLEAResult, and the results of participant surveys are included.

### I.8.1 Program Operations

The RDR program is managed by Evergy's product manager, who coordinates the external program operations with the third-party implementer, CLEAResult, and manages the internal operations with Evergy's marketing team.

Mid-year 2022, program management changed for both Evergy and CLEAResult. However, senior management from both the utility and the implementer took over daily program management. Staff from both organizations indicated that despite the changes there were no effects on the program roles and responsibilities.

> *"There were no changes in general operations and divided up CORE activities." (Program Staff)*

***Program Design***

The program design remained the same. The staff indicated that the program is "pretty well balanced" from the two jurisdictions.

The program also switched to a Bring-Your-Own Thermostat (BYOT) program design, which increased customer participation rates with existing thermostats.

***Program Enrollment***

The RDR program met its enrollment goals in 2022. The staff reported that enrollment rates were consistent year-over-year. Customers enrolled in the program through the online customer portal. The BYOT option led to increased program enrollment.

> *“Marketing has done an excellent (job) by saying that customers are always in control.” (Program Staff)*

Program staff is also looking for ways to add more eligible thermostats to the program going forward.

The program implementer also started tracking customer enrollment through Google Analytics in 2022. The goal was to identify and break down the barriers to entry during the July to September event period and better understand where in the enrollment process customer drop out.

As a result, the program implementer simplified the application process to streamline enrollment and emphasized the BYOT approach more heavily in 2022 compared to previous years.

#### *Program Participation*

Evergy called 12 residential events, which was higher than the previous years. The summer was warmer and hotter than in previous years, which also required calling more DR events.

The program implementer also looked for ways to “be more creative” in calling events, including calling an event on a non-peak day. The implementer would also switch between the residential and business sectors, which staff viewed as another way to “manage fatigue.”

Customers also received regular notices or “touch points” in emails that thanked them for participating and reinforced program goals. The implementer plans to continue customer educational outreach efforts to maintain program enrollment levels in the off-season.

#### *Data Tracking and Quality Assurances and Controls (QA/QC)*

The program implementation team works closely with the Evergy staff in conducting Quality Assurance/Quality Control activities. The program documentation is updated annually. The team has also created a "pre-season checklist" to identify and follow all reporting and tracking steps.

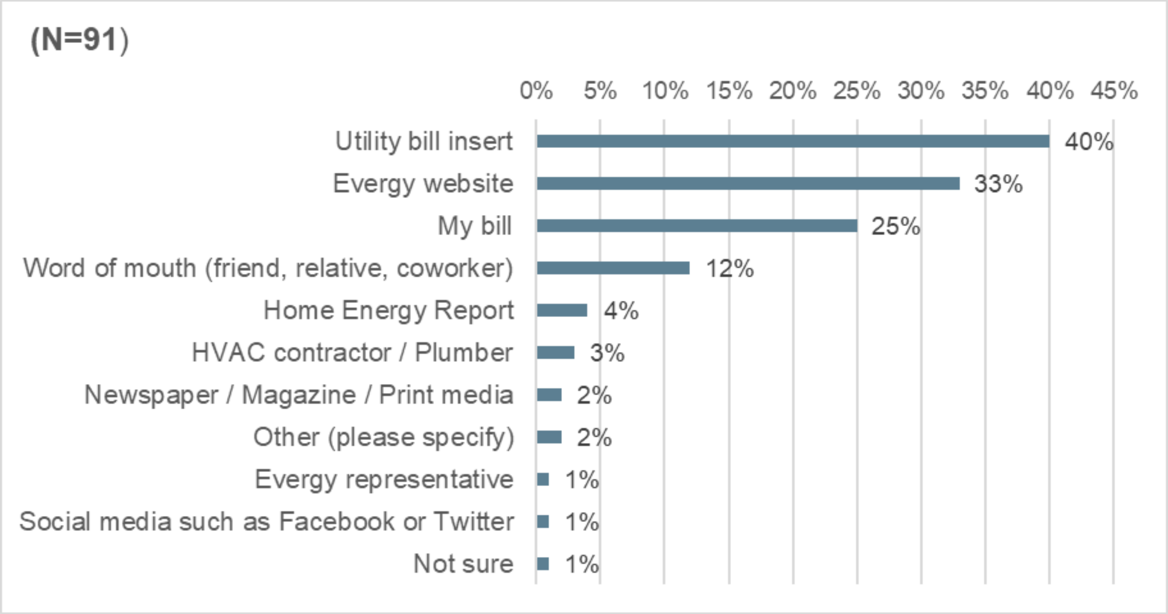
### I.8.2 Participant Survey

A total of 91 program participants completed a follow-up survey to gauge the effectiveness of program operations, satisfaction and identify areas for program improvement. These findings are summarized below.

### Sources of Awareness

The utility bill insert (40 percent) and Evergy's website (33 percent) were the participants' most frequently mentioned ways to learn about the program. Participants also recalled learning about the program from their bill (25 percent), word-of-mouth (12 percent) and from trade allies (3 percent) (see Figure I-9).

*Figure I-9: Sources of Program Awareness*



*Note: Percentages may exceed 100% due to respondents being able to select more than one response.*

### Enrollment Timing

Most participants enrolled in the program before June 2021, as Table I-23 shows. However, 20 respondents (22 percent) were unable to recall when they first enrolled in the program.

*Table I-23: Enrollment Timing*

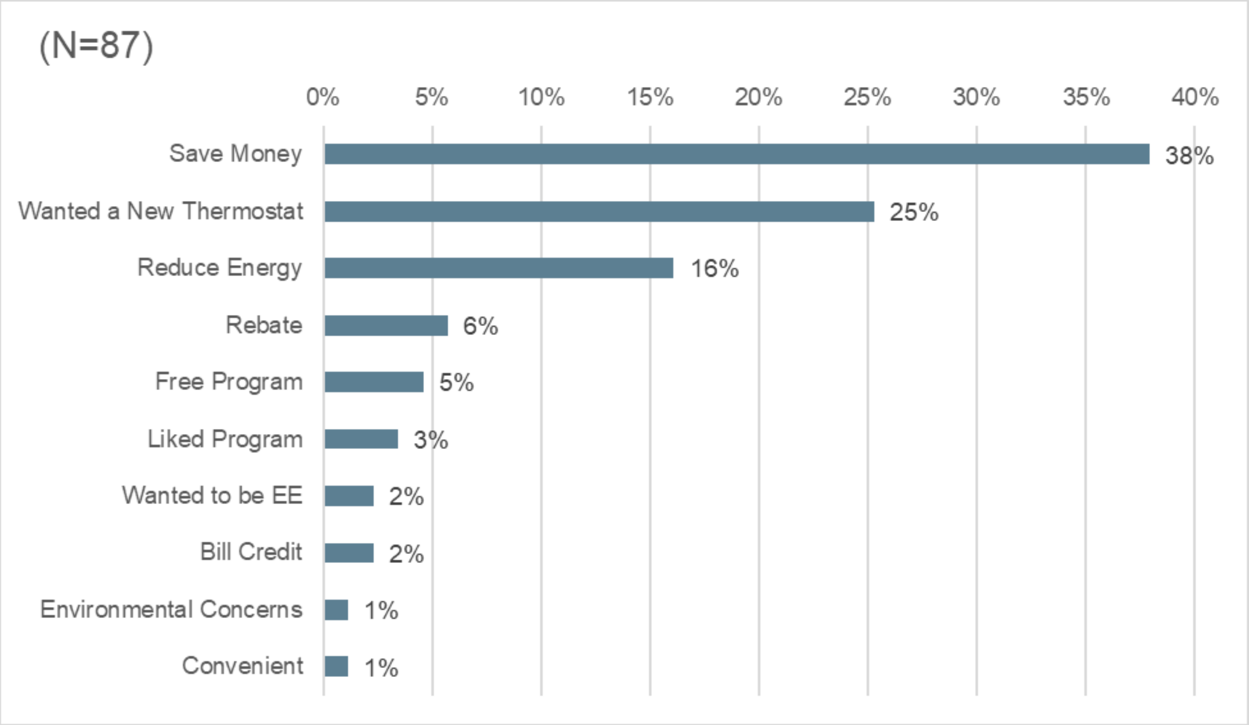
| When did you enroll in the program? | Count of Respondents (n = 91) | Percentage of Respondents |
|---|---|---|
| Before June 1, 2022 | 36 | 40% |
| Between June 1, 2022 through July 31, 2022 | 20 | 22% |
| Between August 1, 2021 through September 30, 2022 | 15 | 16% |
| Not sure | 20 | 22% |

Most participants (54 percent) self-installed the thermostats while 46 percent had their contractor install the devices.

### *Reasons for Program Participation*

To save money was the most frequently mentioned reason for enrolling in the program (38 percent), followed by wanting a new thermostat, mentioned by 25 percent of the respondents. Figure I-10 summarizes these responses. Two respondents participated in the program to be “energy-efficient” and two wanted the bill credits.

*Figure I-10: Reasons for Participating in the Residential DR Program*



### *Participation in DR Events*

Respondents recalled participating in an event between 25 percent and 30 percent of the time (see Table I-24).

*Table I-24: Participation in Residential DR Events*

| Event Participation | Count of Respondents | Percentage of Respondents |
|---|---|---|
| June 13, 2022 from 4-6 p.m. | 27 | 30% |
| June 14, 2022 from 4-6 p.m. | 26 | 29% |
| June 21, 2022 from 4-6 p.m. | 24 | 26% |
| July 5, 2022 from 4-6 p.m. | 24 | 26% |
| July 6, 2022 from 4-6 p.m. | 23 | 25% |
| July 19, 2022 from 4-6 p.m. | 23 | 25% |
| July 21, 2022 from 4-6 p.m. | 24 | 26% |
| August 2, 2022 from 4-6 p.m. | 26 | 29% |
| August 3, 2022 from 4-6 p.m. | 25 | 27% |
| September 7, 2022 from 3-6 p.m. | 23 | 25% |

**Reasons for not participating in DR Events:** Participants either did not recall participating in the DR event, were on vacation, or still needed their smart thermostat installed.

**Received Notification:** Of the 32 respondents who answered this question, 31 percent recalled receiving a notification about the DR events, while 31 percent did not. Another 38 percent were not sure.

### *Program Satisfaction*

The survey respondents rated their satisfaction with the RDR Program and its components on a five-point scale, where “1” meant “Very Dissatisfied” and “5” meant “Very Satisfied.” Table I-25 summarizes these ratings. Overall, the participants were most satisfied with the ease of program enrollment, with 84 percent of the participants awarding a rating of “4” or “5.”

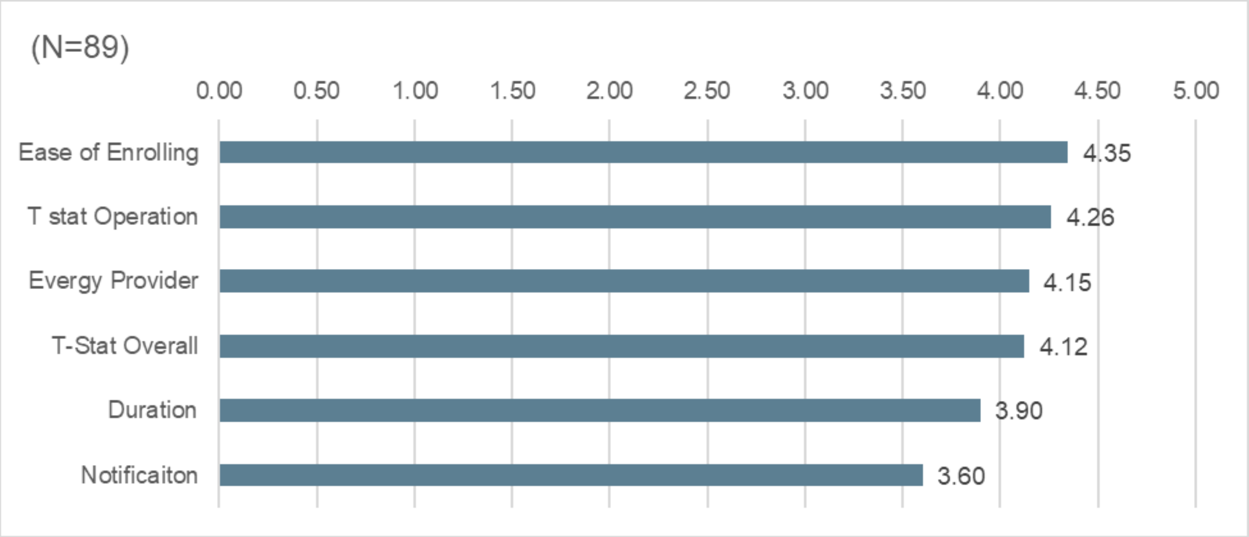
In contrast, they were least satisfied with the notification of the DR events, with only 53 percent awarding a score of “4” or “5”.

*Table I-25: Satisfaction Ratings for the Residential DR Program Components*

| Program Component | % "Very Dissatisfied" "1" | "2" | "3" | "4" | % "Very Satisfied" "5" |
|---|---|---|---|---|---|
| The operation of your thermostat (n = 88) | 6% | 3% | 8% | 25% | 58% |
| Ease of enrolling in the program (n = 89) | 2% | 3% | 10% | 26% | 58% |
| Notification of the Energy Savings Events (n = 78) | 9% | 13% | 26% | 14% | 38% |
| Duration of the Energy Savings Events (n = 68) | 4% | 6% | 24% | 28% | 38% |
| The Thermostat Program overall (n = 89) | 6% | 3% | 13% | 28% | 49% |
| Evergy as your electricity provider (n = 88) | 2% | 1% | 22% | 30% | 45% |

Figure I-11 provides the satisfaction ratings of the survey respondents. The major drivers of program satisfaction were the ease of the program and the excellent service, as mentioned by 12 respondents.

*Figure I-11: Average Satisfaction Ratings with Residential DR Program Components*



The major reasons for program dissatisfaction were not receiving notification of the DR events (n = 9). Two respondents complained that DR events made their homes uncomfortable.

### *Respondent Demographics*

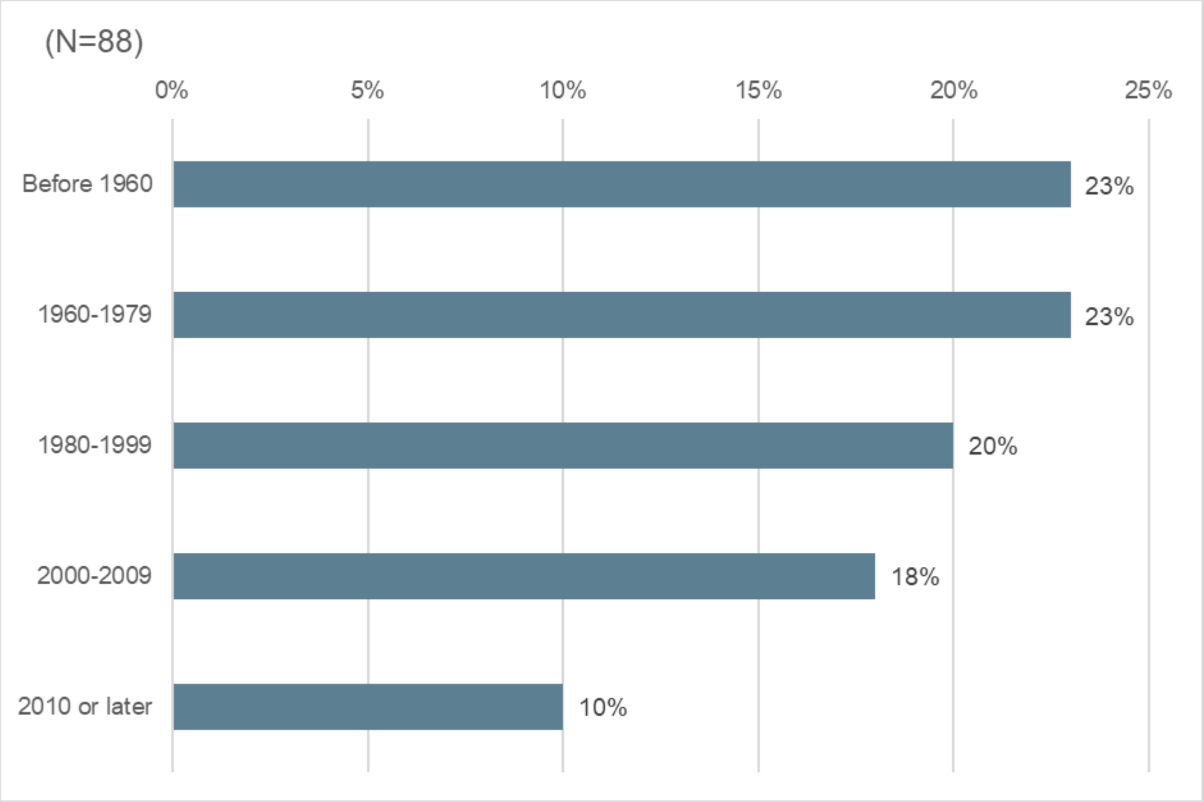
This section summarizes the demographic characteristics of the survey respondents. Table I-26 provides the housing type of the survey respondents.

*Table I-26: Housing Type of Respondents*

| Housing Type | Count of Respondents (n = 88) | Percentage of Respondents |
|---|---|---|
| Single-family home | 77 | 88% |
| Duplex or townhouse | 6 | 7% |
| Apartment or condominium | 3 | 3% |
| Manufactured or mobile home | 2 | 2% |

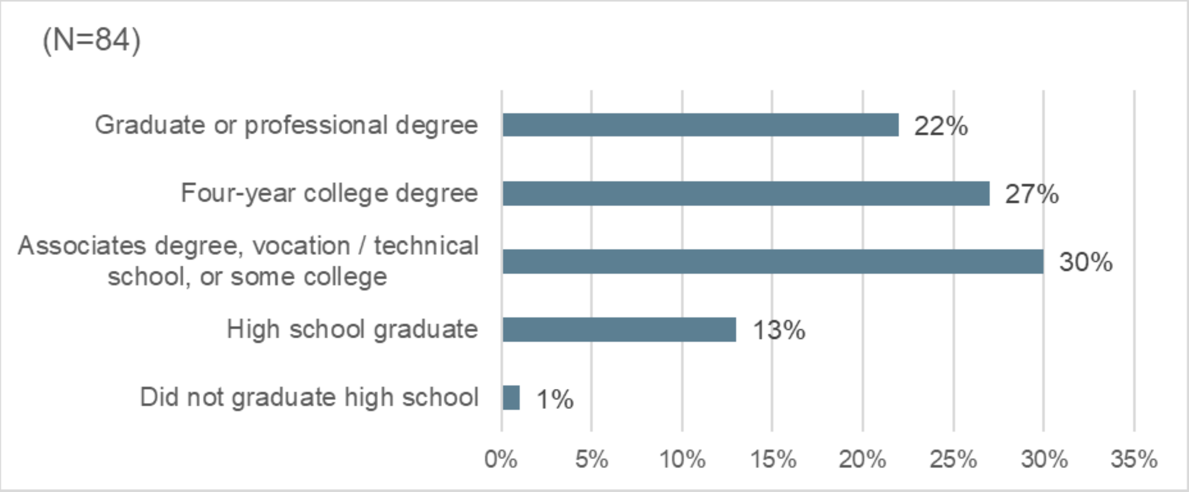
Figure I-12 provides the average age of the residence. Most of these homes were built before 1960 (23 percent) or between 1960 - 1979 (23 percent).

*Figure I-12: Year Home Built*



Most respondents used natural gas (74 percent) while 24 percent used electricity and 2 percent relied on propane. As Figure I-13 shows, most respondents had an associates degree (30 percent) or higher.

*Figure I-13: Highest Educational Level Completed*



## I.9 Conclusions and Recommendations

ADM performed a process evaluation that assessed program documentation and primary data collected from program stakeholders. The evaluation included fielding a customer survey and conducting in-depth interviews with the utility and third-party implementation staff.

The following summarizes the key findings of the process evaluation of the RDR Program:

- The RDR program met its enrollment goals in 2022 by streamlining the application process, emphasizing a BYOT approach and using creative curtailment strategies to minimize “customer fatigue.”
- Despite increasing the number of DR events in 2022, overall program participants reported high satisfaction rates for most program elements. Specifically, the respondents were awarded the highest satisfaction levels for the ease of enrolling in the program (84 percent were Satisfied) and the thermostat operation (83 percent).
- However, only 53 percent of the respondents were satisfied with the event notification, and only 66 percent were satisfied with the duration of events.

The following recommendations are offered for continued improvement of the RDR Program:

- **Evergy should continue to implement creative DR event strategies to minimize customer fatigue.**

- **The program implementer should conduct additional QA/QC to ensure that all respondents receive notification of upcoming events, which is the chief source of participant dissatisfaction.** The implementer should also consider sending notifications through multiple channels, such as email and text, to ensure that program participants are aware of the upcoming DR event.
- **The program implementer and Evergy should coordinate follow-up engagement strategies after each DR event.** This would ensure that customers receive the notification promptly and understand the benefits of program participation.

# Appendix J Business Smart Thermostats Program-Specific Methodologies

This chapter describes the evaluation activities that were performed by ADM to evaluate the Business Smart Thermostat (BST) Program.

## J.1 Program Overview

The BST Program offers customers the ability to control and monitor energy usage through their smart thermostat.

Participation Channels:

- Customers can purchase devices and install the device themselves.
- Customers can enroll their eligible existing device
- Customers can receive discounted devices and receive professional installation.

Called upon devices (in PY3) will increase a customer's setpoint between 2- and 5-degrees Fahrenheit. Pre-cooling occurs prior to an event and the customer receives notification via their smart device application.

### Expected Energy Savings and Demand Reduction

Targeted energy and demand impact for the Business Smart Thermostat program years 2020 - 2022 are shown in the tables below (Table J-1 and Table J-2). These Targeted savings are taken from KCP&L filing EO-2019-0132.

*Table J-1: Program Goal Savings by Year – Missouri Metro*

| Program Year | Energy Savings Goal (MWh) | Peak Demand Reductions Goal (MW) |
|---|---:|---:|
| 2020 | 29 | 0.21 |
| 2021 | 58 | 0.43 |
| 2022 | 87 | 0.64 |
| **Total** | **174** | **1.28** |

*Table J-2: Program Goal Savings by Year – Missouri West*

| Program Year | Energy Savings Goal (MWh) | Peak Demand Reductions Goal (MW) |
|---|---|---|
| 2020 | 28 | 0.21 |
| 2021 | 57 | 0.41 |
| 2022 | 85 | 0.62 |
| **Total** | **170** | **1.24** |

Table J-3 below provides a summary of program metrics for the PY3 for the BST Program.

*Table J-3: Performance Metrics – Business Smart Thermostats Program*

| Metric | PY3 Total | MO West | MO Metro |
|---|---|---|---|
| Number of Participants | 87 | 54 | 33 |
| ***Energy Savings (kWh)*** | | | |
| Targeted Energy Savings | 172,572 | 85,104 | 87,468 |
| Reported Energy Savings | 214,398 | 128,805 | 85,593 |
| Gross Verified Energy Savings | 100,104 | 60,140 | 39,964 |
| Net Verified Energy Savings | 100,104 | 60,140 | 39,964 |
| ***Peak Demand Reduction (kW)*** | | | |
| Targeted Peak Demand Reduction | 1,261.44 | 622.08 | 639.36 |
| Reported Peak Demand Reduction | 210.30 | 129.59 | 80.70 |
| Gross Verified Peak Demand Reduction | 245.08 | 139.33 | 105.75 |
| Net Verified Peak Demand Reduction | 245.08 | 139.33 | 105.75 |
| ***Benefit / Cost Ratios*** | | | |
| Total Resource Cost Test Ratio | 0.75 | 0.62 | 1.04 |

## J.2 EM&V Methodologies

This chapter describes the impact evaluation activities and methodology that ADM performed for Evergy’s 2022 Business Smart Thermostat Program. Table J-4 provides a summary of the savings approach by program year.

*Table J-4: Savings Approaches by Program Year*

| Program Year | kW Savings | kWh Savings |
|---|---|---|
| 2020 | Calculated | Calculated |
| 2021 | Calculated | Calculated |
| 2022 | Calculated | PY2 Value |

In evaluating the 2022 Business Smart Thermostat Program, ADM implemented a variety of impact evaluation exercises including estimation of gross and net energy savings (kWh) as well as peak demand reductions (kW) as framed by the following research questions:

- How many Evergy customers participated in the program? What is the quantity and type of measures incentivized/rebated?
- What are the energy savings for each incentivized measure?
- What is the peak demand reduction for each incentivized measure?
- What percentage of gross savings is directly attributable to the program (net savings analysis)?

### J.2.1 Demand Response Events in 2022

As shown in Table J-5, there were 12 demand response events called in 2022 falling in the months of June, July, August, and September. Curtailment events were called between the hours of 3 p.m. through 6 p.m. CDT, with most events lasting two hours.

*Table J-5: Demand Response Events in 2022*

| Date | Hours Called | Jurisdiction |
|---|---|---|
| 6/13/2022 | 4-6 PM | MO West/MO Metro |
| 6/14/2022 | 4-6 PM | MO West/MO Metro |
| 6/21/2022 | 4-6 PM | MO West/MO Metro |
| 7/5/2022 | 4-6 PM | MO West/MO Metro |
| 7/6/2022 | 4-6 PM | MO West/MO Metro |
| 7/19/2022 | 4-6 PM | MO West/MO Metro |
| 7/21/2022 | 4-6 PM | MO West/MO Metro |
| 8/2/2022 | 4-6 PM | MO West/MO Metro |
| 8/3/2022 | 4-6 PM | MO West/MO Metro |
| 9/7/2022 | 3-6 PM | MO West/MO Metro |
| 9/19/2022 | 4-6 PM | MO Metro |
| 9/20/2022 | 4-6 PM | MO West |

### J.2.2 Smart Thermostat Devices

Table J-6 provides the quantity of devices for each device type and jurisdiction.[40]

*Table J-6: Device Types by Jurisdiction*

| Jurisdiction | Device Type | # of Devices |
|---|---|---|
| MO West | ecobee | 40 |
| MO West | Google Nest | 88 |
| MO Metro | ecobee | 56 |
| MO Metro | Google Nest | 20 |

As shown in Table J-7, the most common device was the ecobee 3 Lite, which accounted for 44 percent of all devices across both jurisdictions.

*Table J-7: Device Subtypes by Jurisdiction*

| Jurisdiction | Device Type | # of Devices |
|---|---|---|
| MO West | ecobee SmartThermostat with voice control | 1 |
| MO West | ecobee3 Lite | 39 |
| MO West | Google Nest Learning Thermostat | 36 |
| MO West | Google Nest Thermostat | 52 |
| MO Metro | ecobee Smart Thermostat Premium | 3 |
| MO Metro | ecobee SmartThermostat with voice control | 2 |
| MO Metro | ecobee3 Lite | 51 |
| MO Metro | Google Nest Learning Thermostat | 4 |
| MO Metro | Google Nest Thermostat | 15 |
| MO Metro | Google Nest Thermostat E | 1 |

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[40] Counts include all devices present in PY3 tracking data, with the exclusion of devices that were removed or returned in PY3.

Table J-8 provides the number of Smart Thermostat units installed and the number of customers for each measure type.[41] Professional (PRO) installations were the most frequent measure type for the BST program and accounted for 83 percent of installations in 2022. In addition, Do-it-yourself (DIY) accounted for 14 percent of installations while Bring-Your-Own-Thermostat (BYOT) installations accounted for the remaining 3 percent of installed units.

*Table J-8: Smart Thermostat Installations by Measure Type*

| Jurisdiction | Measure Type | # of Smart Thermostat Units | # of Customers |
|---|---|---|---|
| MO West | BYOT Installation | 3 | 3 |
| MO West | DIY Installation | 20 | 20 |
| MO West | PRO Installation | 105 | 31 |
| MO Metro | BYOT Installation | 3 | 3 |
| MO Metro | DIY Installation | 9 | 9 |
| MO Metro | PRO Installation | 64 | 21 |

## J.3 Sampling Plan

ADM evaluated each participating thermostat for each event. An extrapolated peak demand reduction value from the analyzed thermostats was applied to thermostats with installation after all events took place.

## J.4 Data Collection

Data used for this evaluation include:

- Program tracking data for 2022. This data identifies which customers participated in the program and contains data fields such as thermostat installation date, number of devices installed, thermostat device type, measure type, and other relevant data fields.
- 15-minute interval meter data (AMI) for each participating customer.
- A full schedule of program events, including the time of the event.
- ADM collected recorded weather data from the NOAA to estimate the impact of weather on usage.

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[41] Counts include all devices present in PY3 tracking data, with the exclusion of devices that were removed or returned in PY3.

As a first step, ADM reviewed the data tracking systems associated with the program to ensure that the data provides sufficient information to calculate energy and demand impacts. ADM determined that all the relevant data fields were included in the tracking data and savings reported in the tracking system complied with energy savings calculations and guidelines set by the Evergy TRM.

### J.4.1 Weather Data

ADM collected two types of weather data for the evaluation: 1) actual recorded weather from the National Oceanographic and Atmospheric Administration (NOAA) and 2) 30-year weather normal or Typical Meteorological year (TMY) weather data. Actual weather data was used when fitting the models and TMY data was used to extrapolate savings (if appropriate).

ADM collected hourly Heating Degree Hours (HDH) and Cooling Degree Hours (CDH) from NOAA.gov for use in the regression analysis. Data was collected from the nearest available weather stations and assigned to each customer based on customer zip code. Daily HDDs are calculated as the sum of hourly average temperature values under the heating setpoint (65°F) on each day, while daily CDDs are calculated as the sum of hourly average temperature values over the cooling setpoint (65°F) on each day. The setpoint values for HDDs and CDDs were determined by running regressions with multiple setpoints from 60°F - 80°F and choosing the setpoint combination with the highest adjusted R-squared value (i.e., best fit).

ADM collected Typical Meteorological Year (TMY) data[42] from the nearest relevant weather station/s to extrapolate estimated annual savings, as shown in Table J-9.

*Table J-9: TMY for Kansas City International Airport*

| Annual TMY | HDD | CDD |
|---|---|---|
| | 5,581 | 1,461 |

## J.5 Gross Impact Methodology

This section describes the impact evaluation activities and methodology that inform the savings values for Evergy's PY3 Business Smart Thermostat Program. For PY3, peak demand reductions were calculated using estimates from PY1 and PY2, accounting for average temperature (F) during event hours in PY3. Annual energy savings (kWh) in PY3 are based on estimates from PY2.

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[42] https://rredc.nrel.gov/solar/old_data/nsrdb/1991-2005/tmy3/by_state_and_city.html

### J.5.1 Gross Energy Savings and Demand Reduction

***Demand Response Demand Reduction (kW) Methodology***

Demand savings for the demand response portion of the program was estimated using a weather-adjusted Linear Fixed Effects Regression (LFER) model. The model uses customers’ 15-minute AMI data on non-event baseline days and extrapolates the model to event days to estimate the impact on energy demand. The LFER model specifies energy demand as a function of temperature and other variables that influence usage. ADM identified non-event baseline days during the same month as demand response events whose weather pattern most closely matches the weather pattern on event days, and these days served as the counterfactual baseline. ADM defined baseline days as those with a maximum daily temperature greater than or equal to the minimum observed maximum temperature during all demand response events.

When fitting regression models, ADM tested correlations between explanatory variables, statistical significance of variables, and the impact of each variable on model fit. The final form of the model is shown below.

*Equation J-1: Linear Fixed Effects Regression Model*

$$\begin{aligned} Usage\ (kWh)_{it} &\\ &= \alpha_0 + \sum_{m=1}^{12} \alpha_m\, Month_{it} + \sum_{w=1}^{7} \alpha_w\, DOW_{it} + \beta_3 CDH_{it} + \beta_4 MA24CDH_{it} \\ &+ \sum_{h=1}^{24} \alpha_h\, Hour_{it,h} * \sum_{i=1}^{n} \alpha_i\, Customer_{it} + \epsilon_{it} \end{aligned}$$

Where:

$\alpha_0$ = *intercept term*

*m* = *index for month m*

*w* = *index for day of the week m*

*t* = *time interval*

*i* = *index for customer i*

*n* = *number of sampled smart thermostat households*

$Usage(kWh)$ = *average usage during the time interval for customer i*

$\beta_k, \alpha_m, \alpha w_i, \alpha_h, \alpha_i$ = *vectors of coefficients.*

$Month$ = *vector of dummy variables for each month m*

$DOW$ = *vector of dummy variables for each day of the week w*

$CDH$ = *cooling degree hours*

$MA24CDH$ = *moving average of the last 24 hours CDH*

$Hour$ = *vector of dummy variables for each hour of the day*

$Customer$ = *vector of dummy variables for each customer i*

$\epsilon$ = *error term*

ADM estimated savings rates kW/unit separately for both Missouri Metro and Missouri West. Prior to running the model, ADM removed devices that fail to meet certain criteria, including:

- Missing zip code for a device/customer (due to inability to map to correct weather data)
- Incomplete or missing data during the DR season (<1 percent of households)
- Average usage of 0 during the DR season (<1 percent of households)
- Devices that were returned or removed before the end of the DR season

### *Classification of Non-Contributing Devices using AMI Billing Data*

ADM identified non-contributing households to assess its impact on demand reductions. Example reasons why a household may be a non-contributor includes:

- Non-responding devices (NRD) are devices that not responsive to the curtailment signal.
- Opt-outs are customer who opt-out of a DR event.
- Customers that are not running their AC (i.e. they away on vacation or at work during the event).

A device is considered a “non-responding device” (NRD) if it is not responsive to the curtailment signal. This would indicate that the switch communications were not working.

Switch communications may be interrupted for a variety of reasons: the A/C unit may not be powered on, the switch may become disconnected or defective, or the participant’s household wiring may prevent communication. In some cases, it may be difficult for utilities to determine the reason the switch is not communicating.

Opt-outs are different than non-responding devices, though the resulting observations are similar. Opt-outs occur when a customer chooses not to participate in the curtailment event. In most cases, when a customer chooses to opt-out, the customer is declining to participate in all subsequent events, rather than a single event. Opt-outs are similar to non-responding devices in that AMI meter data for the household displays no demand reductions during the curtailment event. However, opt-outs can be categorized as opt-outs using customer communication records, or program tracking of opt-out customers.

Customers who are not running their AC unit during the DR event will have a load shape like NRD and opt-out customers and appear to not have a demand reduction. For instance, the customer may be on vacation, away at work, or have an AC unit problem.

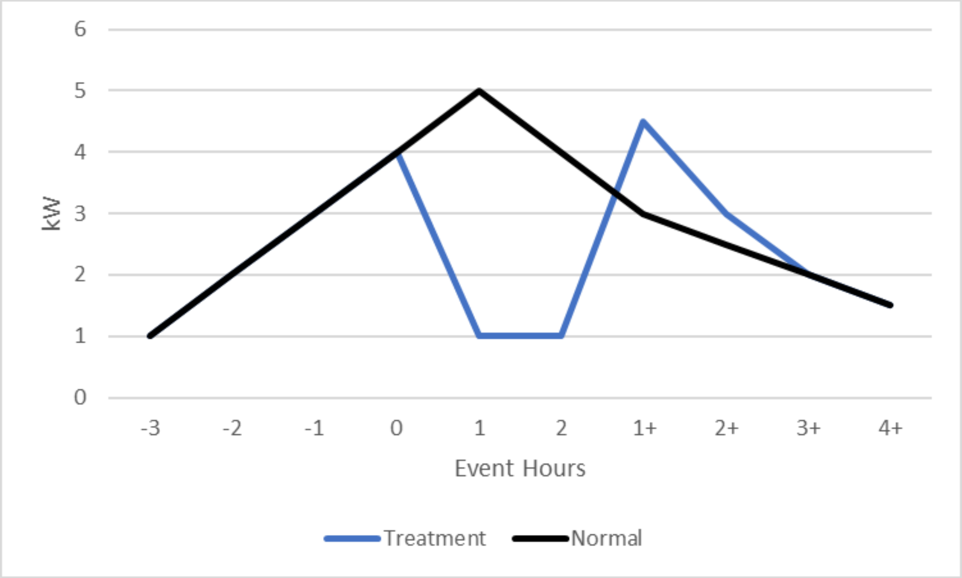
ADM attempted to quantify a separate opt-out rate for the program; however, information on customer opt-outs was not available for the program. As such, a rate that includes all non-contributing households was calculated.

ADM identified non-contributing households using a combination of two algorithms:

1. A cumulative sum (CSUM) change in slope analysis
2. A linear 10 percent decrease in load detection

When a DR event is called, each device is sent curtailment instructions that result in a significant load drop over the duration of the event. This drop is illustrated in Figure J-1, which provides an example event and an example of a typical or “baseline” usage curve.

*Figure J-1: Example of Site-Level Load Shapes During Event Hours*



ADM defined the methodology applied for each algorithm in the following sections.

**CSUM Analysis:**

The CSUM smoothing technique is a rolling sum defined as:

*Equation J-2: CSUM Smoothing Technique*

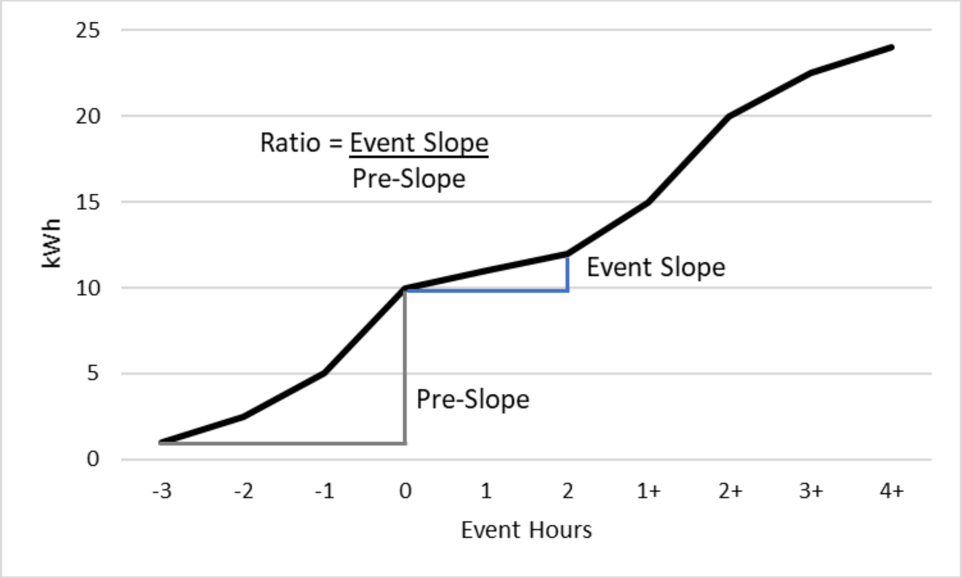
$$x = (a, b, c, \dots, z)\ CSUM(x) = (a, a+b, a+b+c, \dots, a+\dots+z)$$

Where:

$x$ = *a vector of kWh measures taken at increasing one-hour intervals during the event day*

A smoothed, increasing curve is created by taking the CSUM of each treatment site during the demand response period (Figure J-2).

*Figure J-2: Example of Site-Level CSUM Slope Changes During Event Hours*



The slopes of this curve for the three hours prior to the start of the event and the hours during the event are calculated (Figure J-2). ADM calculated a ratio of the event period slope divided by the pre-period slope to test if there was a significant change in the slope due to the demand response event. A contributing device is detected by a decrease in the line slope. Therefore, the ratio is less than one. Using this test, ADM defined sites with a slope less than one to be a contributing device, which indicates a decrease in demand during the demand response event.

**Linear 10 Percent Decrease Analysis:**

In parallel with the CSUM analysis, a linear test for 10 percent reduction in consumption during the demand response event is also employed. For each unique device, the consumption for the hour prior to the event is compared to the consumption during the first hour of the event (Equation J-3) to detect a reduction in demand greater than 10 percent with the following equation:

*Equation J-3: Non-Contributing Device for 10 Percent Decrease Analysis*

$$\mathrm{Non-Contributing\ Device} = T1_{kWh} \leq T2_{kWh}$$

Where:

$T1_{kWh} =$ $= PriorHr_{kWh} - EventHr_{kWh}$

$T2_{kWh} =$ $= PriorHr_{kWh} * 10\%$

$PriorHr_{kWh}$ *= demand displayed during the hour prior to the demand response event*

$EventHr_{kWh}$ *= demand displayed during the first hour of the demand response event*

By taking advantage of the processing speed of vectorized programming in the R-Studio environment, every individual site in the program is tested per event.

### *Annual Energy Savings (kWh) Methodology*

Annual energy savings for smart thermostat customers were estimated using a weather-adjusted Post Period Regression (PPR) ordinary least-squares (OLS) model. A matched comparison group was created using a Propensity Score Matching (PSM) approach. With the PSM approach, a propensity score is estimated for treatment customers (i.e., those who received program services) and a group of customers who did not receive program services using a logit model. Customers in the treatment and control groups are matched based on seasonal pre-period usage (e.g., summer, spring, fall, and winter) and zip code (or other factors such as rate code). In addition, demand response event days are removed from the data to avoid creating bias.

Control group customers were selected from customers who have not participated in any demand response or energy efficiency programs. In addition, the PPR model utilized post period data only. Data for control customers was restricted to the post period timeframe for their matched participant (to ensure the same number of observations in the post period). After creating a matched comparison group, the program impacts were estimated with the following regression.

The final form of the model is shown below.

*Equation J-4: Final Model*

$$Usage\ (kWh)_{it} = \alpha_0 + \sum_{m=1}^{12} \alpha_m\, Month_{m,t} * \sum_{p=1}^{4} \alpha_p\, Pre - Period\ Usage_{p,it}\ + \beta_1 * Treatment_{it} + \beta_2 * HDH_{it} + \beta_3 * CDH_{it} + \beta_4 * Treatment_{it} * HDH_{it} + \beta_5 * Treatment_{it} * CDH_{it} + \epsilon_{it}$$

Where:

$\alpha_0$ *= intercept term*

*t* *= index for the time interval*

*i* = *index for the customer*

*m* = *index for month of the year*

*p* = *index for season of the year (spring, summer, fall, winter)*

*Month* = *dummy variable for month of the year*

*Pre-Period Usage* = *average pre-period usage for season p (spring, summer, fall, winter) for customer i*

*Treatment* = *dummy variable*

= *1 if in the treatment group, and 0 otherwise*

$HDH_{it}$ = *average heating degree hours for time interval t*

$CDH_{it}$ = *average cooling degree hours for time interval t*

$\epsilon_{it}$ = *error term*

$\alpha, \beta$ = *parameters to be estimated by the model.* $\beta_1, \beta_4, and\ \beta_5$ *are the parameters of interest for estimating the reduction in kWh usage*

The total annual energy savings (kWh) for the program is calculated by taking the estimated kWh savings/unit and multiplying by the number of thermostat units considered part of the program in 2022.

### *Estimating Net Savings*

In demand response programs, it is typically assumed that there are neither spillover effects nor free ridership (only participating customers are expected to curtail usage). As such, the net-to-gross ratio for this program is assumed to be 100 percent.

## J.6 Gross Impact Evaluation Findings

The following sections provide the results of the impact evaluation for BST Program.

### J.6.1 Peak Demand Reduction from Demand Response Events

ADM obtained peak demand reductions in PY3 by estimating the relationship between weather and peak demand reduction in prior program years (PY1/PY2). The following equations provide the estimated relationship between peak demand reduction (kW/unit) and average temperature (F) during event hours.

*Equation J-5: MO Metro Peak Demand Reduction*

$$Peak\ demand\ reduction\ \left(\frac{kW}{unit}\right) = -2.03352 + 0.032778 * Average\ Temperature\ (F)\ During\ Event\ Hours$$

*Equation J-6: MO West Peak Demand Reduction*

$$Peak\ demand\ reduction\ \left(\frac{kW}{unit}\right) = -0.65822 + 0.001892 * Average\ Temperature\ (F)\ During\ Event\ Hours$$

Table J-10 provides weather normalized peak demand reductions for each jurisdiction over a range of temperatures (F).

*Table J-10: Weather Normalized Peak Demand Reduction*

| Average Temperature (F) During Event Hours | MO West (kW/Unit) | MO Metro (kW/Unit) |
|---|---|---|
| 83 | 0.82 | 0.69 |
| 84 | 0.82 | 0.72 |
| 85 | 0.82 | 0.75 |
| 86 | 0.82 | 0.79 |
| 87 | 0.82 | 0.82 |
| 88 | 0.82 | 0.85 |
| 89 | 0.83 | 0.88 |
| 90 | 0.83 | 0.92 |
| 91 | 0.83 | 0.95 |
| 92 | 0.83 | 0.98 |
| 93 | 0.83 | 1.01 |
| 94 | 0.84 | 1.05 |
| 95 | 0.84 | 1.08 |
| 96 | 0.84 | 1.11 |
| 97 | 0.84 | 1.15 |
| 98 | 0.84 | 1.18 |
| 99 | 0.85 | 1.21 |
| 100 | 0.85 | 1.24 |
| 101 | 0.85 | 1.28 |
| 102 | 0.85 | 1.31 |
| 103 | 0.85 | 1.34 |
| 104 | 0.85 | 1.38 |
| 105 | 0.86 | 1.41 |

The following columns are referenced in the tables below:

- **Jurisdiction** – This column describes which service area the results cover.
- **Event Date** – This column contains the date of each DR event.
- **% Non-Contributing Devices** – This column contains the percent of non-contributing devices on DR event days.

- **Expected Peak Demand Reduction per Unit** – This column contains the expected DR event peak demand reductions per unit = 1.40.
- **Realized Peak Demand Reduction per Unit** – This column contains the realized average DR event peak demand reductions per unit.
- **Expected kWh/Unit Savings** – This column contains the expected annual kWh/Unit savings = 197.
- **Realized kWh/Unit Savings** – This column contains the realized annual kWh/Unit savings.
- **% Non-Contributing Businesses** – This column contains the percentage of Businesses with non-contributing devices.
- **Eligible Units** – This column contains the number of devices eligible for savings. For kWh savings, a device is deemed eligible if the measure type is Do-it-Yourself (DIY) or Professional (PRO); Bring-Your-Own-Thermostat (BYOT) is ineligible for annual kWh savings as the assumption is that these customers would have installed the device in the absence of the program. In addition, the device must have been installed in PY3 and not returned or removed.[43] For kWh eligible units, devices must have been installed but do not have to be available for DR events. For kW devices, the device must be enrolled in the DR program during the program year and be available for curtailment events.
- **Expected Peak Demand Reductions** – This column contains the total expected DR Peak Demand Reductions = Expected Peak Demand Reduction per Unit*Eligible Units.
- **Realized Peak Demand Reductions** – This column contains the total DR Peak Demand Reductions = Realized Peak Demand Reduction per Unit * Eligible Units.
- **Expected kWh Savings** – This column contains the total expected annual kWh savings = Expected kWh/Unit Savings*Eligible Units.
- **Realized kW Savings** – This column contains the total realized annual kWh savings = Realized kWh/Unit Savings*Eligible Units.

Table J-11 provides impact results for each BST demand response event called in 2022.

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[43] Evergy also removes devices returned or removed in PY3 that were available or installed in prior program years. The Eligible Unit counts reflect these annual adjustments.

*Table J-11: BST Peak Demand Reductions by Event Date*

| Event Date | MO West (kW/Unit) | MO Metro (kW/Unit) |
|---|---:|---:|
| 6/13/2022 | 0.84 | 1.10 |
| 6/14/2022 | 0.83 | 0.97 |
| 6/21/2022 | 0.84 | 1.09 |
| 7/5/2022 | 0.84 | 1.09 |
| 7/6/2022 | 0.83 | 0.96 |
| 7/19/2022 | 0.84 | 1.14 |
| 7/21/2022 | 0.84 | 1.12 |
| 8/2/2022 | 0.84 | 1.14 |
| 8/3/2022 | 0.82 | 0.78 |
| 9/7/2022 | 0.82 | 0.71 |
| 9/19/2022 | - | 1.09 |
| 9/20/2022 | 0.84 | - |
| **Average kW/Unit** | **0.83** | **1.02** |

Table J-12 shows the average percentage of businesses across all DR events that were non-contributing utilizing ADM's classification detailed in 'Classification of Non-Contributing Devices using AMI Billing Data' section.

*Table J-12: Average Percent Non-Contributing Devices Across Events*

| Jurisdiction | Device | % Non-Contributing Businesses |
|---|---|---|
| MO West/MO Metro | Any | 33% |

The following figure (Figure J-3) provides ADM's estimate of the percent of non-contributing businesses over the course of the demand response season[44].

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[44] September events were excluded from the comparison because the first September event started during different times for ecobee and Google devices and the other September events were called on different days for each jurisdiction.

*Figure J-3: Percent Non-Curtailed Businesses*

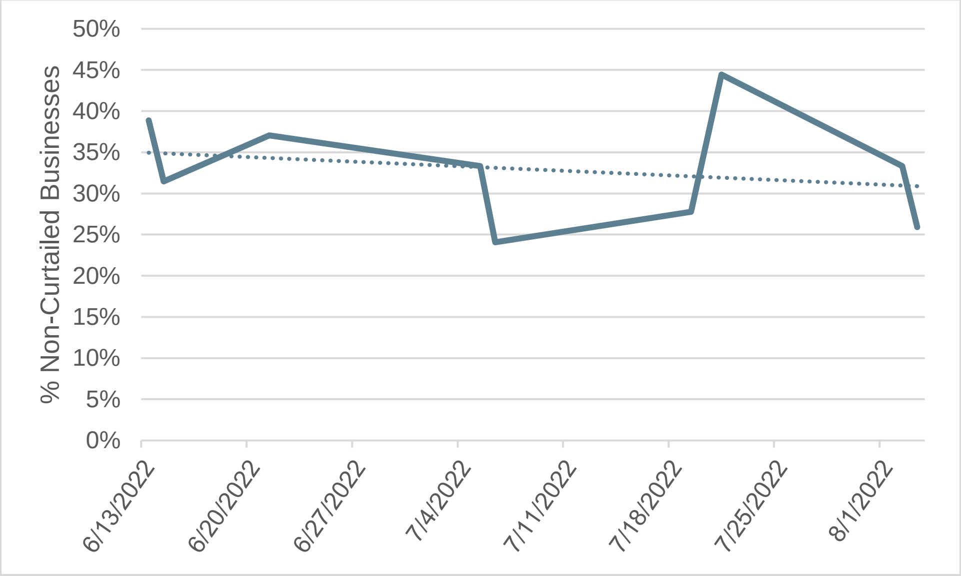


Table J-13 provides average event time temperature (F) during events by jurisdiction.

*Table J-13: RDR DR Event Weather*

| Year | Event Date | Average Event Time Temperature (F) |
|---|---|---|
| 2022 | 6/13/2022 | 95.51 |
| | 6/14/2022 | 91.62 |
| | 6/21/2022 | 95.33 |
| | 7/5/2022 | 95.27 |
| | 7/6/2022 | 91.28 |
| | 7/19/2022 | 96.69 |
| | 7/21/2022 | 96.33 |
| | 8/2/2022 | 96.83 |
| | 8/3/2022 | 85.74 |
| | 9/7/2022 | 83.71 |
| | 9/19/2022 | 95.35 |
| | 9/20/2022 | 95.43 |
| **Average** | | **93.26** |

Reported and verified peak demand reductions for BST DR are shown in Table J-14 below. The realization rate for peak demand reductions is 65 percent. Reported peak demand reductions per unit were based on an estimate for residential customers. The realization rate can be explained the difference in realized peak demand reductions for BST customers.

*Table J-14: BST Peak Demand Reduction*

| Jurisdiction | Reported Peak Demand Reduction per Unit | Verified Peak Demand Reduction per Unit | Eligible Units | Reported Peak Demand Reductions | Verified Peak Demand Reductions | RR (kW) |
|---|---|---|---|---|---|---|
| MO West | 0.78 | 0.83 | 167 | 129.59 | 139.33 | 108% |
| MO Metro | 0.78 | 1.02 | 104 | 80.70 | 105.75 | 131% |
| **Total** | | | **271** | **210.30** | **245.08** | **117%** |

### J.6.2 Annual Energy Savings (kWh)

Annual energy savings (kWh) per unit for smart thermostats of 388 kWh were derived from the PY2 analysis, which utilized Propensity Score Matching (PSM) to create a matched cohort. The results of the PY2 analysis are provided below for reference.

ADM was successful in creating a matched cohort and the results of Propensity Score Matching (PSM) and the annual consumption estimate for BST are summarized below. ADM used nearest neighbor, 4 to 1 ratio matching with replacement for control customers and had a considerable pool of control customers to draw upon, as shown in Table J-15. Customers were matched on their average monthly pre-period usage.

Prior to matching, customers were required to have at least 6 months of post-period data. In addition, demand response event days were removed from the post-period to avoid creating bias.

*Table J-15: PSM Customer Matches*

| Status | Control | Treated |
|---|---|---|
| All | 712 | 43 |
| Matched | 133 | 38 |
| Unmatched | 579 | 5 |

Table J-16 presents the propensity score covariate summary of pre-period usage for treatment and control customers before and after matching. The standardized mean difference prior to matching is often over 0.1 for many covariates; however, after matching the absolute value of the standardized mean difference is less than 0.1, which is an ideal outcome.

*Table J-16: PSM Covariate Summary*

| **Variable** | **Before Matching** | | | **After Matching** | | |
|---|---|---|---|---|---|---|
| | **Mean Treated** | **Mean Control** | **Standardized Mean Difference** | **Mean Treated** | **Mean Control** | **Standardized Mean Difference** |
| Distance | 0.117 | 0.053 | 0.360 | 0.059 | 0.059 | 0.000 |
| Pre-period Jan | 95.650 | 67.356 | 0.216 | 68.717 | 80.468 | -0.090 |
| Pre-period Feb | 112.379 | 66.415 | 0.256 | 66.282 | 80.856 | -0.081 |
| Pre-period Mar | 72.238 | 52.967 | 0.200 | 49.714 | 56.591 | -0.071 |
| Pre-period Apr | 52.633 | 45.703 | 0.088 | 39.705 | 42.860 | -0.040 |
| Pre-period May | 58.904 | 49.093 | 0.118 | 46.401 | 42.895 | 0.042 |
| Pre-period June | 100.000 | 75.139 | 0.203 | 81.054 | 67.984 | 0.107 |
| Pre-period July | 124.264 | 83.150 | 0.232 | 90.181 | 77.087 | 0.074 |
| Pre-period Aug | 113.377 | 76.517 | 0.235 | 81.455 | 70.076 | 0.072 |
| Pre-period Sept | 112.694 | 74.993 | 0.245 | 77.792 | 67.786 | 0.065 |
| Pre-period Oct | 72.998 | 57.892 | 0.145 | 51.480 | 53.827 | -0.023 |
| Pre-period Nov | 80.689 | 61.559 | 0.166 | 58.343 | 67.072 | -0.076 |
| Pre-period Dec | 87.733 | 63.047 | 0.197 | 62.098 | 72.666 | -0.084 |

Table J-17 provides results for a t-test which helps determine the success of matching. The test measures whether there are statistically significant differences in average daily consumption used between the treatment and comparison groups in the pre-period by month. Statistically significant differences are defined as a p-value of less than 0.05 at the 95 percent significance level. As shown below, the p-value is greater than 0.05 for each month tested. This result further indicates propensity score matching performed well because the differences between the treatment and comparison groups are not statistically significant.

*Table J-17: Post-Matching T-Test of Difference in Pre-Period Usage by Month*

| Month | Average Daily kWh Control | Average Daily kWh Treatment | T Stat | Std Error | P-Value | Reject Null? |
|---|---|---|---|---|---|---|
| Jan | 76.236 | 68.717 | 0.406 | 18.535 | 0.686 | No |
| Feb | 77.650 | 66.282 | 0.623 | 18.253 | 0.535 | No |
| Mar | 53.533 | 49.714 | 0.300 | 12.718 | 0.765 | No |
| Apr | 40.999 | 39.705 | 0.109 | 11.902 | 0.914 | No |
| May | 40.970 | 46.401 | -0.447 | 12.155 | 0.657 | No |
| June | 64.562 | 81.054 | -0.922 | 17.890 | 0.361 | No |
| July | 73.541 | 90.181 | -0.860 | 19.357 | 0.394 | No |
| Aug | 66.885 | 81.455 | -0.829 | 17.571 | 0.410 | No |
| Sept | 64.384 | 77.792 | -0.828 | 16.187 | 0.411 | No |
| Oct | 51.102 | 51.480 | -0.031 | 12.369 | 0.976 | No |
| Nov | 63.569 | 58.343 | 0.345 | 15.140 | 0.731 | No |
| Dec | 68.664 | 62.098 | 0.400 | 16.436 | 0.691 | No |

Figure J-4 displays the density of seasonal pre-period usage, before conducting matching. Figure J-5 displays the density of seasonal pre-period usage, after conducting matching.

*Figure J-4: Seasonal Pre-Period Usage Before Matching*

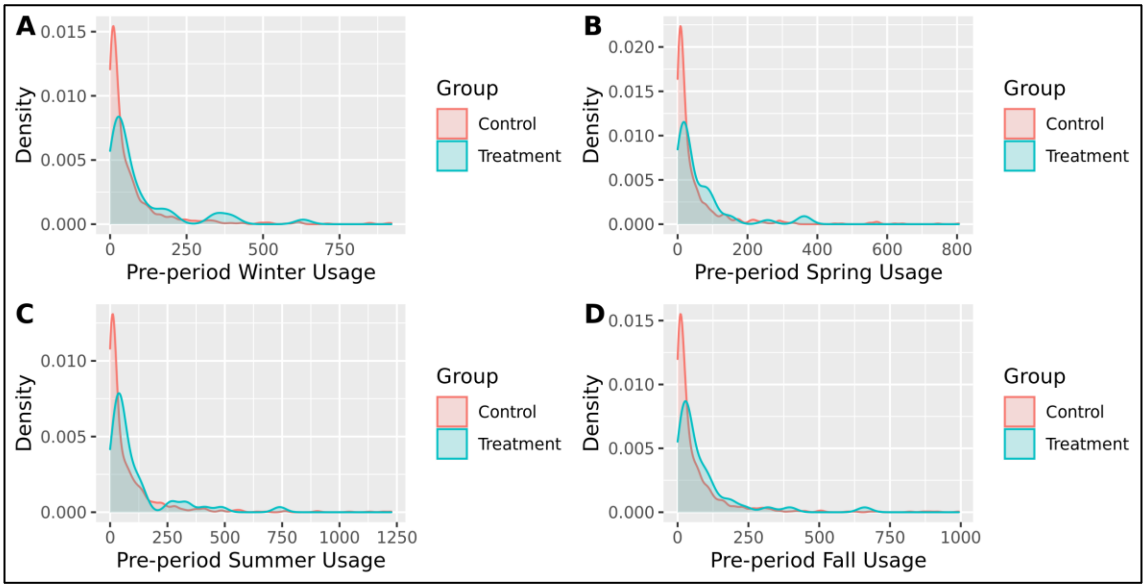
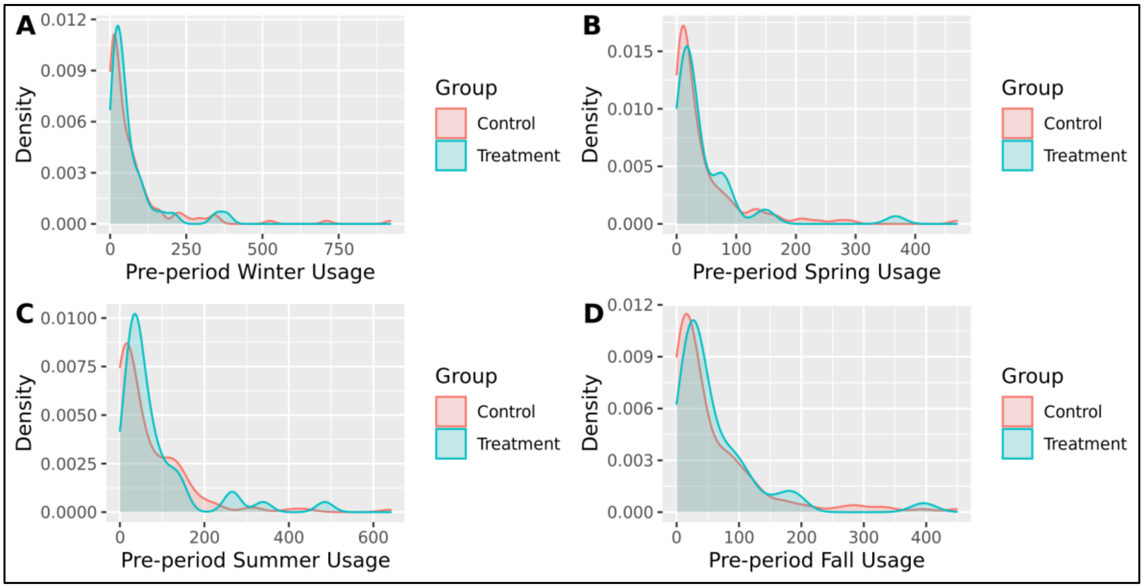


*Figure J-5: Seasonal Pre-Period Usage After Matching*



Lastly, the joint chi-square test for covariate balance had a p-value of 0.88, meaning we failed to reject the null hypothesis of covariate imbalance (i.e., the treatment and comparison group are similar).

Table J-18 provides regression results for annual energy savings (kWh) savings post matching. Interaction variables between pre-period usage and month have been omitted for the sake of brevity.

*Table J-18: Annual Energy Savings (kWh) Regression Results*

| Variable | Estimate | Std Error | T-Statistic | P-Value | 95% CI Lower | 95% CI Upper |
|---|---|---|---|---|---|---|
| (Intercept) | 8.478 | 72.203 | 0.117 | 0.907 | -110.380 | 127.337 |
| Pre-Period Usage Fall | 0.276 | 0.156 | 1.776 | 0.076 | 0.020 | 0.532 |
| Pre-Period Usage Winter | -0.109 | 0.063 | -1.726 | 0.085 | -0.213 | -0.005 |
| Pre-Period Usage Summer | 0.809 | 0.077 | 10.498 | 0.000 | 0.682 | 0.936 |
| June | | | | | | |
| July | 36.290 | 11.897 | 3.050 | 0.002 | 16.706 | 55.874 |
| Aug | 37.342 | 14.382 | 2.596 | 0.010 | 13.666 | 61.018 |
| Sept | -108.143 | 34.464 | -3.138 | 0.002 | -164.877 | -51.410 |
| Oct | -765.595 | 222.139 | -3.446 | 0.001 | -1131.275 | -399.914 |
| Nov | -1881.889 | 555.222 | -3.389 | 0.001 | -2795.883 | -967.895 |
| Dec | -2287.502 | 677.403 | -3.377 | 0.001 | -3402.628 | -1172.376 |
| Treatment | -6.106 | 9.859 | -0.619 | 0.536 | -22.336 | 10.124 |
| CDD | -3.169 | 5.894 | -0.538 | 0.591 | -12.871 | 6.533 |
| HDD | 102.007 | 31.151 | 3.275 | 0.001 | 50.727 | 153.288 |
| Treatment*CDD | 0.257 | 0.846 | 0.304 | 0.761 | -1.136 | 1.650 |
| Treatment*HDD | 0.215 | 0.551 | 0.390 | 0.696 | -0.692 | 1.122 |
| **Adjusted R2 = 0.89, Sample Size = 38** | | | | | | |

The kWh savings were derived using the following equation:

*Equation J-7: Energy Savings (kWh) for BST Program*

$$Annual\ kWh\ Savings = Treatment * 365.25 + Treatment{:}\,CDH * 1{,}461 + Treatment{:}\,HDH * 5{,}581$$

Where:

*Treatment* = *dummy variable*

= *1 if in the treatment group, and 0 otherwise*

$HDH_{it}$ = *average heating degree hours for time interval t*

$CDH_{it}$ = *average cooling degree hours for time interval t*

Despite obtaining a good matching control group and the PPR model providing a good fit for the data (Adj. R2 = 0.89), the estimated 388 kWh/Unit savings are not statistically significant at the 95 percent level (p-value=0.71) This outcome is due to the small number of participants and the small size of the expected treatment effect (1 percent to 2 percent of annual savings).

Annual kWh savings per thermostat are equal to the annual kWh savings estimate (654.23) divided by the average number of thermostat units per customer (1.684), as shown in the equation below.

$$\begin{aligned} &Annual\ kWh\ Savings\ per\ Unit \\ &\qquad = ((-6.106 * 365.25) + (0.257 * 1{,}461) + (0.215 * 5{,}581))/1.684 \end{aligned}$$

Table J-19 shows annual expected and realized energy savings for Business Smart Thermostats. Expected annual energy savings were based on estimates for residential households which have lower usage on average compared to small business customers.

*Table J-19: BST Annual kWh Savings*

| Jurisdiction | Expected kWh/Unit Savings | Realized kWh/Unit Savings | Eligible Units | Expected kWh Savings | Realized kWh Savings | RR (kWh) |
|---|---|---|---|---|---|---|
| MO West | 831 | 388 | 155 | 128,805 | 60,140 | 47% |
| MO Metro | 831 | 388 | 103 | 85,593 | 39,964 | 47% |
| **Total** | | | **258** | **214,398** | **100,104** | **47%** |

## J.7 Impact Evaluation – Final Savings Tables

Based on the impact evaluation results, the total verified net energy savings for the Business Thermostat Program are 100,104 kWh, and the total verified net peak demand savings are 245.08 kW.

Table J-20 and Table J-21 summarize the verified net energy and peak demand reductions for the Business Smart Thermostat Program.

*Table J-20: BST Peak Demand Reduction (kW)*

| Jurisdiction | Reported Peak Demand Reduction per Unit | Verified Peak Demand Reduction per Unit | Eligible Units | Reported Peak Demand Reductions | Verified Peak Demand Reductions | RR (kW) |
|---|---|---|---|---|---|---|
| MO West | 0.78 | 0.83 | 167 | 129.59 | 139.33 | 108% |
| MO Metro | 0.78 | 1.02 | 104 | 80.70 | 105.75 | 131% |
| **Total** | | | **271** | **210.30** | **245.08** | **117%** |

*Table J-21: BST Annual Energy Savings (kWh)*

| Jurisdiction | Expected kWh/Unit Savings | Realized kWh/Unit Savings | Eligible Units | Expected kWh Savings | Realized kWh Savings | RR (kWh) |
|---|---|---|---|---|---|---|
| MO West | 831 | 388 | 155 | 128,805 | 60,140 | 47% |
| MO Metro | 831 | 388 | 103 | 85,593 | 39,964 | 47% |
| **Total** | | | **258** | **214,398** | **100,104** | **47%** |

## J.8 Process Evaluation

### J.8.1 Program Operations

According to the program staff, the Residential Demand Response (RDR) and the Business Smart Thermostat (BST) programs operate identically but target two different customer groups: residential customers and small business customers. This section summarizes Johnson consulting's (a subcontractor to ADM) findings from the in-depth interviews conducted with Evergy program staff and its implementer, CLEAResult to gain a better understanding of the program design, operations, challenges, and future opportunities. The summary for the in-depth interview was included in the 'Residential Demand Response Program' (see Section I.8).

### J.8.2 Participant Survey

The number of responses from the participant surveys were too small (n = 4) to provide any meaningful analysis for the BST Program.

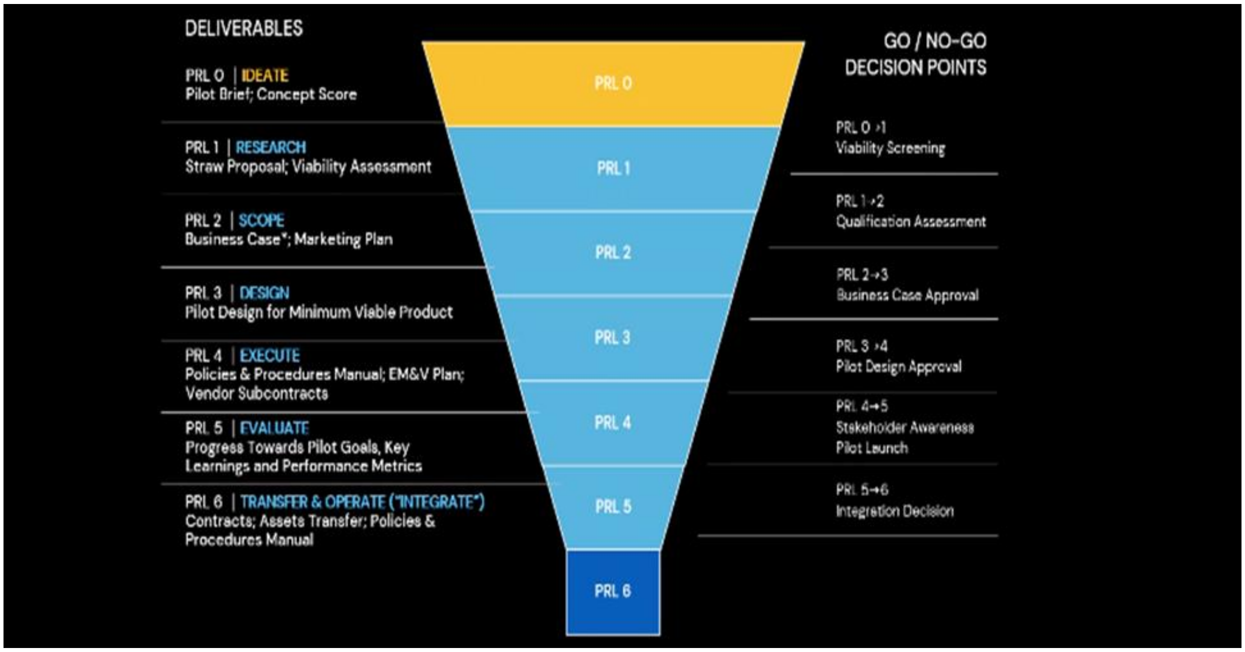
## J.9 Conclusions and Recommendations

The key findings and program recommendations for the BST Program are included in Section I.9.

# Appendix K Products & Services Incubator Program-Specific Methodologies

ADM completed processes analyses on seven Evergy pilot programs and impact analyses on four pilot programs. Figure K-1 illustrates the Pilot Incubator Funnel that ICF used to vet pilot program concepts for Evergy. This figure highlights the various decision points used to determine if the pilot concept should proceed or stay at the current level. According to ICF staff, the goal is to launch between two and four pilots each year; however, this is not a "fixed goal," as the team explained.

*Figure K-1: ICF Vetting Process for New Program Concepts*



A significant goal in evaluating these pilot programs is to identify what, if any, energy savings are associated with them. The program design process also identifies the critical metrics needed to estimate the energy savings from the pilot programs. Hence, an essential element of the program pilot process is to gather crucial data in the first year of program operations.

## K.1 Appliance Recycling

### K.1.1 Program Overview

The Appliance Recycling Program is a new pilot program offered by Evergy starting in 2022. The program is a collaboration between Evergy and ARCA Recycling Inc. (ARCA) that works to provide customers in the St. Joseph, Maryville and surrounding areas with an easy way to recycling old, working appliances[45].

The goal of the program is to reduce the number of older, inefficient appliances being used. To accomplish this goal, Evergy provides eligible customers with a $75 incentive for old, working refrigerators or freezers and a $25 incentive for room air conditioners or dehumidifiers.

Participating Evergy customers can schedule an appointment through phone or online. The appliance can be left inside or at an outside location and a contractor then verifies the appliance is working, picks it up and recycles it.

Table K-1 provides a summary of program metrics for the PY3 for the Appliance Recycling Program.

*Table K-1: Performance Metrics – Appliance Recycling Pilot Program*

| Metric | PY3 Total | MO West | MO Metro |
|---|---|---|---|
| Number of Appliances Recycled | 211 | 207 | 4 |
| ***Energy Impacts (kWh)*** | | | |
| Targeted Energy Savings | - | - | - |
| Reported Energy Savings | 173,731 | 170,119 | 3,612 |
| Gross Verified Energy Savings | 168,816 | 164,492 | 4,324 |
| Net Verified Energy Savings | 168,816 | 164,492 | 4,324 |
| ***Peak Demand Impacts (kW)*** | | | |
| Targeted Peak Demand Savings | - | - | - |
| Reported Peak Demand Savings | 42.71 | 42.30 | 0.41 |
| Gross Verified Peak Demand Savings | 25.82 | 25.30 | 0.52 |
| Net Verified Peak Demand Savings | 25.82 | 25.30 | 0.52 |
| ***Benefit / Cost Ratios*** | | | |
| Total Resource Cost Test Ratio | - | - | - |

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[45] Research and Pilot Program. Evergy. Available online: https://www.evergy.com/ways-to-save/programs-link/research-and-pilot-program

### K.1.2 Gross Impact Methodology

This subsection summarizes the methods used to verify measure savings and calculate gross energy savings for the Appliance Recycling Program.

For the PY3 evaluation, ADM used two primary data resource used for M&V review:

1. Program data provided by Evergy, containing the quantity, appliance type, and savings for the year.
2. Program data provided by ARCA, containing the age, model type, size, unit brand and unit location of the old unit being picked up.

The calculation of gross energy savings and demand reduction relied on energy savings values and algorithms from the Evergy TRM. The data collected from ARCA, along with program tracking data were used as inputs to the savings algorithms as outlined in the Evergy TRM.

The gross energy savings and demand reduction algorithms are outlined in Appendix M.

### K.1.3 Gross Impact Findings

Table K-2 below summarizes the verified gross energy and demand savings for the Appliance Recycling Program. The overall realization rates for energy savings and demand reduction were 97 percent and 60 percent. Detailed descriptions of the difference in savings calculations are in the measure level findings below.

*Table K-2: Program Measure Level Gross Energy Savings (kWh) and Peak Demand Reduction (kW)*

| **Measure** | | **Qty** | **Reported Savings** | | **Verified Savings** | | **Realization Rate** | |
|---|---|---|---|---|---|---|---|---|
| | | | **kWh** | **kW** | **kWh** | **kW** | **RR (kWh)** | **RR (kW)** |
| MO West | Room AC | 26 | 10,181 | 21.79 | 7,059 | 4.47 | 69% | 20% |
| | Dehumidifiers | 26 | 20,091 | 4.56 | 16,030 | 3.63 | 80% | 80% |
| | Freezer | 48 | 43,454 | 4.96 | 38,807 | 4.55 | 89% | 92% |
| | Refrigerator | 107 | 96,392 | 11.00 | 102,596 | 12.65 | 106% | 115% |
| | **Sub Total** | **207** | **170,119** | **42.30** | **164,492** | **25.30** | **97%** | **60%** |
| MO Metro | Room AC | 0 | 0 | 0 | 0 | 0 | - | - |
| | Dehumidifiers | 0 | 0 | 0 | 0 | 0 | - | - |
| | Freezer | 2 | 1,811 | 0.21 | 2,022 | 0.24 | 112% | 115% |
| | Refrigerator | 2 | 1,802 | 0.21 | 2,302 | 0.28 | 128% | 138% |
| | **Sub Total** | **4** | **3,612** | **0.41** | **4,324** | **0.52** | **120%** | **126%** |
| **Total** | | **211** | **173,731** | **42.71** | **168,816** | **25.82** | **97%** | **60%** |

For each measure in the program, total gross energy savings and peak demand reduction were determined as a product of the number of measures recycled as part of the program and the gross savings per measure. A description of the verified gross findings for each measure type is included below.

**Room Air Conditioner:** The energy savings for room air conditioners have a realization rate of 69 percent and the peak demand reduction had a realization rate of 20 percent. The difference in kWh savings and kW demand reduction between the reported savings calculations and the verified savings calculations is a result of the reported savings calculations using a default capacity of 8,500 Btu/H. The verified calculations use the capacities of each unit as reported by ARCA Recycling. The average capacity, as reported by ARCA is 5,700 Btu/H, which is smaller than the TRM default. The reported peak demand reduction uses the nameplate demand savings from the Evergy TRM and not the coincident peak demand savings. This leads to a larger reported demand reduction as the nameplate demand savings is multiplied by the peak coincidence factor of 30 percent to get to the coincident peak demand savings. Updating this value would lead to a much higher realization rate. Additionally, there is one project that is classified in the tracking data as a room air conditioner, however the reported energy savings and demand reduction, as well as the ARCA data indicate the item is actually a refrigerator.

**Dehumidifier:** The energy savings and the peak demand reduction for dehumidifiers have a realization rate of 80 percent. The difference in kWh savings and kW demand reduction between the reported savings calculations and the verified savings calculations is a result of the reported savings calculations using different values for capacity and efficiency than the verified savings calculations. With a capacity of around 38.5 pt/day and efficiency of about 1.6 L/kWh, the kWh savings are very close (1.2 kWh difference) to the reported savings value. The verified calculations use the capacity values reported by ARCA and assumed the federal standard criteria efficiency of 1.54 L/kWh. However, some of ARCA's reported capacity values are not valid. It appears that some of the capacity values, specifically the values 15 and under are actually the cubic feet and not the pints per day. To account for this, the sizes that are reasonable (any values above 15) were used in the line calculations and the average of those valid sizes was used for the invalid sizes (29.5 pt/day). This average is smaller than the deemed TRM average value and is more conservative.

**Freezer:** The energy savings for freezers have a total realization rate of 90 percent and the peak demand reduction had a realization rate of 93 percent. The difference in kWh savings and kW demand reduction between the reported savings calculations and the verified savings calculations is a result of the reported savings calculations using default values for age, capacity, freezer type and other variables. The verified calculations use the values of each unit as reported by ARCA. The averages from the two sources are listed below in Table K-3. For age and capacity, the ARCA averages higher than the TRM default value. The TRM default matches the ARCA data for the percentage of freezers that are chest freezers. The largest differences from the pre-1990 value, the percentage of units that are older than 1990, and the unconditioned space value, the percentage of units that are located in an unconditioned space. The ARCA values indicate that only 30 percent of the freezers being recycled in this program in PY3 are older than 1990, while the TRM assumes a value of 60 percent. Seventy percent of the freezers recycled in this program were located in unconditioned spaces. This includes garages, driveways, outbuildings and porches. Basements were considered half conditioned and half unconditioned and therefore given a value of 0.5. The TRM assumes that percentage would be smaller, at only 30 percent.

*Table K-3: Comparison of the Freezer Characteristic ARCA Recycling Averages and Evergy TRM Defaults*

| Characteristic | Evergy TRM Default | ARCA Recycling Average |
|---|---:|---:|
| Age | 26.92 | 31.02 |
| Capacity | 15.90 | 16.56 |
| Type | 48% Chest Freezer | 48% Chest Freezer |
| Pre-1990 | 60% | 30% |
| Unconditioned Space | 30% | 70% |

Additionally, the reported peak demand reduction uses the nameplate demand savings from the Evergy TRM and not the coincident peak demand savings. This leads to a smaller reported demand reduction as the nameplate demand savings is multiplied by the peak coincidence factor of 102.8 percent to get to the coincident peak demand savings.

**Refrigerator:** The energy savings for refrigerators have a total realization rate of 107 percent and the peak demand reduction had a realization rate of 115 percent. The difference in kWh savings and kW demand reduction between the reported savings calculations and the verified savings calculations is a result of the reported savings calculations using default values for age, capacity, primary usage, and other variables. The verified calculations use the values of each unit as reported by ARCA. The averages from the two sources are listed below in Table K-4. The reported ARCA data for this program year matches closely to the TRM default for capacity, and is in the same range for age, pre-1990 value, the percentage of units that are older than 1990, and the primary usage value, the percentage of units that were used as a primary refrigerator. The two characteristics with the largest differences are the type, the percentage of units that have a side-by-side configuration, and the unconditioned space value, the percentage of units that are located in an unconditioned space. For both values, the ARCA data has a larger percentage and for unconditioned spaces, the value is more than double the TRM default. ADM assumed that the unconditioned locations listed in the ARCA data were garages, driveways, outbuildings and porches. Basements were considered half conditioned and half unconditioned and therefore given a value of 0.5.

*Table K-4: Comparison of the Refrigerator Characteristic ARCA Recycling Averages and Evergy TRM Defaults*

| Characteristic | Evergy TRM Default | ARCA Recycling Average |
|---|---|---|
| Age | 22.81 | 28.88 |
| Capacity | 18.82 | 19.59 |
| Type | 17% side by side | 28% side by side |
| Pre-1990 | 45% | 41% |
| Primary Usage | 34% | 31% |
| Unconditioned Space | 30% | 74% |

Additionally, the reported peak demand reduction uses the nameplate demand savings from the Evergy TRM and not the coincident peak demand savings. This leads to a smaller reported demand reduction as the nameplate demand savings is multiplied by the peak coincidence factor of 108.1 percent to get to the coincident peak demand savings.

### K.1.4 Net Savings Evaluation Findings

For PY3, ADM applied a designated NTG value of 1.0. The designation as pilot program and the small overall size of the Appliance Recycling Program did not justify the development of a net-to-gross ratio for this program.

### K.1.5 Impact Evaluation – Final Savings Table

Based on the impact evaluation results, the total verified gross energy savings for the Appliance Recycling Program are 168,816 kWh and 25.82 kW. Table K-5 below summarizes the verified gross energy and demand savings and Table K-6 summarizes the verified net impacts for the Appliance Recycling Program.

*Table K-5: Program Jurisdiction Level Gross Energy Savings (kWh) and Peak Demand Reduction (kW)*

| Jurisdiction | Reported Energy Savings (kWh) | Reported Demand Reduction (kW) | Gross Verified Energy Savings (kWh) | Gross Verified Demand Reduction (kW) | RR (kWh) | RR (kW) |
|---|---|---|---|---|---|---|
| MO West | 170,119 | 42.30 | 164,492 | 25.30 | 97% | 60% |
| MO Metro | 3,612 | 0.41 | 4,324 | 0.52 | 120% | 126% |
| **Total** | **173,731** | **42.71** | **168,816** | **25.82** | **97%** | **60%** |

*Table K-6: Verified Gross and Net Annual Energy Savings (kWh)*

| Jurisdiction | Free Ridership | NTG (kWh) | Gross Verified Energy Savings (kWh) | Net Energy Savings (kWh) |
|---|---|---|---|---|
| MO West | 0% | 100% | 164,492 | 164,492 |
| MO Metro | 0% | 100% | 4,324 | 4,324 |
| **Total** | **0%** | **100%** | **168,816** | **168,816** |

### K.1.6 Process Evaluation

This section summarizes the results from the process evaluation of Evergy's Appliance Recycling Program based on feedback from in-depth interviews with Evergy program staff and the third-party implementer, as well as reviewing available program materials.

*Program Operations*

Evergy, partnered with ARCA, offers a residential appliance recycling program to customers in select areas of Evergy's Missouri service territory. Evergy offers customers a rebate to encourage them to recycle old appliances, including refrigerators and freezers ($75), dehumidifiers, and room air conditioners ($25). The program was launched in April 2022 and Evergy plans on continuing this pilot into 2023.

*Roles and Responsibilities*

The program is partnered with ARCA Recycling, implemented by ICF, and managed by an Evergy staff member. During the fourth quarter of PY3, the ICF program manager of the Products & Services Incubator Programs left. During this interim period, the program was managed by a senior ICF staff member.

*Program Design*

Initially, the program targeted a small subset of zip codes within Evergy's Missouri West St. Joseph's and Maryville territory, primarily small rural towns closest to the recycling facility in Minnesota, thereby decreasing the number of routes to improve cost-effectiveness.

The program scope was then expanded in September of 2022 beyond the initial target of St. Joseph to include other nearby cities, such as Lee's Summit, Blue Springs or Grain Valley. Evergy staff explained this change was made after they noticed a "tapering [off] of recycling orders [in the smaller towns] and so opened up the program to the larger suburban in Missouri West".

Staff indicated that the data tracking and reporting were sufficient for this program.

*Participation Goals*

The goal was to recycle 300 units in PY3. As of August 2022, the program has completed 160 projects and based on the implementor interview, expects to complete 225 projects by the end of the program year. The final number of recycled appliances at the end of the program year is 211 appliances.

According to Evergy staff, the program is "hitting its goals." The staff also reported positive customer feedback and increased satisfaction with the program and the incentives based on responses from the customer survey sent out by ICF once the customers are paid out for their incentive.

*Enrollment Process*

The program is promoted through a variety of channels to generate participant interest, including postcard mailing in specific zip codes. Each postcard has a QR code and telephone number that a customer can use to schedule a pick-up through a telephone call or by visiting the online scheduling portal and scheduling an appointment. Evergy staff noted that the newspaper and postcard mailings were most effective in rural areas, whereas targeted emails were more successful in the larger suburban cities like Lee's Summit and Blue Springs.

The customer wait time is three to four weeks depending upon the location. ARCA uses a "batch approach" to schedule pick-ups along designated routes to keep down costs. No delays have been reported in the scheduling and pick-up, and ARCA currently has four different routes in Evergy's service territory.

### K.1.7 Conclusions and Recommendations

The evaluation team at ADM performed an impact and process evaluation that assessed program documentation and primary data collected from program stakeholders. The evaluations included in-depth interviews with the Evergy program staff and the third-party implementer, and verification of measure savings calculation of gross energy savings.

The following summarizes the key findings of the evaluation of the Appliance Recycling Program for PY3.

- While the program did not reach the goal of 300 units recycled, the program is running well and have received positive customer feedback.
- Utilizing newspaper and postcard mailings was most effective for enrollment in rural areas and targeted emails were more successful in larger suburban cities.
- The energy savings and demand reduction realization rates are 96 percent and 60 percent overall, mainly due to differences in the TRM default values and the ARCA data on the units recycled, as well as the use of the nameplate demand savings.

The following recommendations are offered for continued improvement of the Appliance Recycling Program.

- **Add additional data collection requirements to the reporting fields for the program tracking data.** This would allow for ARCA Recycling data to be combined with the tracking data allowing for easier calculations of savings. Additionally, this could catch errors in the data earlier in the year, allowing for changes to be made, such as the dehumidifier capacity being reported as a cubic feet capacity and not pints/day.
- **Use the coincident peak demand savings from the Evergy TRM, not the nameplate demand savings to account for demand savings more accurately during peak events.**
- **Combine promotional efforts with other pilot programs.** For example, the Appliance Recycling program could be promoted at the local libraries that are partnered with the Power Check program. This could attract an additional part of the community. Fliers could be added to the Power Check device boxes or attached to the trees given out with the Energy-Saving Trees program, assuming the locations coincide with the Appliance Recycling targeted area.

- **Evaluation surveying efforts could be conducted to confirm the unit characteristics, verify the unit was in working condition and determine the participant satisfaction with the program.** If the pickup location was a basement, the survey should include a question on if the basement is conditioned or not.

## K.2 BPI Certification

### K.2.1 Program Overview

Evergy's Building Performance Analyst Scholarship (BPI) Program launched in August of 2022 with the goal of filling the gap of available BPI-certified analysts in the region thus improving the support for the PAYS and HCHC programs that require BPI-certified individuals to complete the energy audits.

### K.2.2 Gross Impact Findings

As this pilot program does not claim savings directly, no impact analysis was completed. Savings from this program are claimed through other programs such as HCHC and PAYS.

### K.2.3 Process Evaluation

This section summarizes the results from the process evaluation of BPI Program based on feedback from interviews with the Evergy program staff and the third-party implementer, as well as reviewing available program materials.

*Program Design*

In August 2022, Evergy launched the BPI Program, designed to support Evergy's programs while supporting the local economy with additional technical competencies for the local workforce.

Evergy's program implementer, ICF, developed a partnership with the Partner with The Energy and Environmental Training Center of Kansas City (EETCKC) to identify up to 10 local contractors to enroll in the scholarship program to receive BPI certification.

The primary objective of this program is to fill the gap of available BPI-certified analysts in the region, specifically to support two air sealing and PAYS programs that Evergy offers. These programs require that the energy audits be completed by BPI certified individuals. Before this pilot program, only seven companies in Evergy's service territory had BPI-certified analysts on staff.

> *“The objective was to increase the number of contractors available in the market and to support the economy in adding to available technical people to the workforce.” (Program Staff)*

Evergy provides a scholarship of $1,850 per student that covers the cost of training, learning material, and exams for each participant. The utility also offers bonus incentives of up to $3,000 to the participants if they complete an energy audit and submit an insulation or air sealing job to Evergy before the end of the year. There is an additional $2,000 bonus for jobs that are completed in the Missouri West jurisdiction. This bonus incentive is intended to help defray the cost of purchasing and/or replacing recommended energy auditing equipment (i.e., blower doors, combustion analyzers, etc.).

### *Program Performance*

ICF staff worked directly with the EETCKC who provided BPI-certified trainers. The training was conducted over one week at the Project Living Proof demonstration home in Kansas City. The training included four and a half days in a classroom, a half a day in the field to learn the equipment and final exams lasting half a day.

ICF recruited a total of 10 participants in 2022. The participants were divided into three cohorts:

- September – 3 participants
- October – 6 participants
- December – 1 participant

Nine trade allies have completed the training and passed the exams as of mid-November 2022. The final participant will complete the program in December 2022.

### *Program Participation and Marketing*

This pilot was promoted via word-of-mouth and leveraging ICF’s long-term relationships with the local contractors already supporting the MEEIA energy efficiency programs. Specifically, the implementation contractor identified trade allies currently participating in the Evergy Residential Programs (i.e. HCHC and PAYS) who did not have BPI-certified contractors.

Three participating contractors also worked with the natural gas utility Spire and were interested in offering air sealing services. Two selected contractors support the PAYS program.

The BPI program had a quick enrollment process. The contractors completed the applications and were then enrolled in either the September or October training class.

Program enrollment went smoothly, according to program staff.

> *“The BPI certification doesn’t have any prerequisites, although it’s recommended that participants understand the fundamentals of building science. We did get a range of knowledge, but it was a good mix, and all were capable of passing the exam.” (Program Staff).*

### *Roles and Responsibilities*

For the BPI program, Evergy provided overall management while ICF oversaw the day-to-day program management. Specifically, ICF staff coordinated the program's recruitment and training of trade allies with the EETCKC. During the fourth quarter of PY3, the ICF program manager of the Products & Services Incubator Programs left. During this interim period, the program was managed by a senior ICF staff member. ICF will bring in a new program manager in 2023.

### *Communication*

The implementation contractor held weekly meetings with Evergy throughout the pilot period. These meetings included updates on the training schedule and outcomes. The implementation team also had weekly contact with the EETCKC staff to discuss the progress of the trainings.

### *Tracking and Reporting*

ICF gathered data regarding each program participant, including their employer and the program they are supporting. ICF is also tracking the bonus incentive payments for equipment purchases or upgrades.

The program also traces the types of air sealing or insulation measures installed by the newly certified BPI Building Analysts but needs to track the savings directly attributing to these program participants.

### *Quality Assurance and Quality Control*

EETCKC and the BPI trainers oversee the QA/QC process as part of the training module. The BPI instructor also completes the QA/QC in the field, certifies and records the field examination results, and randomly conducts QA/QC to ensure consistent scoring.

### *Program Successes*

A critical element of program success was ICF’s ability to build on its pre-existing relationships with MEEIA-affiliated contractors throughout Evergy’s service territory.

> *“We had many relationships with contractors who were not yet auditors in the program, so this was a way to certify (them) and add (them) to the program.” (Program Staff)*

Currently, there are no plans to continue the pilot beyond 2022, but it could be expanded in the future to include other trainings and a broader cross-section of Evergy’s Trade Ally Network.

*Challenges for Program*

> *“The timing of the launch put a constraint on achievement of bonus incentives… (The contractors) only had a couple of months left for jobs to be submitted to the program.” (Program Staff)*

The idea of expanding the recruitment to local weatherization agencies was briefly investigated during the launch of the program, however it was determined that expanding the program to weatherization contractors could be difficult because these agencies can utilize federal funding to take part in the training and certification.

Additionally, the time commitment required could be a future deterrent for participants, as the training take a full week, every day from 8:00 am to 5:00 pm. However, it was noted that none of the applicants decided against the training because of this.

### K.2.4 Conclusions and Recommendations

The following summarizes the key findings of the process evaluation of the BPI Program.

- The BPI Pilot Program met its intended goals and objectives. It is an effective way to increase the overall pool of qualified energy auditors to support multiple Evergy residential programs.

The following recommendations are offered for continued improvement of the BPI:

- **Evergy staff should continue this pilot in 2023.** Specifically, the staff should work with the implementation contractor to identify additional contractors, especially those who support other Evergy Diversity, Equity and Inclusion (DEI) initiatives, to increase the quality and availability of contractors to support Evergy’s residential programs.

## K.3 Energy Efficiency Nonprofits Program (EENP)

As part of the Stipulation Order from the Missouri Public Service Commission, Evergy identified and launched its Energy Efficiency Nonprofits (EENP) Program. This pilot program targets organizations that provide transitional housing and emergency services to residential customers living in Evergy's service territory.

### K.3.1 Program Overview

The EENP Program offered by Evergy targeted 501(c)(3) to organizations that provide lodging and social services to low-income, homeless, or at-risk populations in the Evergy

Missouri jurisdiction, so they can better serve these individuals and families. Lodging must be the facility's primary function. Satellite facilities associated with the headquarters organization are also eligible (EENP Application).

The program offers these organizations low- and no-cost energy efficiency measures and incentives and includes an energy audit and recommendations for energy efficiency improvements. Eligible measures include interior and exterior lighting upgrades, HVAC tune-ups, water conservation measures and power strips. In addition, the organizations may also qualify for additional rebates or incentives based on the results of the energy audit (EENP Application). In PY3, the program had one carry over project from PY2. This project consisted of custom lighting measures.

Table K-7 provides a summary of program metrics for the PY3 for the EENP Program.

*Table K-7: Performance Metrics – Energy Efficiency Nonprofits Pilot Program*

| Metric | PY3 Total | MO West | MO Metro |
|---|---:|---:|---:|
| Number of Businesses | 1 | 0 | 1 |
| ***Energy Impacts (kWh)*** | | | |
| Targeted Energy Savings | - | - | - |
| Reported Energy Savings | 39,658 | - | 39,658 |
| Gross Verified Energy Savings | 39,657 | - | 39,657 |
| Net Verified Energy Savings | 39,657 | - | 39,657 |
| ***Peak Demand Impacts (kW)*** | | | |
| Targeted Peak Demand Savings | - | - | - |
| Reported Peak Demand Savings | 18.31 | - | 18.31 |
| Gross Verified Peak Demand Savings | 18.31 | - | 18.31 |
| Net Verified Peak Demand Savings | 18.31 | - | 18.31 |
| ***Benefit / Cost Ratios*** | | | |
| Total Resource Cost Test Ratio | - | - | - |

### K.3.2 Gross Impact Methodology

All of the program savings for PY3 from the EENP program came from custom lighting.

ADM utilized the same evaluation methodology as PY2. ADM compared savings attributed to the measures installed through the EENP program by validating savings according to the relevant unit energy savings methodology from the Evergy TRM. ADM's evaluation consisted of:

- Confirmed that savings for measures included in the program were calculated in accordance with the Evergy TRM.

- Verified that the measure specifications and claimed savings were appropriate and reasonable.

### K.3.3 Gross Impact Findings

Table K-8 below summarizes the verified gross energy and demand savings for the EENP. The overall realization rates for energy savings and demand reduction were both 100 percent.

*Table K-8: Program Measure Level Gross Energy Savings (kWh) and Peak Demand Reduction (kW)*

| Measure | | Qty | Reported Savings | | Verified Savings | | Realization Rate | |
|---|---|---|---|---|---|---|---|---|
| | | | kWh | kW | kWh | kW | RR (kWh) | RR (kW) |
| MO West | - | - | - | - | - | - | - | - |
| MO Metro | Custom Lighting | 17 | 39,658 | 18.31 | 39,657 | 18.31 | 100% | 100% |
| | **Sub Total** | **17** | **39,658** | **18.31** | **39,657** | **18.31** | **100%** | **100%** |
| **Total** | | **17** | **39,658** | **18.31** | **39,657** | **18.31** | **100%** | **100%** |

The verified energy savings are one kWh less than the reported savings. The reported savings includes one kWh for Equipment ID 63897148 – Materials and Labor Cost for EENP Contractor. As this is a line for cost, there should be zero savings. This small difference between the verified and reported savings means the realization rate is still 100 percent.

### K.3.4 Net Savings Evaluation Findings

For PY3, ADM applied a designated NTG value of 1.0. The designation as pilot program and the small overall size of the EENP did not justify the development of a net-to-gross ratio for this program.

### K.3.5 Impact Evaluation - Final Savings Tables

The total verified gross energy savings for the Energy Efficiency Nonprofits Program are 39,657 kWh and the demand savings are 18.31 kW. Table K-9 below summarizes the verified gross energy and demand savings and Table K-10 summarizes the verified net impacts for the EENP Program.

*Table K-9: Program Gross Energy Savings (kWh) and Peak Demand Reduction (kW)*

| Jurisdiction | Reported Energy Savings (kWh) | Reported Demand Reduction (kW) | Gross Verified Energy Savings (kWh) | Gross Verified Demand Reduction (kW) | RR (kWh) | RR (kW) |
|---|---|---|---|---|---|---|
| MO West | - | - | - | - | - | - |
| MO Metro | 39,658 | 18.31 | 39,657 | 18.31 | 100% | 100% |
| **Total** | **39,658** | **18.31** | **39,657** | **18.31** | **100%** | **100%** |

*Table K-10: Verified Gross and Net Annual Energy Savings (kWh)*

| Jurisdiction | Free Ridership | NTG (kWh) | Gross Verified Energy Savings (kWh) | Net Energy Savings (kWh) |
|---|---|---|---|---|
| MO West | 0% | 100% | - | - |
| MO Metro | 0% | 100% | 39,657 | 39,657 |
| **Total** | **0%** | **100%** | **39,657** | **39,657** |

### K.3.6 Process Evaluation

This section summarizes the results from the process evaluation of the EENP Program based on feedback from interviews with the program staff and third-party implementer as well as reviewing available program materials.

*Key Findings*

This pilot program began in 2021. The program officially ended in February 2022 with its last project ending. This final project began in December of 2021 and was a “carry-over” from the pilot, with savings being claimed in 2022. The EENP project funded a mix of indoor and outdoor lighting as well as wall packs and emergency strips for a homeless shelter that includes a health care clinic, children’s advocacy center and provides shelter services for runaways.

Since this was a carry-over project, the project implementer did not conduct any marketing or outreach during 2022.

The enrollment process began in December. Evergy carried the budget from 2021 as the project funding was included in the three-year cycle. As the Evergy staff explained, the utility did not need special permission to extend this project into 2022.

The program had good reception as the nonprofit organizations are not able to invest in energy efficiency.

> *“With our lighting being at no cost, I think that was a real boon to them.” (Program Staff)*

### K.3.7 Conclusions and Recommendations

The following summarizes the key findings from the evaluation of the Energy Efficiency Nonprofits Program.

- Due to supply chain issues, many of the EENP projects did see some delays. The final project, which provided indoor and outdoor lighting measures for a homeless shelter, was completed in February 2022.

ADM recommends the following are considered to support the continued improvement and development of the Energy Efficiency Nonprofits Program:

- **Evergy should follow up with program participants in six months after measure installation.** This follow-up will help remind these participants of the available energy savings opportunities, particularly the recommendations identified through the energy audit.

## K.4 Energy-Saving Trees

### K.4.1 Program Overview

The Energy-Saving Trees (EST) Program, started in 2019, is part of Evergy’s Products & Services Incubator programs. The program is a collaboration between Evergy, The Arbor Day Foundation, and Bridging the Gap, and works to provide customers in the Missouri Metro jurisdiction with shade trees at no cost.

The goal of the program is to increase the overall tree canopy in the “urban core,” reducing the heat island effect in urban areas and customer’s energy usage. To accomplish these goals, Evergy provides eligible residential customers with trees to be planted in their yards, or at multi-family properties.

Participating Evergy customers are guided through an online dashboard where they can select the types of tree(s) that they would like to receive and select a planting location for the tree(s). The platform uses iTree, an established software system developed by the USDA Forest Service, to determine the expected savings based on the tree type and planting location. The system can also recommend the planting locations that will save the most energy. Once the participants place their order, they will either pick up their trees from designated pickup locations or receive a drop off at their requested location.

For 2022, the EST Program provided 200 trees to customers in the Kansas City area, with reported savings of 25,176 kWh. There were no projects in PY3 in Missouri West. Table K-11 shows the performance metrics for the EST Program in 2022.

*Table K-11: Performance Metrics – Energy-Saving Trees Program*

| Metric | PY3 Total | MO West | MO Metro |
|---|---|---|---|
| Number of Trees Provided | 200 | 0 | 200 |
| ***Energy Impacts (kWh)*** | | | |
| Targeted Energy Savings | - | - | - |
| Reported Energy Savings | 25,176 | - | 25,176 |
| Gross Verified Energy Savings | 23,373 | - | 23,373 |
| Net Verified Energy Savings | 23,373 | - | 23,373 |
| ***Peak Demand Impacts (kW)*** | | | |
| Targeted Peak Demand Savings | - | - | - |
| Reported Peak Demand Savings | - | - | - |
| Gross Verified Peak Demand Savings | - | - | - |
| Net Verified Peak Demand Savings | - | - | - |
| ***Benefit / Cost Ratios*** | | | |
| Total Resource Cost Test Ratio | - | - | - |

### K.4.2 Gross Impact Methodology

The following section details the methodologies ADM used to verify savings from the EST Program.

#### *Data Collection*

For the PY3 evaluation, ADM used two primary data resources for M&V review.

1. Program data provided by The Arbor Day Foundation, calculated using the iTree Software, containing the quantity, species, and expected planting location of the trees provided through the program, as well as the annual and cumulative savings expected from the trees after 5, 10, 15, and 20 years.
2. Program survey to a representative sample of program participants to understand their perceptions of the program, whether participants planted the trees they received, the current health of the trees, and the final location where the trees were planted.

To inform the process evaluation, ADM also conducted an in-depth interview with program staff at Evergy and the implementation contractor. This interview provided insight into various aspects of the program and its organization. Respondents also discussed aspects of the program operations that they considered to be successful, and the challenges faced over the course of the program year.

*Program Survey*

The program survey was sent to a sample of randomly selected participants in the Energy-Saving Trees program. Each participant received a unique, single use link the program survey, and offered a small monetary incentive of $5 for completion of the survey. Using unique links allowed ADM tailor each respondent's questions based on their participation in the program, including the number and species of tree that they reportedly received, and the locations where they reportedly intended to plant their trees.

Of the 111 participants initially contacted, 35 completed the program survey. The data collected provided insights into customers perceptions of the program and energy efficiency, the health of the trees they received, motivations, and satisfaction with the program.

### *Gross Impact Methodology*

This subsection summarizes the methods used to verify measure savings and calculate gross energy savings for the Energy Saving Trees Program.

Reported energy savings for the program were based on program averages calculated by The Arbor Day Foundation using the iTree Software.[46] ADM's evaluation consisted of: (1) comparing savings estimates provided by Arbor Day for a sample of trees to the estimates ADM calculated using the iTree software to ensure that the savings did not differ dramatically from what iTree was outputting, (2) analyzing program survey results to determine that program attrition (trees that were not planted or did not survive), and (3) verifying that the final planting location for the trees aligned with the location that participants reported when they ordered their trees.

*Program Planting Rate and Mortality Rate*

Final program savings were calculated by adjusting the savings reported for each tree, based on the percentage of delivered trees that were planted (Planting Rate), and percentage of trees that survived from planting to the time of the program survey (Mortality Rate), as reported in the program survey.

The 35 respondents to the program survey received a total of 59 trees (an average of 1.7 trees per participant – the same average as PY1 and PY2.). Of these, 30 respondents (86 percent) reported planting all the trees they received, while 6 percent planted some

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[46] www.itreetools.org, accessed 3/06/2023

of their trees, and 6 percent did not report planting any of their trees. One respondent could not recall if they planted the tree(s) or not. Based on the participant responses, 55 of the 59 trees received were planted, for a planting rate of 93 percent.

Of those who reported planting their trees, 63 percent reported that prior to the winter of 2022, the tree was healthy and growing, and 13 percent reported that their tree died, with the remainder reporting that their tree was leafy but growing slowly, had few needles or leaves, or some other condition. Respondents reported that seven trees had died as of the winter of 2022, resulting in a mortality rate of 12 percent relative to the number of trees delivered. This is a smaller mortality rate than PY1 and PY2.

Using the results from the program survey, ADM calculated an attrition rate, the ratio of the number of trees planted and alive, and the number of trees delivered. The overall attrition rate for the EST Program was found to be of 81 percent, as shown in Table K-12.

*Table K-12: Planting and Mortality Rates for the Energy-Saving Trees Program*

| Metric | N Trees | Percentage |
|---|---:|:---:|
| Received | 59 | 98% |
| Planted | 55 | 93% |
| Living | 48 | 81% |
| **Rate of Attrition** | **-** | **81%** |

*Location Adjustments*

When applying for the program, each participant selected a location where they were intending to plant their trees (Intended Location). To determine if the participants planted their trees at the intended location, the participant survey showed select participants the Intended Location, and asked the respondents to report whether this matched the actual location where the trees were planted (Actual Location). Eighty-four percent of respondents said they were able to follow the link and view the location pins, of which sixty-two percent said the locations marked in the link match the locations where the trees were actually planted.

Nine of the ten respondents who answered no to the question about the locations marked in the link matching where the trees are planted gave detailed answers on how the location marked differs from where the tree(s) was actually planted. Participants changed their planting locations due to personal preference, to replace old trees that were cut down, or physical constrains such as overhead power lines or underground gas lines. The other planting locations included:

> *"More in the yard; back side of house; northeast and northwest corners"*

> *"I planted both trees in the front of the house. One on the lawn and one on the area of grass between the sidewalk and the street."*

> *"The Tulip tree was planted in the front location as marked. The Shumard Oak went to a neighbor across the street."*

Due to the qualitative nature of the responses, program savings were not adjusted due to planting locations. Further research will be necessary to determine a statistically significant adjustment rate based on the actual and intended planting location. This could involve additional questions to the survey for people who said no such as determining if the tree is on the same size of the house as the marked location, and how far off it is (in feet), to get a more quantitative result.

### K.4.3 Gross Impact Findings

To determine gross reported savings, ADM compiled a program dataset using data received from the Arbor Day Foundation and information in the 2021 Evergy TRM. There were 6 species of trees provided through the program in 2022, though only 5 species of tree were included in the 2021 Evergy TRM. In order to establish savings estimates for the remaining species, ADM mapped each missing species to one of the 5 species in the TRM, based on mapping provided by Evergy and Bridging the Gap, as shown in Table K-13.

*Table K-13: Mapping of Tree Species to TRM Values*

| Tree Species | TRM Mapping |
|---|---|
| Black Tupelo | Black Gum |
| Red Maple | Sugar Maple |
| Shumard Oak | Shumard Oak |
| Sugar Maple | Sugar Maple |
| Short Leaf Pine | Short Leaf Pine |
| Tulip Tree | Tulip Tree |

Verified savings were calculated based on the iTree savings estimates provided for each tree by The Arbor Day Foundation. A random sample of one of each species was verified by ADM using the iTree software online. Table K-14 shows the savings reported by Arbor Day and the output ADM received when using iTree.

*Table K-14: Verification of iTree Reported kWh Savings*

| Tree Species | Energy Benefits kWh Cumulative Year 20 (Arbor Day) | Diameter | Diameter Unit | 20 Year Cumulative kWh savings iTree Output |
|---|---|---|---|---|
| Tulip Tree | 2,620 | 1 | inch | 2,568 |
| | | 2 | inch | 2,791 |
| | | 3 | inch | 3,022 |
| Short leaf Pine | 2,747 | 1 | inch | 1,914 |
| | | 2 | inch | 2,251 |
| | | 3 | inch | 2,563 |
| Shumard Oak | 892 | 1 | inch | 513 |
| | | 2 | inch | 644 |
| | | 3 | inch | 797 |
| Black Tupelo | 1,474 | 1 | inch | 1,144 |
| | | 2 | inch | 1,402 |
| | | 3 | inch | 1,659 |
| Sugar Maple | 1,094 | 1 | inch | 1,253 |
| | | 2 | inch | 1,668 |
| | | 3 | inch | 2,060 |
| Red Maple | 3,057 | 1 | inch | 2,856 |
| | | 2 | inch | 3,262 |
| | | 3 | inch | 3,642 |

Savings are within the same order of magnitude for the different tree species. The differences between the two could be due to a myriad of issues including:

- Housing age (ADM assumed all houses were built between 1950 and 1980).
- When ADM entered the structures into iTree, only the house closest to the reported tree location was included. Neighboring houses were excluded.
- The program reports a 2.5-year tree age average. No reputable sources were found in a literature review for the diameter of trees based on their age. Therefore, iTree kWh savings were calculated at 20 years for 1 inch, 2 inch and 3 inch trees to give an estimated range.

As the iTree savings reported by Arbor Day were verified, the verified savings were calculated based on their iTree estimates. Savings estimates were then adjusted based on the attrition rate calculated from the program survey. For Black Tupelo, Red Maple, and Sugar Maple, the savings reported by The Arbor Day Foundation differed significantly from the savings for the appropriate species in the Evergy TRM, resulting in wide discrepancies between the reported and verified savings. Arbor Day savings are more accurate to each individual tree given out in the program and vary depending on the planting location. However, the overall program realization rate was 93 percent. For the tree species that were also available in previous years, the realization rates are similar to PY2.

Total counts of delivered trees, reported and verified kWh savings, and realization rates, by species are shown Table K-15.

*Table K-15: Quantities and Reported and Verified Savings by Tree Species*

| Jurisdiction | Tree Species | Quantity Installed | Reported kWh | Verified kWh | RR (kWh) |
|---|---|---|---|---|---|
| MO Metro | Black Tupelo | 25 | 1,680 | 2,931 | 174% |
| | Red Maple | 9 | 605 | 1,281 | 212% |
| | Shumard Oak | 50 | 6,732 | 5,009 | 74% |
| | Sugar Maple | 41 | 2,755 | 3,402 | 123% |
| | Short leaf Pine | 25 | 5,706 | 4,590 | 80% |
| | Tulip Tree | 50 | 7,699 | 6,161 | 80% |
| **Total** | | **200** | **25,176** | **23,373** | **93%** |

### K.4.4 Net Savings Evaluation Findings

For PY3, ADM applied a designated NTG value of 1.0. The designation as pilot program and the small overall size of the EST Program did not justify the development of a net-to-gross ratio for this program.

### K.4.5 Impact Evaluation – Final Savings Tables

Based on the impact evaluation results, the total verified gross energy savings for the EST Program are 23,373 kWh. There were no demand savings claimed for 2022.

*Table K-16: Program Gross Energy Savings (kWh) and Peak Demand Reduction (kW)*

| Jurisdiction | Reported Energy Savings (kWh) | Reported Demand Reduction (kW) | Gross Verified Energy Savings (kWh) | Gross Verified Demand Reduction (kW) | RR (kWh) | RR (kW) |
|---|---|---|---|---|---|---|
| MO West | - | - | - | - | - | - |
| MO Metro | 25,176 | 0 | 23,373 | 0 | 93% | - |
| **Total** | **25,176** | **0** | **23,373** | **0** | **93%** | **-** |

Table K-17 summarizes the verified net impacts of the Energy-Saving Trees Program.

*Table K-17: Verified Gross and Net Annual Energy Savings (kWh)*

| Jurisdiction | Free Ridership | NTG (kWh) | Gross Verified Energy Savings (kWh) | Net Energy Savings (kWh) |
|---|---|---|---|---|
| MO West | - | - | - | - |
| MO Metro | 0% | 100% | 23,373 | 23,373 |
| **Total** | **0%** | **100%** | **23,373** | **23,373** |

### K.4.6 Process Evaluation

This section summarizes the findings from the process evaluation for Evergy's Energy Saving Trees Program. This section outlines the findings from in-depth interviews conducted with Evergy program staff and the program partners: Bridging the Gap and the Arbor Day Foundation. It also includes findings from an online survey emailed to 111 participants, of which 35 completed the survey.

#### *Program Operations*

The Evergy Program Manager oversees this program and other duties, including managing the incubator program's products and services. Program management remained the same throughout 2022.

For the past four years, Evergy staff has worked with the Arbor Day Foundation and Bridging the Gap to design and deliver this program to Evergy's customers. The Arbor Day Foundation has two staff members that source the trees and provide the technology that manages the tree distribution. The Arbor Day Foundation developed the initial grant for the program funded through the U.S. Forest Service. The Arbor Day Foundation also runs similar energy saving/shade tree programs for utilities throughout the United States.

Bridging the Gap (BTG) is a Kansas-City-based nonprofit organization that provides various environmental educational programs.[47] They handle the distribution of the selected trees to Evergy's customers in the Missouri West region.

*Program Design*

The program was launched in Spring 2019 with the goal of increasing the overall tree canopy in the "urban core" to reduce the heat island effect in metropolitan areas. In 2022, the program targeted around 30 zip codes in the "urban core."

Eligible customers may select up to two trees for planting in their yards. The best location for planning was determined using the i-Tree computer program, provided by The Arbor Day Foundation. The I-Tree software, linked to Google Maps, allows users to input their home address and identifies the ideal location to plant each tree to maximize energy savings by providing increased shade.

There are two different ways customers can get their trees: home drop off or at a pick up event. The Arbor Day Foundation and BTG organize two of these tree giveaway pick up events each year, one in the Spring and one in the Fall. Bridging the Gap handles the logistics of distributing these trees while the Arbor Day Foundation identifies the best tree species to give away during each event.

In 2022, the tree giveaways were in the parking lot of the Evergy Connect Store and Evergy's Green Team[48] assisted in distributing the trees at central locations throughout Evergy's service territory. Between the drop off and pick up options 100 trees were distributed in the spring and again in the fall.

*Program Participation*

The Arbor Day Foundation identifies the most viable tree species that will thrive in Evergy's service territory; however, the types of trees vary for each program period. Some species are also more popular than others, so only some participants may receive their first choice of a tree. Program participants may select up to two trees from a list provided by the Arbor Day Foundation. On the online portal, there is also facts about each species, helping inform the customer on the differences between the tree species.

The online enrollment form displays all available tree options and participants select the trees from the available inventory. If a customer outside of the designated areas tried to apply, the enrollment form would inform them of their ineligibility. Similar to previous years, a total of over 200 trees were given away to eligible participants, thus surpassing the pilot participation goal of 200 trees.

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[47] https://bridgingthegap.org/ <<Accessed 3-17-2023>>

[48] The Evergy Green Team consists of "employees and retiree volunteers that take on environmental projects". Source: https://www.evergy.com/smart-energy/environmental-impact-link/green-team <<Accessed 4-5-2023>>

> *“We are getting the trees to the areas of highest need. We made big improvements in targeting the urban heat island of the city.” (Program Staff)*

*Program Marketing*

The marketing and outreach activities focused on specific zip codes located in the urban core. Common outreach activities in 2022 included social media posts, word-of-mouth, press releases and articles in environmental publications.

*Communication*

Evergy and its partners have developed an effective communication strategy during the past three years. The team has established a regular meeting schedule which includes meeting virtually five to six times before each event. The team also communicates more frequently via email and group chats.

*Quality Assurances and Controls (QA/QC)*

Given the unique nature of this program, it is critical to provide support and guidance to ensure that the program participants plant and nurture the trees correctly. Both program partners provide educational materials to the participants when they receive their trees. This information supplements the guidance provided on the program website regarding the care of these trees.

However, the program partners do not monitor the trees’ progress after they have been delivered. This means that if a tree dies, it will not be replaced during this event period; there is no excess inventory of available trees.

The program implementation team discuss ways to follow-up with customers after receiving their trees but they have not yet implemented these recommendations.

*Program Database*

Program data is uploaded to the Arbor Day Foundation’s portal. This portal tracks orders and monitors the tree inventory. It also provides information on identifying where the trees should be delivered and creates maps to assist the Green Team in delivering trees via the driveway drop-off. According to the program staff and partners, the database is valuable and practical.

*Areas for Program Improvement*

The program partners also suggested several strategies to increase the trees’ overall planting and survival rate. These recommendations included:

- Automating the data reporting
- Conduct follow-ups to determine each delivered tree’s status, including where the trees are planted and how many trees have survived during the past two years.

- Send out seasonal emails on the subject of a “cadence of tree care” that provide seasonal information on how to best take care of the new tree.
- Continue to ensure that the trees are going to the highest need areas where canopy might be the lowest.

### *Participant Survey*

To assess the EST Program, the evaluation team gathered insights regarding the energy efficiency made by Evergy customers through a survey platform during 2022.

The team sent over 100 individual survey links to project participants in one wave. One reminder was sent a week before the survey was closed. For completing the survey and providing their feedback, participants received a monetary incentive of $5. The response metrics can be seen in Table K-18

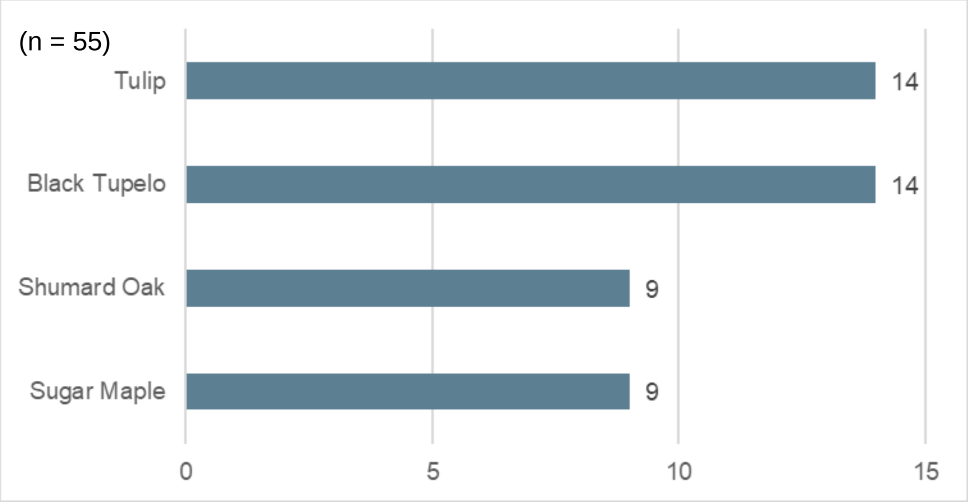
*Table K-18: Summary of Email Survey Response*

| Metric | Result |
|---|---|
| Initially Contacted | 111 |
| Undeliverable | 0 |
| Completed | 35 |
| Response rate | 32% |

#### *Overview of Pilot Program Participation*

Most of the participants have received up to two trees through the pilot program; however, not all of the trees received were planted. See Figure K-2 for more details on the types of trees planted.

*Figure K-2: Types of Trees Planted by Survey Participants*



**n is the number of trees total received*

### *Reasons for Not Planting Trees*

The participants provided the following reasons for not planting the trees:

> *"It died before I could plant it. I'm very upset about that!"*
>
> *"Too big, not enough space in the yard, but my neighbor planted it."*
>
> *"We gave the Shumard to [our] neighbor because it was going to be too big for our yard."*
>
> *"It was the wrong tree."*

### *Experience with Pilot Program*

Of the participants who remember getting the trees from the pilot program (n = 35), 86percent (n = 30) planted all of the trees, six percent (n = 2) planted some of the trees, two respondents did not plant any of the trees and one respondent could not recall.

Participants provided information about the health of their tree(s). Most stated that their tree(s) were healthy and growing (63 percent), leafy with little growth (16 percent), or that their tree(s) had died (13 percent). Other participants had a combination of statuses (see Table K-19).

*Table K-19: Health Status of Tree(s)*

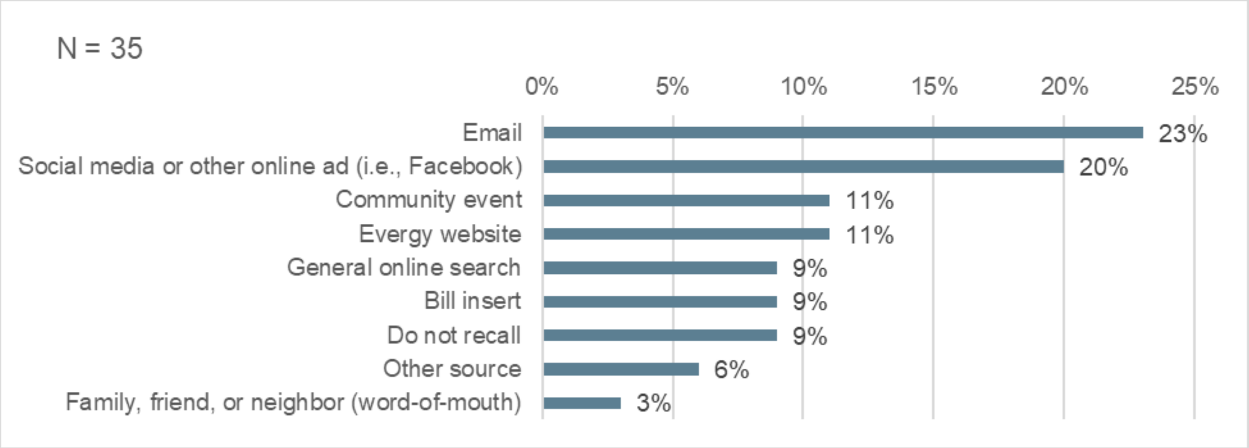
| Tree Status | Count of Respondents (n = 32) | Percent of Responses |
|---|---|---|
| Healthy and growing | 20 | 63% |
| Leafy but little growth | 5 | 16% |
| The tree died | 4 | 13% |
| Other | 3 | 9% |

A few participants complained about the quality of the trees as the following comments show:

> *"The pine looked good and the poplar was bare."*
>
> *"Buds, but no leaves. Really received two trees that were not more than a twig."*
>
> *"One tree was good, the other died."*

Figure K-3 shows how survey participants became aware of the project. Over half of the participants learned about the program through email and social media/online ads (53 percent combined). Other sources of information included receiving texts and learning about the program through newsletters.

*Figure K-3: Program Awareness*



Almost three-quarters (78 percent) of the respondents said the trees met their expectations while 19 percent (n = 6) said the trees did not. One respondent could not recall, and 3 respondents left this question blank. The reasons that trees did not meet participant expectations are listed below. Most reasons centered around the size of the trees when first received.

> *"I thought they would be bigger."*
>
> *"The tree was near dead when I received it. I did my best to keep it alive."*
>
> *"I was hoping it would have been taller."*
>
> *"I thought they would be a little larger."*
>
> *"The tree died in the first month."*
>
> *"Received two twigs, 6 inches tall."*

Table K-20 highlights the areas of the program that the survey respondents found the most or least helpful. Most survey respondents viewed the iTree program as "Extremely helpful" in providing ways to avoid overhead (57 percent) or underground (49 percent) utility lines. However, the participants rated the highest helpfulness scores to the information about the benefits that the trees provide (59 percent rating it as "Extremely Helpful").

*Table K-20: Participant Assessment of System Support*

| Helpfulness of System | 1- Not at all Helpful | 2 | 3 | 4 | 5- Extremely helpful |
|---|---|---|---|---|---|
| Avoiding overhead utility lines (n = 33) | 3% | 3% | 14% | 17% | 57% |
| Avoiding underground utility lines (n = 32) | 9% | 6% | 14% | 14% | 49% |
| Planting in a location that reduces energy consumption (n = 32) | 0% | 3% | 17% | 20% | 51% |
| Learning about the benefits that trees provide (n = 32) | 0% | 0% | 12% | 24% | 59% |

Most participants (88 percent) planted the trees within one week of receiving it. However, rate of caring for the trees declined as time went on. For example, only 55 percent mulched the tree’s root zone while 67 percent reported watering the trees regularly (see Table K-21).

*Table K-21: Participants’ Tree Planting Experience*

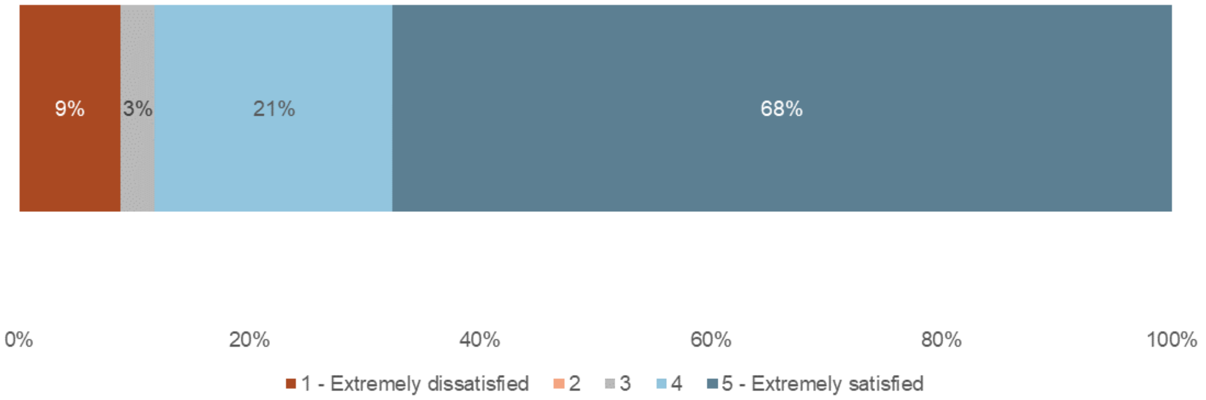
| Response | Count of Respondents (n = 71) | Percent of Responses |
|---|---|---|
| I planted my tree(s) within a week of receiving it | 29 | 88% |
| I mulched my tree’s root zone | 18 | 55% |
| I watered my tree(s) regularly | 22 | 67% |
| I didn’t plant my tree(s) | 1 | 3% |
| I don’t know | 1 | 3% |

*Note: Percentages may exceed 100% due to respondents being able to select more than one response.*

### *Satisfaction with Program*

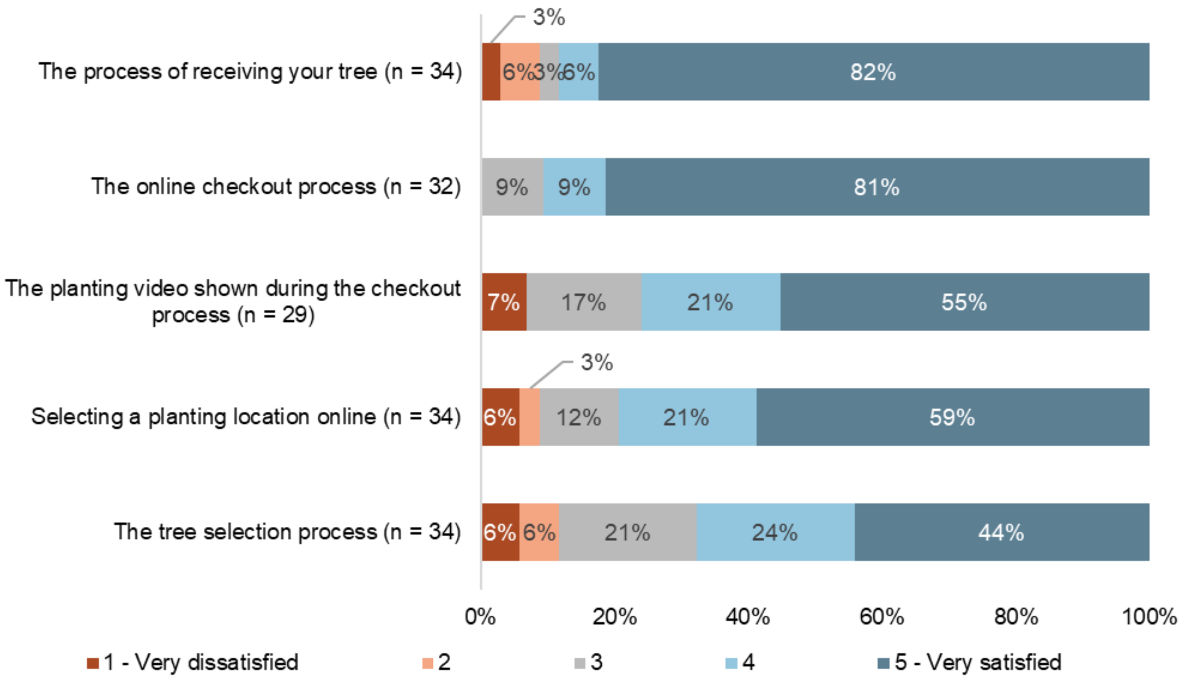
Overall, approximately two-thirds (68 percent) of the survey respondents stated they were extremely satisfied with the program overall (see Figure K-4). An additional 21 percent stated they were very satisfied (a ranking of four on the five-point scale).

*Figure K-4: Overall Satisfaction with the Program*



Furthermore, the aspects survey respondents were most satisfied with in the program were the process of receiving the tree (82 percent), the online checkout process (81 percent), and selecting the planting location online (59 percent). See Figure K-5 for more details. Worth noting, 17 percent of the survey respondents did not know about the planting video shown during the checkout process.

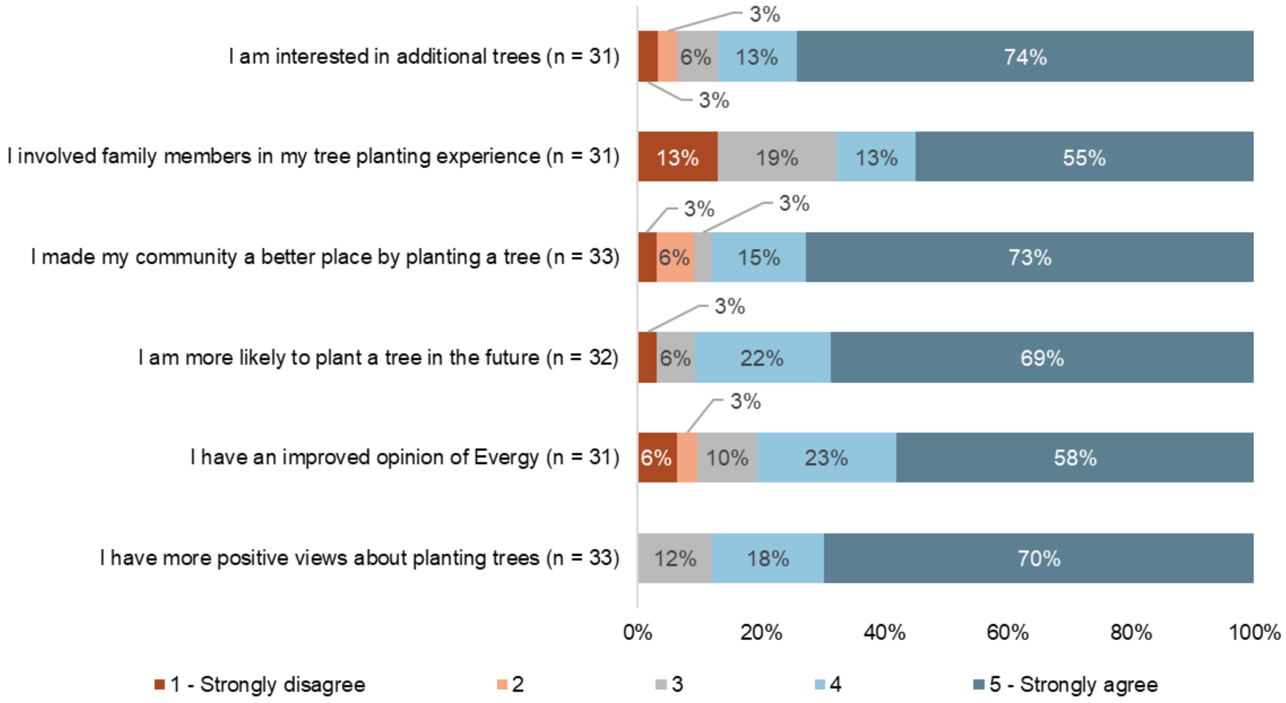
*Figure K-5: Satisfaction with Other Aspects of Program*



### *Future Participation*

Respondents expressed they are more likely to plant a tree in the future after participating in this project (69 percent). Survey participants also shared that the program made their community better by planting a tree (73 percent), are interested in planting additional trees (74 percent) in the future and have a more positive view on planting trees (70 percent). See Figure K-6 for more details.

*Figure K-6: Positive Perceptions after Participating in Program*



Of note, 80 percent of the respondents were “Extremely Likely” to recommend the program to others. Many participants reported that they would recommend this program to others in their community and appreciated the opportunity to improve the tree canopy in the urban center. Some positive responses include:

> *“It’s great to receive a plant that can positively contribute to the environment and that can help keep energy costs down!”*
>
> *“I learned a lot about selecting and planting a tree. Things that I did not have a clue about but believe people can benefit from this information.”*
>
> *“Very easy process and beneficial to my community.”*

A few participants would not recommend the program due to some miscues in execution, such as dropping off the wrong tree, or running out of certain tree types.

*Demographics*

According to survey respondents, 43 percent of homes were built before 1960, and natural gas is the primary source of the fuel type used in the homes. A large majority (89 percent) report owning their home, a single-family, detached unit (see Table K-22). Seventy-two percent also reported their homes were just under 3,000 square feet. Regarding socio-economic factors, most survey respondents have a degree in higher education (74 percent) and earn $50,000 or more (57 percent).

*Table K-22: Respondent Home Characteristics*

| Responses | Percent of Respondents |
|---|---|
| **Home Ownership** | |
| Own | 89% |
| Rent | 9% |
| Prefer not to answer | 3% |
| **Home Type** | |
| Single-family home | 97% |
| Duplex or townhome | 0% |
| Prefer not to answer | 3% |
| **Home Size (Square Feet)** | |
| Less than 1,000 square feet | 9% |
| 1,000-1,999 square feet | 49% |
| 2,000-2,999 square feet | 14% |
| 3,000-3,999 square feet | 9% |
| 4,000-4,999 square feet | 0% |
| 5,000 or greater square feet | 9% |
| Not sure | 9% |
| Prefer not to answer | 3% |

| Responses | Percent of Respondents |
|---|---|
| **Year Home Was Built** | |
| Before 1960 | 43% |
| 1960 to 1969 | 17% |
| 1970 to 1979 | 9% |
| 1980 to 1989 | 9% |
| 1990 to 1999 | 0% |
| 2000 to 2009 | 6% |
| 2010 to 2019 | 6% |
| 2020 or newer | 3% |
| Not sure | 6% |
| Prefer not to answer | 3% |
| **Primary Fuel Type** | |
| Natural Gas | 63% |
| Electricity | 34% |
| Propane | 0% |
| Solar | 0% |
| Not sure | 3% |
| Prefer not to answer | 0% |

*Table K-23: Respondent Characteristics of Household*

| Responses | Percent of Respondents |
|---|---|
| **Household Income** | |
| Less than $10,000 | 3% |
| $10,000 to less than $20,000 | 6% |
| $20,000 to less than $30,000 | 3% |
| $30,000 to less than $40,000 | 3% |
| $40,000 to less than $50,000 | 6% |
| $50,000 to less than $75,000 | 23% |
| $75,000 to less than $100,000 | 11% |
| $100,000 to less than $150,000 | 6% |
| $150,000 to less than $200,000 | 11% |
| $200,000 or more | 6% |
| Not sure | 0% |
| Prefer not to answer | 23% |
| **Highest Level of Education** | |
| High school graduate or GED equivalent | 6% |
| Some college | 17% |
| Associate degree | 3% |
| Bachelor’s degree | 31% |
| Master’s degree | 34% |
| Professional degree (MD, JD, DDS, DDO) | 6% |
| Prefer not to answer | 3% |

### K.4.7 Conclusions and Recommendations

The evaluation team at ADM performed a process evaluation that assessed program documentation and primary data collected from program stakeholders and program participants.

The following summarizes the key findings of the process evaluation of the EST Program:

- Evergy has developed an effective collaborative working relationship with its program partners: The Arbor Day Foundation and Bridging the Gap. As the pilot enters its fifth year, the program implementation team worked effectively and throughout the year.
- Nearly all participants (93 percent) reported planting the trees, and 81 percent reported that their trees were alive and thriving.

- The email (23 percent) and social media outreach (20 percent) appeared to be the most effective market tactic, as it was mentioned as the primary source of awareness by the respondents.
- Overall, the participants were most satisfied with the enrollment process of the program (88 percent) and the online checkout system (75 percent).
- The Energy-Saving Trees project led to positive improvements regarding participants' opinions on both planting trees (83 percent) and having a more positive attitude about planting trees in the future (83 percent). Of note, 83 percent said they would plant more trees in the future.
- Most participants were middle-income homeowners living in the urban core (i.e., 23 percent earned $50,000 - $75,000; 89 percent were homeowners). Only 9percent of the program participants earned less than $20,000 annually.

These findings led to the following recommendations on ways to continue to improve the EST Program:

- **Send follow-up emails to monitor the tree delivery and follow-up care to ensure that all trees remain healthy and are planted promptly.**
- **Continue to offer driveway drop-offs to ensure that the trees are delivered to the program participants.**
- **Explore strategies to increase program participation among low and moderate-income residents in these urban areas.** This may include reaching out to landlords to increase participation among low-income renters.
- **Conduct additional surveying efforts to better understand where participants are planting their trees.** This may include additional questions to obtain the quantitative data needed for the correct adjustments to be made.

## K.5 Market-Rate Multi-Family

### K.5.1 Program Overview

Evergy's Market-Rate Multi-Family (MRMF) Program provides rebates for energy-efficient equipment to market-rate multi-family residences.

The goal of the program is to increase the number of energy-efficient equipment in multi-family residences. To accomplish this goal, the program has two different avenues: standard rebates and mailed kits.

The standard rebates program offers rebates for various appliances and heating and cooling equipment ranging from $50 to $700. The kits program provides a kit with LED bulbs, efficient-flow kitchen and bathroom faucet aerators, efficient-flow showerheads and advanced power strips for ten dollars.

PY3 performance metrics for the MRMF Program are summarized in Table K-24.

*Table K-24: Performance Metrics – Market Rate Multifamily Pilot Program*

| Metric | PY3 Total | MO West | MO Metro |
|---|---|---|---|
| Number of Rebates & Kits | 1,776 | 837 | 939 |
| ***Energy Impacts (kWh)*** | | | |
| Targeted Energy Savings | - | - | - |
| Reported Energy Savings | 1,812,403 | 822,163 | 990,241 |
| Gross Verified Energy Savings | 1,046,525 | 461,878 | 584,647 |
| Net Verified Energy Savings | 1,046,525 | 461,878 | 584,647 |
| ***Peak Demand Impacts (kW)*** | | | |
| Targeted Peak Demand Savings | - | - | - |
| Reported Peak Demand Savings | 196.90 | 86.99 | 109.91 |
| Gross Verified Peak Demand Savings | 131.38 | 55.99 | 75.39 |
| Net Verified Peak Demand Savings | 131.38 | 55.99 | 75.39 |
| ***Benefit / Cost Ratios*** | | | |
| Total Resource Cost Test Ratio | - | - | - |

### K.5.2 Gross Impact Methodology

This subsection summarizes the methods used to verify measure savings and calculate gross energy savings for the MRMF Program.

For the PY3 standard rebates evaluation, ADM used the program data provided by Evergy, containing the measure type, capacity, and additional information. This was supplemented with additional information from ICF, specifically the heating system fuel type for each application.

The calculation of gross energy savings and demand reduction relied on energy savings values and algorithms from the Evergy TRM. The program tracking data was used as inputs to the savings algorithms as outlined in the Evergy TRM.

For two measures in the MRMF kits: Wi-Fi Connected LEDs and Smart Plugs, the savings were not defined in the 2022 Evergy TRM. Therefore, the Wi-Fi Connected LED savings were calculated with the newest version of the IL TRM (v11), as this is the first instance of the measure being included in the IL TRM. See "Connected LED Lightbulbs" in Appendix M for the savings calculations used for these two measures. The smart plug savings come from the phantom load reduction as well as lighting hours reduction. Smart plugs have a phantom load of their own, which likely cancels out the benefits. The lighting hours reductions only work if a lamp is plugged in. Thus, an estimation based on the kWh savings and the kW demand reduction of a smart bulb (using the IL TRM) offered in the same kit as the smart plug was used. It was assumed that smart plugs would have 50 percent of the smart bulb savings.

The gross energy savings and demand reduction algorithms are outlined in Appendix M.

### K.5.3 Gross Impact Findings

Table K-25 below summarizes the verified gross energy and demand savings for the MRMF Program. The overall realization rates for energy savings and demand reduction were 58 percent and 67 percent. Detailed descriptions of the difference in savings calculations are in the measure level findings below.

*Table K-25: Program Measure Level Gross Energy Savings (kWh) and Peak Demand Reduction (kW)*

| Measure | | Qty | Reported | | Verified | | Realization Rate | |
|---|---|---|---|---|---|---|---|---|
| | | | kWh | kW | kWh | kW | RR (kWh) | RR (kW) |
| MO West | Air Conditioner | - | - | - | - | - | - | - |
| | Heat Pumps | - | - | - | - | - | - | - |
| | Kits | 837 | 822,163 | 86.99 | 461,878 | 55.99 | 56% | 64% |
| | **Sub Total** | **837** | **822,163** | **86.99** | **461,878** | **55.99** | **56%** | **64%** |
| MO Metro | Air Conditioner | 2 | 1,857 | 2.06 | 2,218 | 2.00 | 119% | 97% |
| | Heat Pumps | 12 | 79,781 | 11.71 | 71,990 | 11.51 | 90% | 98% |
| | Kits | 925 | 908,603 | 96.14 | 510,439 | 61.88 | 56% | 64% |
| | **Sub Total** | **939** | **990,241** | **109.91** | **584,647** | **75.39** | **59%** | **69%** |
| **Total** | | **1,776** | **1,812,403** | **196.90** | **1,046,525** | **131.38** | **58%** | **67%** |

For each measure in the program, total gross energy savings and peak demand reduction were determined as a product of the number of measures installed as part of the program and the gross savings per measure. A description of the verified gross findings for each measure type is included below.

**Air Conditioner:** The energy savings for air conditioners have a realization rate of 119 percent and the peak demand reduction had a realization rate of 97 percent. The difference in kWh savings and kW demand reduction between the reported savings calculations and the verified savings calculations is a result of the reported savings calculations using the TRM default value for savings and adjusting for the capacity. For example, as the capacity for the projects in this measure were double the TRM default of 12,000 BTU/hr, the reported savings multiplies the TRM savings by two. However, other values should be adjusted based on the specific unit installed, such as the SEER value. The reported savings uses the average SEER value of equipment installed in portfolio. The verified savings calculations use the capacity and SEER value as reported in the tracking data as well as adjusts other variables dependent on these variables such as the SEER_adj, the adjustment percentage to account for in-situ performance of the unit and the EER for the efficient unit.

**Heat Pumps:** The energy savings for heat pumps have a realization rate of 90 percent and the peak demand reduction had a realization rate of 98 percent. The difference in kWh savings and kW demand reduction between the reported savings calculations and the verified savings calculations is a result of the Heat Pump SEER 16 - Replace Failed Electric Resistance Heat calculations. As this measure is labeled a replacement for a failed system, the time of sale HSPF (8.2) was used for the calculations. In the tracking data, one of the two projects in this specific sub-measure used the early replacement HSPF (3.41). This leads to a line item energy realization rate of 9 percent. The other project in this sub-measure appears to use the correct HSPF as the realization rate for energy is 99 percent. Additional differences in reported and verified savings in the heat pumps measure is from the reported savings adjusting the overall unit savings in the Evergy TRM by the capacity, without adjusting the SEER values and the variables dependent on the SEER such as SEER_adj and EER.

**Kits:** The energy savings for kits have a realization rate of 56 percent and the peak demand reduction had a realization rate of 64 percent. The difference in kWh savings and kW demand reduction between the reported savings calculations and the verified savings calculations is a result of the in-service rates (ISRs) utilized in the verified savings calculations and the assumed proportion of water heating supplied by electric resistance heating. The proportion of electric Domestic Hot Water (DHW) was assumed to be 16 percent following the IL TRM for unknown fuel type.

Table K-26 summarizes the ISRs for each of the kit components and the source of the ISRs. The ISRs are pulled from the Evergy TRM for IEMF Kits. This follows the EM&V Plan for Products & Services Incubator (R&P) where it was stated that “To the extent possible, we will leverage the impact evaluation activities from Evergy’s existing Income-Eligible Multi-Family and Business Energy Program Savings." The reported savings do not incorporate an ISR into the calculations.

*Table K-26: ISR Values for MRMF Kit Components*

| Measure | ISR | Source |
|---|---|---|
| A19 60W LED | 94.5% | Evergy TRM ISR for IEMF Kit Screw In – LEDs (In-Unit) |
| 60W Equivalent Wi-Fi Connected A19 LED | 94.5% | Evergy TRM ISR for IEMF Kit Screw In – LEDs (In-Unit) |
| Smart Plug | 94.5% | Evergy TRM ISR for IEMF Kit Screw In – LEDs (In-Unit) |
| Tier 1 Advanced Power Strip | 40% | IL TRM ISR for Multifamily Energy Efficiency Kit, Leave behind[49] |
| Low Flow Showerhead (1.5 GPM) | 95% | Evergy TRM ISR for IEMF Kit Low Flow Showerhead |

### K.5.4 Net Savings Evaluation Findings

For PY3, ADM applied a designated NTG value of 1.0. The designation as pilot program and the small overall size of the MRMF Program did not justify the development of a net-to-gross ratio for this program.

### K.5.5 Impact Evaluation – Final Savings Tables

Based on the impact evaluation results, the total verified gross energy savings for the Market-Rate Multi-Family Program are 1,046,525 kWh and 131 kW. Table K-27 below summarizes the verified gross energy and demand savings and Table K-28 summarizes the verified net impacts for the MRMF Program.

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[49] No ISR was listed in the Evergy TRM for this measure.

*Table K-27: Program Jurisdiction Level Gross Energy Savings (kWh) and Peak Demand Reduction (kW)*

| Jurisdiction | Reported Energy Savings (kWh) | Reported Demand Reduction (kW) | Gross Verified Energy Savings (kWh) | Gross Verified Demand Reduction (kW) | RR (kWh)$_h$ | RR (kW) |
|---|---|---|---|---|---|---|
| MO West | 822,163 | 86.99 | 461,878 | 55.99 | 56% | 64% |
| MO Metro | 990,241 | 109.91 | 584,647 | 75.39 | 59% | 69% |
| **Total** | **1,812,403** | **196.90** | **1,046,525** | **131.38** | **58%** | **67%** |

*Table K-28: Verified Gross and Net Annual Energy Savings (kWh)*

| Jurisdiction | Free Ridership | NTG (kWh) | Gross Verified Energy Savings (kWh) | Net Energy Savings (kWh) |
|---|---|---|---|---|
| MO West | 0% | 100% | 461,878 | 461,878 |
| MO Metro | 0% | 100% | 584,647 | 584,647 |
| **Total** | **0%** | **100%** | **1,046,525** | **1,046,525** |

### K.5.6 Process Evaluation

This section summarizes the findings from the process evaluation for the MRMF Program. This section outlines the findings from in-depth interviews with Evergy and implementation staff.

*Program Design*

Evergy launched the MRMF Program in the third quarter of 2021. The primary objective of this program was to help close “the gap” between customers not currently being served by existing Evergy MEEIA programs. Specifically, this program targets Market Rate Multifamily buildings, defined as four units or more, in Evergy’s service territory, and who fall above the income eligible guidelines.

Currently, Evergy’s MRMF customers are constrained in what programs they are eligible to participate in. These customers cannot participate in the current multifamily program as it only targets income-eligible customers, which means that customers living in “market rate” buildings are not eligible. These customers are not able to participate in the HCHC Program because of the limit on the number of units allowed (no more than four). Additionally, the MRMF buildings have a residential meter, disqualifying them from participating in any existing Evergy business programs as those require a commercial meter.

### *Roles and Responsibilities*

An Evergy staff member directs the MRMF program while the implementation staff from ICF manages program implementation and daily operations. Overall, the Evergy project manager ensures that the pilot project's accomplishments align with its overall goals. During the fourth quarter of PY3, the ICF program manager of the Products & Services Incubator programs left. During this interim period, the program was managed by a senior ICF staff member. ICF will bring in a new program manager in 2023.

### *Program Performance*

The MRMF Program had a planned participation goal of enrolling 10 to 20 properties in 2022, depending on the size and total number of units in the property. Only 13 rebate applications were received overall, despite several attempts to recalibrate the pilot to engage more participants. More concerning, however, was that all program participants were condominium owners, and not renters, which was the initial focus of this pilot.

> *"We did not have any multifamily participants." (Program Staff)*

To increase overall participation, the program implementer tried several additional strategies to engage property managers and owners. First, the implementation team expanded program participation to trade allies who work in both single-family and multi-family residences rather than restricting it to trade allies working only in multifamily buildings. This strategy expanded the pool of eligible residences by working with the HCHC program and removing the four-unit limit. This allowed for trade allies to submit the rebates for their customers. The pilot also used the same rebate application portal as the HCHC program to submit rebate applications.

> *"The pivot strategy to use the existing online rebate tool opened up (eligibility) for trade allies to use the existing online intake tool." (Program Staff)*

The program implementation team also incorporated a second pivot strategy, offering energy efficiency kits, as another way to bolster awareness of the pilot program. This strategy was very similar to what was being done in the Income Eligible Multi-Family program, except in the MRMF the kits were offered with a fee. Initially, the implementation staff reached out to the property managers to encourage them to pay $20.00 per tenant unit to receive the installation kit. However, the property managers wanted the tenants to pay for the kits directly.

As a compromise, the program implementation staff offered residents a $10.00 "holiday-themed kit" that included LED lighting, smart bulbs, smart plugs, an advanced power strip and a low-flow showerhead.

The program staff estimates that there will be a total of 1,700 kits delivered to MRMF participants by the end of the program year: 1,000 in Missouri West and 700 in Missouri Metro.

The kits are processed within a few days after enrollment online by the kit subcontractor, Techniart.

While facing many challenges in recruiting participants, the program was successful at adapting and learning.

> *"We actually ended up running three pilots in one multifamily program design and saw how they failed and recognize that quickly, got a lot of input on how we would again commercialize a multifamily program in this market." (Program Staff)*

Additionally, removing the limitation on the number of units and allowing trade allies to submit the rebate applications for their customers was "a great success."

The program will end at the end of 2022; however, the intent is to incorporate the pivot strategy of allowing trade allies to submit rebates for properties that have more than 4 units to HCHC.

### *Program Marketing*

The program implementer tried multiple strategies throughout the pilot to engage property managers and residents. The initial approach was at the property level with an online application for customers to fill out. However, direct outreach to property managers could have been more successful. The most successful approach has been to offer the energy savings kits directly to the building residents via postcards and email.

### *Pandemic Effects*

The ongoing uncertainty associated with the pandemic hurt this pilot's operations. Specifically, funding, staff turnovers and the eviction moratoriums preoccupied property managers who were more concerned about running their properties successfully than concerns about energy efficiency.

### *Communication*

The utility and program implementation staff communicated weekly regarding the program status, changes in program outreach and strategies. All parties indicated they received the communication they needed to manage and supervise this pilot properly.

### *Data Tracking and Quality Assurances and Controls (QA/QC)*

There were no reported issues with either data tracking or QA/QC for this program.

The program database aligns with Evergy's HCHC program for rebate processing as the same interface is used to collect the rebate information. Techniarts' program database captures the kit information.

Additionally, the rebate application process follows the same QA/QC process as the HCHC program. Techniarts uses a tracking number to verify the delivery of the energy efficiency kits.

*Challenges for Program*

This program pilot faced numerous barriers, including:

- Property managers did not see any value in program participation in the “split incentive,” in which the building occupants pay for their utilities directly.
- Energy efficiency is not “top of mind.” Many of the targeted buildings had already made energy efficiency improvements previously, so their units were ineligible to participate in this pilot. Other property managers were not interested in learning more about energy efficiency opportunities, as they were focused on more pressing issues, such as eviction moratoriums.

MRMF buildings face the same obstacles as traditional income-eligible buildings. These improvements often require an extended timeframe, and there is limited ‘buy-in” from property managers.

### K.5.7 Conclusions and Recommendations

The evaluation team at ADM performed a process evaluation that assessed program documentation and primary data collected from program stakeholders. The evaluation included in-depth interviews with utility and program implementation staff.

The following summarizes the key findings of the process evaluation of the MRMF Program:

- Despite deploying multiple program strategies throughout the year, the MRMF Program did not meet its participation goals.
    - By expanding the pool of eligible trade allies to include those participating in single-family homes, the program processed 13 rebates, primarily for HVAC units.
    - Property managers were not interested in participating in the program and instead wanted the individual building residents to engage in the program directly.
    - A total of 1,700 energy savings kits will be delivered to residents in MRMF buildings.
- Although this pilot did not reach its participation and savings goal, it did provide insights into the challenges of serving the MRMF market throughout Evergy’s service territory.

The following recommendations are offered for continued improvement of the MRMF Program:

- **Evergy should consider removing the current MEEIA restrictions of buildings with four or more units to open up this program to a broader pool of building professionals.** This includes those who typically specialize in single-family residences.
- **The program should continue to reach out to property owners rather than property managers, as they are the decision-makers.**

## K.6 Power Check

### K.6.1 Program Overview

The Power Check Program partners with local libraries to provide a P3 “Kill A Watt” electricity usage monitor that allows library patrons to understand the energy costs of running various plug-load appliances.

### K.6.2 Gross Impact Findings

As this program does not claim saving, no impact analysis was completed.

### K.6.3 Process Evaluation

This section summarizes the results from the process evaluation of Evergy’s Power Check Pilot Program based on feedback from interviews with the Evergy program staff and third-party implementer, as well as reviewing available program materials.

*Program Design*

Evergy partnered with Kansas City and Mid-Continent Public Libraries to provide a total of 60 meters spread across Evergy’s entire service territory. Specifically, Evergy provided 30 devices to the local branch libraries in Kansas City and 30 to the branches served by the Mid-Continent Public Library in the Missouri West’s service area. Customers can check out these power meters for an average of one to two weeks and analyze the energy usage in their homes.

The program was launched in April 2022 to align with Earth Day.

*Program Operations*

According to librarian staff, searching the Kansas City Library catalog for “energy” returns over 1,200 resources, with the meter in the top twenty results. When “energy efficiency” is search, 60 resources are found, with the meter in the top 25 results.

Once checked out, the packaging for the meter included instructions on how to use the meter, as well as links to energy and energy efficiency information. The energy and energy efficiency information was also provided to the branch staff and added to the Kansas City Library page.

Program staff reported that the pilot was on track to meet its original goal. Throughout the program year, the implementation staff frequently engaged with the public library branches through community events and hosting tables at the branches to promote all of Evergy's residential programs. The implementation staff also meets with the libraries weekly to verify that devices are working, and the branded boxes are in good shape, and the libraries have "everything they need."

> *"We had a lot of community events…especially at branches in low-income areas in the Kansas City area. We wanted to come out to the community and engage with a different type of customer." (Program Staff)*

### *Participation Goals*

The goal was to have 300 customers check out these power meters across Evergy's service territory. As of the end of October, there were 202 checkouts across both Kansas City and Mid-Continent Public Libraries.

### *Roles and Responsibilities*

The program is implemented by ICF and managed by an Evergy staff member. During the fourth quarter of PY3, the ICF program manager of the Products & Services Incubator Programs left. During this interim period, the program was managed by a senior ICF staff member. ICF will bring in a new program manager in 2023.

### *Program Operations*

As of August 2022, the program recorded 202 customer check outs. However, the program has been more popular in the Missouri West jurisdiction as its library partner, Mid-Continent, promoted the program internally to its patrons.

> *"The Kansas City area is struggling more (in participation) as there is not a dedicated marketing internal staff to promote the power check device." (Program Staff)*

The program targets "anybody who has a public library card" but typically single-family residential homeowners rent the devices.

### *Participation*

The Kansas City library staff provided additional information on program participation in their branches. Thirty-seven library patrons checked out the devices at seven of the ten branch locations. Of the 37 checkouts, twenty-one “were held and transported to a branch for checkout, suggesting catalog discovery.”

### *Program Enrollment Process*

Each library has its own policy regarding the time a customer may check out the power check device, for example, Mid-Continent Public Library states on their website the device can be checked out for seven days and if there are no holds, two renewals are allowed.

The devices are assigned to home branches, including low-income locations. This allows for immediate check out for anyone a library card. Moreover, depending on customer demand, or customer holds placed online, the devices are transferred to different library branches. Feedback from the Kansas City Public Library suggests that:

> *“Devices could be shelved at every branch in fewer numbers, instead of focusing on only a few locations. If a device is checked out at one location, it could be held and transported from another location.” (Library Staff)*

Each library system promoted the program through various ways to its patrons, including newsletters, direct emails, blogs, and the website.

The Mid-Continent Library System also posted about the power check devices on their blog, including a Q & A about energy efficiency. Of note, the Kansas City Library System did not have a dedicated internal marketing staff resource, so they did not promote the program as aggressively as the Mid-Continent Library System.

The program implementer provided each branch with materials that the librarians could place near desks, computer stations as well as digital ads on the TV monitors within the branches.

### *Future Plans*

Kansas City Library staff had the following suggestions for how the program might be improved:

> *“Couple the program with additional technology to boost awareness about energy and energy efficiency. For example, patrons expressed interest in a simple InfraRed camara for thermal and air bypass, among other monitors for Temperature, Relative Humidity, $CO_2$, to help with building performance learning.” (Library Staff)*

Mid-Continent Public Library staff suggested more devices to account for the size of their library system, as well as:

> *“More consistent promotion on Evergy’s end. We saw a spike in checkouts and holds at the beginning when the pilot was heavily promoted. Customer interest dropped off after the initial press push.” (Library Staff)*
>
> *“It would have been helpful to have a more direct connection to Evergy for expediency in some areas of the project.” (Library Staff)*

Evergy is still determining if this pilot can continue, given that its focus is on education rather than energy savings. As the devices have already been purchased and the program is low cost, it could be easily continued. The staff is investigating “additional strategies for promoting the device.”

### K.6.4 Conclusions and Recommendations

The evaluation team at ADM performed a process evaluation that assessed program documentation and primary data collected from program stakeholders. The evaluation included in-depth interviews with utility and program implementation staff.

The following summarizes the key findings of the process evaluation of the Power Check Program:

- By the end of October, there were 202 checkouts across both Kansas City and Mid-Continent Public Libraries, getting close to the goal of 300 checkouts by the end of the year.
- The participation in the power check program is influenced by outreach programs and promotional efforts by Evergy and the library staff.

The following recommendations are offered for continued improvement of the Power Check Program:

- **The program should be continued next year as the devices have been paid for and the program has a low operating cost.**
- **Evergy should continue to promote the program and have more community outreach events to increase the number of participants.**
- **The program could be expanded to be an energy observation kit that could include the power check device as well as other tools such as those suggested by the library staff.** This could include InfraRed camera, or monitoring devices for temperature, humidity, etc.

## K.7 Virtual Energy Management for Small Business

### K.7.1 Program Overview

The Virtual Energy Management for Small Business (VEM-SmB) Program offers a subscription-based energy management platform from a third-party implementer, Grid-Point, which allows users to control HVAC equipment through installations of Smart Thermostats, Smart Building Controllers, and/or Zone or Lighting Controls. The goal of this pilot program is to engage the small business market and help them automate their energy and facility management and improve their energy efficiency.[50]

### K.7.2 Gross Impact Findings

As this program had only one regional chain with six locations participation, an impact evaluation was not completed.

### K.7.3 Process Evaluation

This section summarizes the results from the process evaluation of Evergy's VEM-SmB Program based on feedback from interviews with Evergy program staff and third-party implementers.

*Program Operations*

Program staff reported that the partnership with Grid-Point has been working well.

The program was promoted primarily through door-to-door in-person engagement, which "has been working well."

Modifying the program incentives resulted in an "uptick in interest" among small business customers. A regional chain with six locations has enrolled in the pilot, and the implementation staff is pursuing other "warm leads."

Although the program initially targeted small mom-and-pop retail locations, the staff indicated that this pilot might be better suited to small regional chains.

> *"We are learning that this program might not be a good fit for smaller mom-and-pop operations (who weren't using a lot of energy) but is better suited for businesses with multiple locations." (Program Staff)*

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[50] Research and Pilot Program. Evergy. Available online: https://www.evergy.com/ways-to-save/programs-link/research-and-pilot-program

### Program Design

The objective of the VEM-SmB program is to engage the hard-to-reach small business market by offering a “lighter version” of a Strategic Energy Management (SEM) program. Evergy initially offered incentives to cover 70 percent of the 3-year subscription cost for the energy management software, offered by Grid-Point. Program participants also have access to the virtual smartphone and computer app to understand how equipment is performing.

Evergy’s incentive ranges from $1,750 to $4,000, depending upon the amount of HVAC equipment that will be controlled as part of this program.

#### *Participation Goals*

The original program aimed to recruit 30 small businesses in 2022. The program was launched in March 2022.

#### *Roles and Responsibilities*

The program is implemented by ICF and managed by an Evergy staff member. During the fourth quarter of PY3, the ICF program manager of the Products & Services Incubator programs left. During this interim period, the program was managed by a senior ICF staff member. ICF will bring in a new program manager in 2023.

#### *Program Challenges Design Changes*

The most significant barrier was the inability of customers to see a clear Return-on-Investment (ROI) for this program, which “made it harder for them to participate.” The COVID-19 pandemic was especially hard on smaller businesses, as they see the strains on the supply chain and struggles with staffing. This could be a contributing factor to the hesitation of paying the original 30 percent of the costs of participation in the program.

Because of this, Evergy increased the program incentive to comprehensively cover all the costs associated with the initial program enrollment and the monthly energy management subscription fee in September based on feedback from small business customers.

> *“The business owners were hesitant to participate because of the 30 percent out-of-pocket expenses” (Program Staff).*

Additionally, the program may be designed better for businesses that have more than three or more locations, as regional managers could see the different location’s energy usage and efficiency on the web application.

### *Program Enrollment Process*

As stated on Evergy's Research and Pilot website[51], there are two requirements to participate in the VEM-SmB program:

1. Be a Small Business in the Evergy Missouri service territory with five or fewer locations.
2. Attend at least one workshop offered by Evergy on optimizing the performance of energy systems in your business.

As mentioned in the previous section, door-to-door in person engagement has been the primary way of engaging participants. During the door-to-door outreach, the program staff conducts a walk-through assessment of a potential customer's business to identify opportunities to reduce HVAC usage. The staff also assesses the lighting situation and if there is a need for controls.

As the staff explained, Grid-Point has a data tool that gathers information about the current HVAC systems. The customer receives a proposal from Grid-Point to install and monitor the equipment and a program application from Evergy. The proposal provides details regarding the number of thermostats they will receive with the program, the total cost of program enrollment, which is now covered fully by Evergy, and Evergy's incentive amount.

Once the customer agrees to participate, Grid-Point installs the equipment, commissions the HVAC monitoring equipment, and notifies the account manager. Equipment includes an EC-2000 controller, TS-150 thermostats that allow for advanced control of the HVAC systems and replaces any existing thermostats at the locations, and optional zone sensor module(s) or lighting and plug controls. The program implementer, ICF, educates the customer on using Grid-Point's energy management app and how to monitor energy usage.

### *Program Tracking*

The program staff reported that Evergy's tracking system captures all necessary information. However, they noted that tracking was only in place once customer enrollments started in September 2022.

### *Future Plans*

Evergy plans to continue this pilot into 2023 to fully evaluate the energy savings from the participants for an entire year. The implementation staff also plans to focus more on the behavioral component of this pilot, emphasizing ways organizations can reduce usage through energy management in customer workshops planned for next year.

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[51] Research and Pilot Program. Evergy. Available online: https://www.evergy.com/ways-to-save/programs-link/research-and-pilot-program

### K.7.4 Conclusions and Recommendations

The evaluation team at ADM performed a process evaluation that assessed program documentation and primary data collected from program stakeholders. The evaluation included in-depth interviews with the Evergy program staff and the implementation team.

The following summarizes the key findings of the process evaluation of the VEM-SmB Program:

- With the COVID-19 impacts, strains on the supply chain and staffing issues, initial participation in the program was low. Participation improved when the incentives covered all of the program costs.

These findings led to the following recommendations on ways to continue to improve the VEM-SmB program:

- **Evergy should continue to cover all of the program costs to improve participation and target smaller, regional businesses with multiple locations instead of small mom-and-pop businesses with single locations.**

# Appendix L Survey Instruments

## L.1 Heating, Cooling, and Home Comfort - Participant Survey

Client: Evergy
Program: Heating, Cooling, and Home Comfort Program
Program Year: 2022
Group: Participants
Mode: Email

**PREDEFINED VARIABLES**

Prepopulated variables are shown in all caps enclosed in brackets, e.g., [PREDEFINED VARIABLE]

| Variable | Definition |
|---|---|
| EMAIL | Customer email |
| CUSTOMER NAME | Customer full name |
| JURISDICTION | 1 = Missouri Metro, 0 = Missouri West |
| DI KIT | 1 = measure installed, 0 = measure not installed |
| AIR SEALING | 1 = measure installed, 0 = measure not installed |
| CEILING/ATTIC INSULATION | 1 = measure installed, 0 = measure not installed |
| CENTRAL AC | 1 = measure installed, 0 = measure not installed |
| AS_HEATPUMP | 1 = measure installed, 0 = measure not installed |
| GS_HEATPUMP | 1 = measure installed, 0 = measure not installed |
| DUCTLESS MINI-SPLIT HEATPUMP | 1 = measure installed, 0 = measure not installed |

**EMAIL SURVEY MESSAGE**

**Subject:** Evergy Energy Efficiency Program Feedback

**Reply To:** survey2026@surveys.admenergy.com

**From Name:** Evergy

Dear [CUSTOMER NAME],

Thank you for participating in Evergy's Energy Efficiency Program. Our records indicate that you received a rebate/discount for purchasing and installing energy-efficient equipment/upgrades for your home and/or received an energy savings kit from Evergy. We are conducting a customer survey and would value your input. Your answers will be anonymous and confidential, and your feedback will help us improve the program. Upon completion of the entire survey, we will send you a **$5 electronic gift card** of your choice.

Click here to go to the survey

If you have questions or require technical assistance, please email us at survey2026@surveys.admenergy.com. If you wish to no longer receive emails about this survey, please click on the “Unsubscribe” link below. Thank you in advance for your time!

Kind Regards,
Katelan Scherer
ADM Associates / Program Evaluation Contractor to Evergy

## QUALIFICATION QUESTIONS

**[SHOW Q1 IF AIR SEALING OR CEILING/ATTIC INSULATION OR CENTRAL AC OR AS_HEATPUMP OR GS_HEATPUMP OR DUCTLESS MINI-SPLIT HEATPUMP = 1 AND DI KIT ≠ 0]**

1. According to program records, you participated in an Evergy program to receive a rebate/discount for purchasing energy efficient equipment/upgrades for your home in 2022. Were you involved in the decision to purchase the energy efficient equipment/upgrades?
    1. Yes
    2. No **[TERMINATE]**
    98. Do not recall **[TERMINATE]**

**[SHOW Q2 IF DI KIT = 1 AND AIR SEALING OR CEILING/ATTIC INSULATION OR CENTRAL AC OR AS_HEATPUMP OR GS_HEATPUMP OR DUCTLESS MINI-SPLIT HEATPUMP ≠ 0]**

2. According to program records, you participated in an Evergy program to receive an energy savings kit in 2022. Were you involved in the decision to receive the energy savings kit?
    1. Yes
    2. No **[TERMINATE]**
    98. Do not recall **[TERMINATE]**

**[SHOW Q3 IF AIR SEALING OR CEILING/ATTIC INSULATION OR CENTRAL AC OR AS_HEATPUMP OR GS_HEATPUMP OR DUCTLESS MINI-SPLIT HEATPUMP = 1 AND DI KIT = 1]**

3. According to program records, you participated in an Evergy program to receive a rebate/discount for purchasing energy efficient equipment/upgrades for your home and receive an energy savings kit in 2022. Were you involved in the decision to purchase the energy efficient equipment/upgrades and receive the energy savings kit?
    1. Yes
    2. No **[TERMINATE]**
    98. Do not recall **[TERMINATE]**

4. Did you have the following energy efficient equipment/upgrades installed in your home through Evergy's Energy Efficiency Program? [**INSERT OPTIONS DEFINED AS 1 = YES, 2 = NO, AND 98 = DO NOT RECALL]**
    1. **[SHOW IF DI KIT = 1]** Energy savings kit (can include LED lightbulbs, faucet aerators, low-flow shower heads, hot water pipe insulation, and smart power strips)
    2. **[SHOW IF AIR SEALING = 1]** Air sealing (sealing air leaks in the home, weather sealing)
    3. **[SHOW IF CEILING/ATTIC INSULATION = 1]** Attic/ceiling insulation
    4. **[SHOW IF CENTRAL AC = 1]** Central air conditioner
    5. **[SHOW IF AS_HEATPUMP = 1]** Heat pump
    6. **[SHOW IF GS_HEATPUMP = 1]** Ground source heat pump
    7. **[SHOW IF DUCTLESS MINI-SPLIT HEATPUMP = 1]** Ductless mini-split heat pump

5. Did you receive a rebate/discount from Evergy for any additional energy efficient equipment/upgrades for your home in 2022 that was not previously mentioned?
    1. Yes
    2. No
    98. Do not recall

**[SHOW Q6 IF Q5 = 1]**

6. Which additional energy efficient equipment/upgrades did you receive? (Please select all that apply, if applicable) **[MULTI-SELECT]**
    1. **[SHOW IF DI KIT = 0]** Energy savings kit (can include LED lightbulbs, faucet aerators, low-flow shower heads, hot water pipe insulation, and smart power strips)
    2. **[SHOW IF AIR SEALING = 0]** Air sealing (sealing air leaks in the home, weather sealing)
    3. **[SHOW IF CEILING/ATTIC INSULATION = 0]** Attic/ceiling insulation
    4. **[SHOW IF CENTRAL AC = 0]** Central air conditioner
    5. **[SHOW IF AS_HEATPUMP = 0]** Heat pump
    6. **[SHOW IF GS_HEATPUMP = 0]** Ground source heat pump
    7. **[SHOW IF DUCTLESS MINI-SPLIT HEATPUMP = 0]** Ductless mini-split heat pump
    96. Other (Please specify) **[OPEN-ENDED]**

## MEASURE INSTALLATION RATE (ISR)

### DIRECT INSTALL (DI) KIT MEASURES

**[SHOW Q7 – Q22 IF DI KIT = 1 AND Q4(1) = 1 OR Q6 = 1]**

7. Which of the following energy efficient equipment was included in your energy savings kit? (Please select all that apply) **[MULTI-SELECT]**
   1. LED lightbulbs
   2. Faucet aerators
   3. Low-flow shower heads
   4. Water heater pipe insulation
   5. Smart power strips
   98. Do not recall

**[SHOW Q8 IF Q7 = 1]**

8. Are **<u>all</u>** the lightbulbs that you received in your energy savings kit currently installed in your home?
   1. Yes, all of them are currently installed
   2. No, only some of them are currently installed
   3. No, none of them are currently installed
   98. Do not recall

**[SHOW Q9 IF Q8 = 2]**

9. How many of the LED lightbulbs that you received in your energy savings kit are currently installed in your home?
   1. **[OPEN-ENDED; NUMERIC VALUE]** _____________
   98. Do not recall

**[SHOW Q10 IF Q8 = 2 OR 3]**

10. Why aren't all of the LED lightbulbs installed? (Please select all that apply) **[MULTI-SELECT]**
    1. Waiting for old lightbulbs to burn out
    2. Not the correct wattage for my needs
    3. Too bright
    4. Not bright enough
    5. Do not fit into any fixtures
    96. Other (Please specify)
    98. Do not recall

**[SHOW Q11 IF Q7 = 2]**

11. Are **<u>all</u>** the faucet aerator(s) that you received in your energy savings kit currently installed in your home?
    1. Yes, all of them are currently installed
    2. No, only some of them are currently installed
    3. No, none of them are currently installed
    98. Do not recall

**[SHOW Q12 IF Q11 = 2]**

12. How many of the faucet aerator(s) that you received in your energy savings kit are currently installed in your home?
    1. **[OPEN-ENDED; NUMERIC VALUE] _____________**
    98. Do not recall

**[SHOW Q13 IF Q11 = 2 OR 3]**

13. Why aren't all of the faucet aerators installed? (Please select all that apply) **[MULTI-SELECT]**
    1. Do not fit any faucets
    2. Unable to install them myself
    3. Not enough water pressure
    4. Faucet aerators were removed
    96. Other (Please specify)
    98. Do not recall

**[SHOW Q14 IF Q7 = 3]**

14. Are **<u>all</u>** the low-flow shower head(s) that you received in your energy savings kit currently installed in your home?
    1. Yes, all of them are currently installed
    2. No, only some of them are currently installed
    3. No, none of them are currently installed
    98. Do not recall

**[SHOW Q15 IF Q14 = 2]**

15. How many of the low-flow shower head(s) that you received in your energy savings kit are currently installed in your home?
    1. **[OPEN-ENDED; NUMERIC VALUE] _____________**
    98. Do not recall

**[SHOW Q16 IF Q14 = 2 OR 3]**

16. Why aren't all of the low-flow shower heads installed? (Please select all that apply) **[MULTI-SELECT]**
    1. Do not fit any shower head fixture
    2. Unable to install them myself
    3. Not enough water pressure
    4. Low-flow shower heads were removed
    96. Other (Please specify)
    98. Do not recall

**[SHOW Q17 IF Q7 = 4]**

17. Is the hot water pipe insulation that you received in your energy savings kit currently installed in your home?
    1. Yes
    2. No
    98. Do not recall

**[SHOW Q18 IF Q17 = 2]**

18. Why isn't the hot water pipe insulation installed? (Please select all that apply) **[MULTI-SELECT]**
    1. Waiting for someone to install it
    2. Did not fit water heater pipes
    3. Hot water pipes were not accessible
    4. Was installed but removed it
    96. Other (Please specify)
    98. Do not recall

**[SHOW Q19 IF Q7 = 5]**

19. Are **all** the smart power strip(s) that you received in your energy savings kit currently setup in your home?
    1. Yes, all of them are currently setup
    2. No, only some of them are currently setup
    3. No, none of them are currently setup
    98. Do not recall

**[SHOW Q20 IF Q19 = 2]**

20. How many of the smart power strip(s) that you received in your energy savings kit are currently installed in your home?
    1. **[OPEN-ENDED; NUMERIC VALUE]** _____________
    98. Do not recall

**[SHOW Q21 IF Q19 = 1 OR 2 OR Q20 = 1]**

21. What is currently plugged into the smart power strips that are currently setup in your home? (Please select all that apply) **[MULTI-SELECT]**
    1. Television
    2. DVD/Blu-ray player
    3. Gaming console
    4. Sound bar
    5. Kitchen appliances (such as refrigerator, microwave, toaster, coffee maker, etc.)
    6. Computer
    7. Computer monitor
    8. Internet modem
    9. Computer keyboard or mouse
    10. Room/portable fan
    11. Floor/desk lamp
    96. Other (Please specify)
    98. Do not recall

**[SHOW Q22 IF Q19 = 2 OR 3]**

22. Why aren’t the smart power strip(s) setup? (Please select all that apply) **[MULTI-SELECT]**
    1. Already have other power strips setup
    2. Did not understand how to set it up
    3. Did not like the look of it
    4. I have no appropriate use for it
    5. Didn’t like how it functions
    96. Other (Please specify)
    98. Do not recall

## FREE-RIDERSHIP

### DIRECT INSTALL (DI) KIT MEASURES

**[SHOW Q23 – Q27 IF Q7 = 1 - 5]**

23. Before receiving an energy savings kit from Evergy, were you planning to purchase and install any of the following energy efficient equipment? **[INSERT OPTIONS DEFINED AS 1 = YES, 2 = NO, AND 98 = NOT SURE]**
    1. **[SHOW IF Q7 = 1]** LED lightbulbs
    2. **[SHOW IF Q7 = 2]** Faucet aerators
    3. **[SHOW IF Q7 = 3]** Low-flow shower heads
    4. **[SHOW IF Q7 = 4]** Water heater pipe insulation
    5. **[SHOW IF Q7 = 5]** Smart power strips

24. How likely is it that you would have purchased and installed the following energy efficient equipment if you had not received an energy savings kit from Evergy? **[INSERT 1-5 SCALE; 1 = NOT AT ALL LIKELY, 5 = VERY LIKELY, WITH 98 = NOT SURE]**
    1. **[SHOW IF Q7 = 1]** LED lightbulbs
    2. **[SHOW IF Q7 = 2]** Faucet aerators
    3. **[SHOW IF Q7 = 3]** Low-flow shower heads
    4. **[SHOW IF Q7 = 4]** Water heater pipe insulation
    5. **[SHOW IF Q7 = 5]** Smart power strips

25. Did you install the following energy efficient equipment sooner because you received them in the energy savings kit? **[INSERT OPTIONS DEFINED AS 1 = YES, 2 = NO, AND 98 = NOT SURE]**
    1. **[SHOW IF Q7 = 1]** LED lightbulbs
    2. **[SHOW IF Q7 = 2]** Faucet aerators
    3. **[SHOW IF Q7 = 3]** Low-flow shower heads
    4. **[SHOW IF Q7 = 4]** Water heater pipe insulation
    5. **[SHOW IF Q7 = 5]** Smart power strips

**[SHOW Q26 IF ANY Q25 = 1]**

26. If you had not received the energy savings kit, when might have you purchased and installed the following energy efficient equipment? When providing your response, please estimate how long you think it might have taken to purchase/install the new energy efficient equipment from the actual date they were installed. **[INSERT 1 – 6 SCALE; 1 = WITHIN 6 MONTHS, 2 = BETWEEN 6 MONTHS AND 1 YEAR, 3 = IN 1 TO 2 YEARS, 4 = IN 2 TO 3 YEARS, 5 = IN MORE THAN 3 YEARS, 6 = NEVER, AND 98 = NOT SURE]**
    1. **[SHOW IF Q25(1) = 1]** LED lightbulbs
    2. **[SHOW IF Q25(2) = 1]** Faucet aerators
    3. **[SHOW IF Q25(3) = 1]** Low-flow shower heads
    4. **[SHOW IF Q25(4) = 1]** Water heater pipe insulation
    5. **[SHOW IF Q25(5) = 1]** Smart power strips

27. Before you received an energy savings kit from Evergy, had you ever had any of the following energy efficient equipment installed in your home? **[INSERT OPTIONS DEFINED AS 1 = YES, 2 = NO, AND 98 = NOT SURE]**
    1. LED lightbulbs
    2. Faucet aerators
    3. Low-flow shower heads
    4. Water heater pipe insulation
    5. Smart power strips

## HVAC, AIR SEALING, AND INSULATION MEASURES

**[SHOW Q29 – Q48 IF AIR SEALING = 1 OR CEILING/ATTIC INSULATION = 1 OR CENTRAL AC = 1 OR AS_HEATPUMP = 1 OR GS_HEATPUMP = 1 OR DUCTLESS MINI-SPLIT HEATPUMP = 1]**

28. What is the primary fuel type used to heat your home?
    1. Electricity
    2. Natural Gas
    3. Propane
    96. Other (Please Specify) **[OPEN-ENDED]**
    98. Not sure

**[SHOW Q29 IF AIR SEALING = 1 AND Q4(2) = 1 OR Q6 = 2]**

29. Did you know you had air leaks in your home before you participated in Evergy’s Energy Efficiency Program?
    1. Yes
    2. No

**[SHOW Q30 IF CEILING/ATTIC INSULATION = 1 AND Q4(3) = 1 OR Q6 = 3]**

30. Did you know you needed more attic insulation before you participated in Evergy’s Energy Efficiency Program?
    1. Yes
    2. No

**[SHOW Q31 IF (CENTRAL AC = 1 AND Q4(4) = 1 OR Q6 = 4) OR (AS_HEATPUMP = 1 AND Q4(5) = 1 OR Q6 = 5) OR (GS_HEATPUMP = 1 AND Q4(6) = 1 OR Q6 = 6) OR (DUCTLESS MINI-SPLIT HEATPUMP = 1 AND Q4(7) = 1 OR Q6 = 7)]**

31. Which of the following best describes the status of your HVAC unit before you participated in Evergy’s Energy Efficiency Program?
    1. Runs when the HVAC unit is turned on (even if it doesn’t cool)
    2. Does not run at all when the HVAC unit is turned on
    98. Not sure

32. Did you plan to purchase the following energy efficient equipment/upgrades before you knew you could receive a rebate/discount from Evergy? **[INSERT OPTIONS DEFINED AS 1 = YES, 2 = NO, AND 98 = NOT SURE]**
    1. **[SHOW IF AIR SEALING = 1 AND Q4(2) = 1 OR Q6 = 2]** Sealing cracks in your home to reduce air leakage
    2. **[SHOW IF CEILING/ATTIC INSULATION = 1 AND Q4(3) = 1 OR Q6 = 3]** Improve your home's efficiency by adding attic/ceiling insulation
    3. **[SHOW IF CENTRAL AC = 1 AND Q4(4) = 1 OR Q6 = 4**Install a central air conditioning system
    4. **[SHOW IF AS_HEATPUMP = 1 AND Q4(5) = 1 OR Q6 = 5]** Install a heat pump
    5. **[SHOW IF GS_HEATPUMP = 1 AND Q4(6) = 1 OR Q6 = 6]** Install a ground source heat pump
    6. **[SHOW IF DUCTLESS MINI-SPLIT HEATPUMP = 1 AND Q4(7) = 1 OR Q6 = 7]** Install a ductless mini-split heat pump

**[SHOW Q33 IF AIR SEALING = 1 AND Q4(2) = 1 OR Q6 = 2]**

33. Did you seal **<u>more</u>** areas in your home to reduce air leakage because of the Evergy discount/rebate?
    1. Yes
    2. No
    98. Do not recall

**[SHOW Q34 IF CEILING/ATTIC INSULATION = 1 AND Q4(3) = 1 OR Q6 = 3]**

34. Did you install a higher R value of attic insulation, install a different type of attic insulation (i.e., loose fill, spray foam), or insulate more square footage of your attic because of the Evergy discount/rebate? (Please select all that apply) **[MULTI-SELECT]**
    1. Installed higher R value of attic insulation
    2. Installed different type of attic insulation (i.e., loose fill, spray foam)
    3. Insulated more square footage of attic
    4. Would have installed same attic insulation without Evergy rebate **[EXCLUSIVE]**
    98. Do not recall

**[SHOW Q35 IF CENTRAL AC = 1 AND Q4(4) = 1 OR Q6 = 4]**

35. Did you purchase a **<u>more</u>** energy efficient (higher SEER rating) air conditioner because of the Evergy discount/rebate?
    1. Yes
    2. No
    98. Do not recall

**[SHOW Q36 IF AS_HEATPUMP = 1 AND Q4(5) = 1 OR Q6 = 5]**

36. Did you purchase a **<u>more</u>** energy efficient heat pump because of the Evergy discount/rebate?
    1. Yes
    2. No
    98. Do not recall

**[SHOW Q37 IF GS_HEATPUMP = 1 AND Q4(6) = 1 OR Q6 = 6]**

37. Did you purchase a **<u>more</u>** energy efficient ground source heat pump because of the Evergy discount/rebate?
    1. Yes
    2. No
    98. Do not recall

**[SHOW Q38 IF DUCTLESS MINI-SPLIT HEATPUMP = 1 AND Q4(7) = 1 OR Q6 = 7]**

38. Did you purchase a **<u>more</u>** energy efficient ductless mini-split heat pump because of the Evergy discount/rebate?
    1. Yes
    2. No
    98. Do not recall

39. Would you have still purchased the following energy efficient equipment/upgrades without the Evergy discount/rebate? **[INSERT OPTIONS DEFINED AS 1 = YES, 2 = NO, AND 98 = NOT SURE]**
    1. **[SHOW IF AIR SEALING = 1 AND Q4(2) = 1 OR Q6 = 2]** Air sealing (sealing air leaks in the home, weather sealing)
    2. **[SHOW IF CEILING/ATTIC INSULATION = 1 AND Q4(3) = 1 OR Q6 = 3]** Attic/ceiling insulation
    3. **[SHOW IF CENTRAL AC = 1 AND Q4(4) = 1 OR Q6 = 4]** Central air conditioner
    4. **[SHOW IF AS_HEATPUMP = 1 AND Q4(5) = 1 OR Q6 = 5]** Heat pump
    5. **[SHOW IF GS_HEATPUMP = 1 AND Q4(6) = 1 OR Q6 = 6]** Ground source heat pump
    6. **[SHOW IF DUCTLESS MINI-SPLIT HEATPUMP = 1 AND Q4(7) = 1 OR Q6 = 7]** Ductless mini-split heat pump

40. Without the Evergy discount/rebate, how likely is it that you would have purchased the following energy efficient equipment/upgrades? **[INSERT 1-5 SCALE; 1 = NOT AT ALL LIKELY, 5 = VERY LIKELY, WITH 98 = NOT SURE]**
    1. **[SHOW IF AIR SEALING = 1 AND Q4(2) = 1 OR Q6 = 2]** Air sealing (sealing air leaks in the home, weather sealing)
    2. **[SHOW IF CEILING/ATTIC INSULATION = 1 AND Q4(3) = 1 OR Q6 = 3]** Attic/ceiling insulation
    3. **[SHOW IF CENTRAL AC = 1 AND Q4(4) = 1 OR Q6 = 4]** Central air conditioner
    4. **[SHOW IF AS_HEATPUMP = 1 AND Q4(5) = 1 OR Q6 = 5]** Heat pump
    5. **[SHOW IF GS_HEATPUMP = 1 AND Q4(6) = 1 OR Q6 = 6]** Ground source heat pump
    6. **[SHOW IF DUCTLESS MINI-SPLIT HEATPUMP = 1 AND Q4(7) = 1 OR Q6 = 7]** Ductless mini-split heat pump

**[SHOW Q41 IF Q4(1-7) = 1 OR Q6 = 1-7, 96]**

41. How did you **<u>first</u>** hear about the Evergy rebates/discounts for the energy efficient equipment and upgrades?
    1. Contractor/Energy Auditor
    2. Community event
    3. General online search
    4. Evergy website
    5. Spire website
    6. Bill insert
    7. Email
    8. Television/radio/media coverage
    9. Evergy call center referral
    10. Connect center referral
    11. Social media or other online ad (i.e., Facebook)
    12. Family, friend, or neighbor (word-of-mouth)
    96. Other source **[OPEN-ENDED]**
    98. Do not recall

**[SHOW Q42 IF Q41 = 1 – 12 OR 96]**

42. How likely is it that you would have purchased the following energy efficient equipment/upgrades if you had not learned about the Evergy rebates/discounts from the [ANSWER TO Q41]? **[INSERT 1-5 SCALE; 1 = NOT AT ALL LIKELY, 5 = VERY LIKELY, WITH 98 = NOT SURE]**
    1. **[SHOW IF AIR SEALING = 1 AND Q4(2) = 1 OR Q6 = 2]** Air sealing (sealing air leaks in the home, weather sealing)
    2. **[SHOW IF CEILING/ATTIC INSULATION = 1 AND Q4(3) = 1 OR Q6 = 3]** Attic/ceiling insulation
    3. **[SHOW IF CENTRAL AC = 1 AND Q4(4) = 1 OR Q6 = 4]** Central air conditioner
    4. **[SHOW IF AS_HEATPUMP = 1 AND Q4(5) = 1 OR Q6 = 5]** Heat pump
    5. **[SHOW IF GS_HEATPUMP = 1 AND Q4(6) = 1 OR Q6 = 6]** Ground source heat pump
    6. **[SHOW IF DUCTLESS MINI-SPLIT HEATPUMP = 1 AND Q4(7) = 1 OR Q6 = 7]** Ductless mini-split heat pump

43. Were any of the following energy efficient equipment/upgrades recommended by your contractor/energy auditor during an initial visit to your home? **[INSERT OPTIONS DEFINED AS 1 = YES, 2 = NO, WITH 98 = DO NOT RECALL AND 99 = NOT APPLICABLE]**
    1. **[SHOW IF AIR SEALING = 1 AND Q4(2) = 1 OR Q6 = 2]** Air sealing (sealing air leaks in the home, weather sealing)
    2. **[SHOW IF CEILING/ATTIC INSULATION = 1 AND Q4(3) = 1 OR Q6 = 3]** Attic/ceiling insulation
    3. **[SHOW IF CENTRAL AC = 1 AND Q4(4) = 1 OR Q6 = 4]** Central air conditioner
    4. **[SHOW IF AS_HEATPUMP = 1 AND Q4(5) = 1 OR Q6 = 5]** Heat pump
    5. **[SHOW IF GS_HEATPUMP = 1 AND Q4(6) = 1 OR Q6 = 6]** Ground source heat pump
    6. **[SHOW IF DUCTLESS MINI-SPLIT HEATPUMP = 1 AND Q4(7) = 1 OR Q6 = 7]** Ductless mini-split heat pump

**[SHOW Q44 IF ANY IN Q43 = 1]**

44. How likely is it that you would have purchased the same energy efficient equipment/upgrades if your contractor/energy auditor didn’t recommend them to you? **[INSERT 1-5 SCALE; 1 = NOT AT ALL LIKELY, 5 = VERY LIKELY, WITH 98 = NOT SURE]**
    1. **[SHOW IF Q43(1) = 1]** Air sealing (sealing air leaks in the home, weather sealing)
    2. **[SHOW IF Q43(2) = 1]** Attic/ceiling insulation
    3. **[SHOW IF Q43(3) = 1]** Central air conditioner
    4. **[SHOW IF Q43(4) = 1]** Heat pump
    5. **[SHOW IF Q43(5) = 1]** Ground source heat pump
    6. **[SHOW IF Q43(6) = 1]** Ductless mini-split heat pump

**[SHOW Q45 IF ANY IN Q39 = 1]**

45. Did you install the following energy efficient equipment/upgrades sooner because of the Evergy discount/rebate? **[INSERT OPTIONS DEFINED AS 1 = YES, 2 = NO, AND 98 = NOT SURE]**
    1. **[SHOW IF AIR SEALING = 1 AND Q4(2) = 1 OR Q6 = 2]** Air sealing (sealing air leaks in the home, weather sealing)
    2. **[SHOW IF CEILING/ATTIC INSULATION = 1 AND Q4(3) = 1 OR Q6 = 3]** Attic/ceiling insulation
    3. **[SHOW IF CENTRAL AC = 1 AND Q4(4) = 1 OR Q6 = 4]** Central air conditioner
    4. **[SHOW IF AS_HEATPUMP = 1 AND Q4(5) = 1]** Heat pump
    5. **[SHOW IF GS_HEATPUMP = 1 AND Q4(6) = 1 OR Q6 = 6]** Ground source heat pump
    6. **[SHOW IF DUCTLESS MINI-SPLIT HEATPUMP = 1 AND Q4(7) = 1 OR Q6 = 7]** Ductless mini-split heat pump

**[SHOW Q46 IF ANY IN Q45 = 1]**

46. When might have you installed the following energy efficient equipment/upgrades if the Evergy discount/rebate had not been available? When providing your response, please estimate how long you think it might have taken to install the new energy efficient equipment/upgrades from the actual date they were installed. **[INSERT 1 – 7 SCALE; 1 = WITHIN 6 MONTHS, 2 = BETWEEN 6 MONTHS AND 1 YEAR, 3 = IN 1 TO 2 YEARS, 4 = IN 2 TO 3 YEARS, 5 = IN MORE THAN 3 YEARS, 6 = NEVER, AND 98 = NOT SURE]**
    1. **[SHOW IF Q45(1) = 1]** Air sealing (sealing air leaks in the home, weather sealing)
    2. **[SHOW IF Q45(2) = 1]** Attic/ceiling insulation
    3. **[SHOW IF Q45(3) = 1]** Central air conditioner
    4. **[SHOW IF Q45(4) = 1]** Heat pump
    5. **[SHOW IF Q45(5) = 1]** Ground source heat pump
    6. **[SHOW IF Q45(6) = 1]** Ductless mini-split heat pump

47. Have any of the energy efficient equipment/upgrades that you received an Evergy discount/rebate for been removed or uninstalled? **[INSERT OPTIONS DEFINED AS 1 = STILL INSTALLED AND 2 = REMOVED/UNINSTALLED]**
    1. **[SHOW IF AIR SEALING = 1 AND Q4(2) = 1 OR Q6 = 2]** Air sealing (sealing air leaks in the home, weather sealing)
    2. **[SHOW IF CEILING/ATTIC INSULATION = 1 AND Q4(3) = 1 OR Q6 = 3]** Attic/ceiling insulation
    3. **[SHOW IF CENTRAL AC = 1 AND Q4(4) = 1 OR Q6 = 4]** Central air conditioner
    4. **[SHOW IF AS_HEATPUMP = 1 AND Q4(5) = 1 OR Q6 = 5]** Heat pump
    5. **[SHOW IF GS_HEATPUMP = 1 AND Q4(6) = 1 OR Q6 = 6]** Ground source heat pump
    6. **[SHOW IF DUCTLESS MINI-SPLIT HEATPUMP = 1 AND Q4(7) = 1 OR Q6 = 7]** Ductless mini-split heat pump

**[SHOW Q48 IF ANY Q47 = 2]**

48. Why were the energy efficient equipment/upgrade(s) removed or uninstalled?

    **[OPEN-ENDED]**

49. What was the most influential aspect in your decision to purchase and install energy efficient equipment/upgrades for your home through Evergy's Energy Efficiency Program? Please rank each aspect from most influential to least influential. **[RANK; RANDOMIZE]**
    1. Program rebate/discount
    2. Contractor/Energy Auditor recommendation
    3. **[SHOW IF Q41 = 1 – 12 OR 96]** Learning about the program from [ANSWER TO Q41]
    4. Evergy's marketing of the program
    96. Other (Please specify)

**CAPTURING POTENTIAL SPILLOVER EFFECTS**

**[SHOW Q50 AND Q51 IF DI KIT = 1 AND Q4(1) = 1 OR Q6 = 1]**

50. How likely are you to do any of the next steps that were recommended in your custom energy savings kit summary report? **[INSERT 1-10 SCALE; 1 = NOT AT ALL LIKELY, 10 = VERY LIKELY, WITH 98 = NOT SURE]**

**[SHOW Q51 IF Q50 >4]**

51. Which next steps from the energy savings kit summary report are you most likely to do? (Please select all that apply) **[MULTI-SELECT]**
    1. Replacing your existing central air conditioner or heat pump with a higher efficiency system
    2. Installing air sealing in gaps and voids of your home
    3. Adding attic, ceiling, or wall insulation to your home
    4. Installing a smart thermostat
    5. Duct sealing and insulation
    6. Purchase and install ENERGY STAR® certified windows and/or doors
    7. Purchase and install ENERGY STAR® certified appliances and/or electronics
    8. Participate in the low-income weatherization program
    9. Participate in the low-income home energy assistance program
    96. Other (Please specify)
    97. None of the next steps listed **[EXCLUSIVE]**
    98. Not sure

52. Have you installed any additional energy efficient equipment or home upgrades in 2022 with or without receiving an Evergy discount or rebate? (This includes lightbulbs, energy efficient appliances, insulation, weather stripping, water heater, etc.)
    1. Yes
    2. No
    98. Do not recall

**[SHOW Q53 IF Q52 = 1]**

53. What additional energy efficient equipment or home upgrades have you purchased in 2022? (Please select all that apply) **[MULTI-SELECT]**
    1. LED lightbulbs
    2. Faucet aerators
    3. Low-flow shower heads
    4. Water heater pipe insulation **[SHOW IF PIPE INSULATION = 0]**
    5. Smart power strips
    6. **[SHOW IF AIR SEALING = 0 AND Q6 ≠ 2]** Air sealing (sealing air leaks in the home, weather sealing)
    7. **[SHOW IF CEILING/ATTIC INSULATION= 0 AND Q6 ≠ 3]** Attic/ceiling insulation
    8. **[SHOW IF AC_REPLACEMENT = 0 AND Q6 ≠ 4]** Central air conditioner
    9. **[SHOW IF AS_HEATPUMP = 0 AND Q6 ≠ 5]** Heat pump
    10. **[SHOW IF GS_HEATPUMP = 0 AND OR Q6 ≠ 6]** Ground source heat pump
    11. **[SHOW IF DUCTLESS MINI-SPLIT HEATPUMP = 0 AND Q6 ≠ 7]** Ductless mini-split heat pump
    12. Furnace
    13. Refrigerator
    14. Freezer
    15. Dishwasher
    16. Clothes washer
    17. Clothes dryer
    18. Air purifier/cleaner
    19. Dehumidifier
    20. ENERGY STAR® windows
    21. ENERGY STAR® doors
    22. Other type of insulation (Please specify type) **[OPEN-ENDED]**
    96. Other energy efficient equipment/upgrade (Please specify) [**OPEN-ENDED**]
    98. Do not recall

**[SHOW Q54 IF Q53 = 1, 2, 3, OR 5]**

54. How many of each energy efficient equipment listed did you purchase AND install in your home? **[OPEN-ENDED; NUMERIC VALUE]**
    1. LED lightbulbs: _____________ **[SHOW IF Q53 = 1]**
    2. Faucet aerators: _____________ **[SHOW IF Q53 = 2]**
    3. Low-flow shower heads: _____________ **[SHOW IF Q53 = 3]**
    4. Smart power strips: _____________ **[SHOW IF Q53 = 5]**

**[SHOW Q55 IF Q53 = 7]**

55. About what square footage in your home's attic does your new insulation cover?
    1. **[OPEN-ENDED; NUMERIC VALUE]**
    98. Not sure

**[SHOW Q56 IF Q53 = 13 - 19]**

56. Were the following appliance(s) you purchased ENERGY STAR® certified? **[INSERT OPTIONS DEFINED AS 1 = YES, 2 = NO, AND 98 = NOT SURE]**
    1. **[SHOW IF Q53 = 13]** Refrigerator
    2. **[SHOW IF Q53 = 14]** Freezer
    3. **[SHOW IF Q53 = 15]** Dishwasher
    4. **[SHOW IF Q53 = 16]** Clothes washer
    5. **[SHOW IF Q53 = 17]** Clothes dryer
    6. **[SHOW IF Q53 = 18]** Air purifier/cleaner
    7. **[SHOW IF Q53 = 19]** Dehumidifier

**[SHOW Q57 IF Q53 = 22]**

57. About what square footage in your home does your new insulation cover?
    1. **[OPEN-ENDED; NUMERIC VALUE]**
    98. Not sure

**[SHOW Q58 IF Q53 = 1 – 22 OR 96]**

58. **Have you applied, or do you still plan to apply, for a rebate/discount from Evergy for the additional energy efficient equipment/home upgrades you purchased?**
    1. Have already applied for **a rebate/discount**
    2. Plan to apply for **a rebate/discount**
    3. Have not applied and do no plan to apply for **a rebate/discount**
    98. Not sure

**[SHOW Q59 AND Q60 IF Q53 = 1 – 22 OR 96]**

59. How important was receiving the discount/rebate and/or energy savings kit from Evergy in your decision to install the additional energy efficient equipment/home upgrades on your own? **[INSERT 0-10 SCALE; 0 = NOT AT ALL IMPORTANT, 10 = VERY IMPORTANT, WITH 99 = NOT APPLICABLE]**
    1. LED lightbulbs **[SHOW IF Q53 = 1]**
    2. Faucet aerators **[SHOW IF Q53 = 2]**
    3. Low-flow shower heads **[SHOW IF Q53 = 3]**
    4. Water heater pipe insulation **[SHOW IF Q53 = 4]**
    5. Smart power strips **[SHOW IF Q53 = 5]**
    6. Air sealing (sealing air leaks in the home, weather sealing) **[SHOW IF Q53 = 6]**
    7. Attic/ceiling insulation **[SHOW IF Q53 = 7]**
    8. Central air conditioner **[SHOW IF Q53 = 8]**
    9. Heat pump **[SHOW IF Q53 = 9]**
    10. Ground source heat pump **[SHOW IF Q53 = 10]**
    11. Ductless mini-split heat pump **[SHOW IF Q53 = 11]**
    12. Furnace **[SHOW IF Q53 = 12]**
    13. Refrigerator **[SHOW IF Q53 = 13]**
    14. Freezer **[SHOW IF Q53 = 14]**
    15. Dishwasher **[SHOW IF Q53 = 15]**
    16. Clothes washer **[SHOW IF Q53 = 16]**
    17. Clothes dryer **[SHOW IF Q53 = 17]**
    18. Air purifier/cleaner **[SHOW IF Q53 = 18]**
    19. Dehumidifier **[SHOW IF Q53 = 19]**
    20. ENERGY STAR® windows **[SHOW IF Q53 = 20]**
    21. ENERGY STAR® doors **[SHOW IF Q53 = 21]**
    22. Other type of insulation **[SHOW IF Q53 = 22]**
    96. Other energy-efficient equipment/upgrade **[SHOW IF Q53 = 96]**

60. If you had **not** received a discount/rebate and/or energy savings kit from Evergy, how likely would you have been to install the additional energy efficient equipment/home upgrades on your own? **[INSERT 1-5 SCALE; 1 = NOT AT ALL LIKELY, 5 = VERY LIKELY, WITH 99 = NOT APPLICABLE]**
    1. LED lightbulbs **[SHOW IF Q53 = 1]**
    2. Faucet aerators **[SHOW IF Q53 = 2]**
    3. Low-flow shower heads **[SHOW IF Q53 = 3]**
    4. Water heater pipe insulation **[SHOW IF Q53 = 4]**
    5. Smart power strips **[SHOW IF Q53 = 5]**
    6. Air sealing (sealing air leaks in the home, weather sealing) **[SHOW IF Q53 = 6]**
    7. Attic/ceiling insulation **[SHOW IF Q53 = 7]**
    8. Central air conditioner **[SHOW IF Q53 = 8]**
    9. Heat pump **[SHOW IF Q53 = 9]**
    10. Ground source heat pump **[SHOW IF Q53 = 10]**
    11. Ductless mini-split heat pump **[SHOW IF Q53 = 11]**
    12. Furnace **[SHOW IF Q53 = 12]**
    13. Refrigerator **[SHOW IF Q53 = 13]**
    14. Freezer **[SHOW IF Q53 = 14]**
    15. Dishwasher **[SHOW IF Q53 = 15]**
    16. Clothes washer **[SHOW IF Q53 = 16]**
    17. Clothes dryer **[SHOW IF Q53 = 17]**
    18. Air purifier/cleaner **[SHOW IF Q53 = 18]**
    19. Dehumidifier **[SHOW IF Q53 = 19]**
    20. ENERGY STAR® windows **[SHOW IF Q53 = 20]**
    21. ENERGY STAR® doors **[SHOW IF Q53 = 21]**
    22. Other type of insulation **[SHOW IF Q53 = 22]**
    96. Other energy-efficient equipment/upgrade **[SHOW IF Q53 = 96]**

**[SHOW Q61 IF Q52 = 1]**

61. In your own words, how did the program influence your decision to purchase the additional energy efficient equipment/home upgrades on your own?
    1. **[OPEN-ENDED]**
    98. Not sure

## EXPERIENCE WITH PROGRAM/PROJECT

### HVAC MEASURES

**[SHOW Q62 AND Q63 IF (CENTRAL AC = 1 AND Q4(4) = 1 OR Q6 = 4) OR (AS_HEATPUMP = 1 AND Q4(5) = 1 OR Q6 = 5) OR (GS_HEATPUMP = 1 AND Q4(6) = 1 OR Q6 = 6) OR (DUCTLESS MINI-SPLIT HEATPUMP=1 AND Q4(7) = 1 OR Q6 = 7)]**

62. How did you select your heating and cooling contractor?
    1. Evergy.com (Find an authorized contractor)
    2. General online search
    3. Friend/Relative recommended
    4. Contractor previously used
    5. Neighbor recommended
    96. Other (Please specify)
    98. Do not recall

63. What is the name of the contractor that installed your new heating/cooling equipment?
    1. **[OPEN-ENDED]**
    98. Do not recall

### HVAC, AIR SEALING, AND ATTIC INSULATION MEASURES

**[SHOW Q64 AND Q65 IF (AIR SEALING = 1 AND Q4(2) = 1 OR Q6 = 2) OR (ATTIC/CEILING INSULATION = 1 AND Q4(3) = 1 OR Q6 = 3) OR (CENTRAL AC = 1 AND Q4(4) = 1 OR Q6 = 4) OR (AS_HEATPUMP = 1 AND Q4(5) = 1 OR Q6 = 5) OR (GS_HEATPUMP = 1 AND Q4(6) = 1 OR Q6 = 6) OR (DUCTLESS MINI-SPLIT HEATPUMP=1 AND Q4(7) = 1 OR Q6 = 7)]**

64. How did you select your energy auditor that conducted your Comprehensive Home Energy Audit?
    1. Evergy.com (Find an authorized contractor)
    2. General online search
    3. Friend / Relative recommended
    4. Contractor previously used
    96. Other (Please specify)
    98. Do not recall
    99. Not applicable; did not have a Comprehensive Home Energy Audit performed

**[SHOW Q65 IF Q64 = 1 – 4 OR 96]**

65. Who was the energy auditor that conducted your Comprehensive Home Energy Audit? **[INSERT DROPDOWN]**
    1. Affordable Energy Solutions
    2. Central Energy Audits
    3. Green CAT Services
    4. Green Improvement Consulting
    5. Star Energy Consultants
    6. Streamline Energy Solutions
    7. The Hayes Company
    96. Other (Please specify)
    98. Do not recall

**AIR SEALING AND ATTIC INSULATION MEASURES**

**[SHOW Q66 AND Q68 IF (AIR SEALING = 1 AND Q4(2) = 1 OR Q6 = 2) OR (ATTIC/CEILING INSULATION = 1 AND Q4(3) = 1 OR Q6 = 3)]**

66. Occasionally, the energy auditor is the same person who does the air sealing or installs your new insulation. Who completed the air sealing and/or installed new insulation in your home?
    1. Energy auditor
    2. Different contractor
    3. Installed myself
    98. Do not recall

**[SHOW Q67 IF Q66 = 2]**

67. What is the name of the contractor that performed your air sealing or installed your new insulation?
    1. **[OPEN-ENDED]**
    98. Do not recall

68. What was the most important and deciding factor that caused you to move forward with your air sealing and/or insulation upgrades for your home?
    1. Saving money on your energy bill
    2. Increase the comfort level of your home
    3. The rebate offered for home improvements
    96. Other (Please specify)
    98. Do not recall

## EVERGY SATISFACTION

### DIRECT INSTALL (DI) KIT

**[SHOW Q69 - Q76 IF DI KIT = 1 AND Q4(1) = 1 OR Q6 = 1]**

69. Was your home energy assessment/energy savings kit conducted virtually or in-person?
    1. Virtually
    2. In-person
    98. Do not recall

**[SHOW Q70 IF Q69 = 2]**

70. Who was the Energy-Efficiency Professional that conducted your energy savings kit/home energy assessment? **[INSERT DROPDOWN]**
    1. Sandi Garrison
    2. Melanie Webb
    3. Alvin (AJ) Stokes
    4. Diana Parrino
    96. Other
    98. Do not recall

**[SHOW Q71 IF Q69 = 2]**

71. How satisfied are you with the following aspects of receiving your energy savings kit? **[INSERT 1-10 SCALE; 1 = VERY DISSATISFIED, 10 = VERY SATISFIED, WITH 98 = NOT SURE AND 99 = NOT APPLICABLE]**
    1. Scheduling your appointment
    2. The Energy-Efficiency Professional that conducted your energy savings kit/home energy assessment
    3. Energy-Efficiency Professional arriving on time
    4. Energy-Efficiency Professional notifying you of their ETA in advance of arriving
    5. Appearance (ID badge, uniform, etc.)
    6. Courtesy of the energy-efficiency professional
    7. Energy-efficiency professional’s knowledge of the program
    8. Installation of energy savings kit items
    9. Length of appointment
    10. The explanation of your “next steps” to improve efficiency in your home?
    11. The condition in which your home was left

**[SHOW Q72 IF ANY Q71 < 5]**

72. Why were you dissatisfied with some aspects of receiving your energy savings kit?

    **[OPEN-ENDED]**

**[SHOW Q73 IF Q69 = 2]**

73. What would you consider to be the “ideal appointment length” for the energy savings kit/home energy assessment?
    1. Less than 30 minutes
    2. Between 30-45 minutes
    3. Between 46-60 minutes
    4. Between 61-75 minutes
    5. Over 75 minutes
    98. Not sure

74. Were you dissatisfied with any of the items in your energy savings kit?
    1. Yes
    2. No
    98. Do not recall

**[SHOW Q75 IF Q74 = 1]**

75. Why were you dissatisfied with some of the items in your energy savings kit?
    **[OPEN-ENDED]**

76. How would you rate the usefulness of your custom energy savings kit summary report? **[INSERT 1-10 SCALE; 1 = NOT AT ALL USEFUL, 10 = EXTREMELY USEFUL, WITH 99 = NOT APPLICABLE]**

**HVAC MEASURES**

**[SHOW Q77 - Q79 IF (CENTRAL AC = 1 AND Q4(4) = 1 OR Q6 = 4) OR (AS_HEATPUMP = 1 AND Q4(5) = 1 OR Q6 = 5) OR (GS_HEATPUMP = 1 AND Q4(6) = 1 OR Q6 = 6) OR (DUCTLESS MINI-SPLIT HEATPUMP=1 AND Q4(7) = 1 OR Q6 = 7)]**

77. How knowledgeable was your contractor about the value/benefits of energy efficient equipment/upgrades? **[INSERT 1-10 SCALE; 1 = NOT AT ALL KNOWLEDGEABLE, 10 = EXTREMELY KNOWLEDGEABLE, WITH 99 = NOT APPLICABLE]**

78. How satisfied are you with the contractor who installed your heating/cooling equipment in regards to…? **[INSERT 1-10 SCALE; 1 = VERY DISSATISFIED, 10 = VERY SATISFIED, WITH 99 = NOT APPLICABLE]**
    1. Scheduling the installation of your new heating/cooling equipment
    2. Arriving on time
    3. Notifying you ahead of time that they are going to be running late
    4. Condition in which your home was left
    5. The installation/quality of work done
    6. The contractor overall

**[SHOW Q79 IF ANY Q78 < 5]**

79. Why were you dissatisfied with some aspects of the contractor who installed your heating/cooling equipment?
    **[OPEN-ENDED]**

**HVAC, AIR SEALING, AND ATTIC INSULATION MEASURES**

**[SHOW Q80 – Q85 IF (AIR SEALING = 1 AND Q4(2) = 1 OR Q6 = 2) OR (ATTIC/CEILING INSULATION = 1 AND Q4(3) = 1 OR Q6 = 3) OR (CENTRAL AC = 1 AND Q4(4) = 1 OR Q6 = 4) OR (AS_HEATPUMP = 1 AND Q4(5) = 1 OR Q6 = 5) OR (GS_HEATPUMP = 1 AND Q4(6) = 1 OR Q6 = 6) OR (DUCTLESS MINI-SPLIT HEATPUMP=1 AND Q4(7) = 1 OR Q6 = 7)]**

80. How satisfied are you with the following aspects of your Comprehensive Home Energy Audit? **[INSERT 1-10 SCALE; 1 = VERY DISSATISFIED, 10 = VERY SATISFIED, WITH 99 = NOT APPLICABLE; DID NOT RECEIVE A COMPREHENSIVE ENERGY AUDIT]**
    1. The scheduling of your comprehensive energy audit
    2. The amount of time it took to complete the comprehensive energy audit
    3. The overall value of the comprehensive energy audit and report in terms of what you received vs. what you expected

**[SHOW Q81 IF ANY Q80 <5]**

81. Why were you dissatisfied with some aspects of your Comprehensive Home Energy Audit?
    **[OPEN-ENDED]**

82. How satisfied are you with the Energy Auditor in regards to…? **[INSERT 1-10 SCALE; 1 = VERY DISSATISFIED, 10 = VERY SATISFIED, 99 = NOT APPLICABLE]**
    1. Arriving on time
    2. Notifying you ahead of time that they are going to be running late
    3. Overall appearance
    4. Courtesy of auditor
    5. Knowledge of Evergy’s Energy Efficiency Program
    6. Sharing energy saving tips
    7. Communicating how Evergy’s Energy Efficiency Program works
    8. Condition in which your home was left
    9. The Energy Auditor overall

**[SHOW Q83 IF ANY Q82 <5]**

83. Why were you dissatisfied with some aspects of the Energy Auditor?
    **[OPEN-ENDED]**

84. How satisfied were you with the following aspects of receiving a discount/rebate through Evergy? **[INSERT 1-10 SCALE; 1 = VERY DISSATISFIED, 10 = VERY SATISFIED, WITH AND 99 = NOT APPLICABLE; MY DISCOUNT WAS APPLIED AS AN INSTANT REBATE]**
    1. The timeliness in receiving the discount/rebate
    2. The discount/rebate amount

**[SHOW Q85 IF ANY Q84 <5]**

85. Why were you dissatisfied with the Evergy discount/rebate?
    **[OPEN-ENDED]**

**DIRECT INSTALL (DI) KIT, AIR SEALING, AND ATTIC INSULATION MEASURES**

**[SHOW Q86 – Q88 IF (DI KIT = 1 AND Q4(1) = 1 OR Q6 = 1) OR (AIR SEALING = 1 AND Q4(2) = 1 OR Q6 = 2) OR (ATTIC/CEILING INSULATION = 1 AND Q4(3) = 1 OR Q6 = 3)]**

86. Are you a Spire (formerly Missouri Gas Energy) customer?
    1. Yes
    2. No
    98. Not sure

**[SHOW Q87 AND Q88 IF Q86 = 1]**

87. Were you aware that Spire and Evergy are partnering together to deliver this program?
    1. Yes
    2. No
    98. Not sure

88. How likely are you to participate in the other customer programs offered by Spire? **[INSERT 1-10 SCALE WHERE 1 = NOT AT ALL LIKELY, 10 = EXTREMELY LIKELY, WITH 99 = NOT APPLICABLE]**

**[SHOW Q89 - Q91 IF Q4(1 - 7) = 1 OR Q6 = 1 - 7 OR 96]**

89. How has your participation in this program impacted your impression of Evergy? **[INSERT SCALE, 1 = MUCH LESS FAVORABLE, 2 = SOMEWHAT LESS FAVORABLE, 3 = NO CHANGE, 4 = SOMEWHAT MORE FAVORABLE, 5 = MUCH MORE FAVORABLE]**

90. How likely are you to participate in other Evergy programs? **[INSERT 1-10 SCALE WHERE 1 = NOT AT ALL LIKELY, 10 = EXTREMELY LIKELY, WITH 99 = NOT APPLICABLE]**

91. Please indicate your level of satisfaction with your overall experience with Evergy's Energy Efficiency Program. **[INSERT 1-10 SCALE; 1 = VERY DISSATISFIED, 10 = VERY SATISFIED, WITH 99 = NOT APPLICABLE]**

**[SHOW Q92 IF Q91 <5]**

92. Why were you dissatisfied with your overall experience with Evergy's Energy Efficiency Program?
    **[OPEN-ENDED]**

**[SHOW Q15 IF Q91 = 99]**

93. You indicated that your level of satisfaction with your overall experience with Evergy's Energy Efficiency Program was "Not applicable"? Please explain.
    **[OPEN-ENDED]**

**[SHOW Q94 IF Q4(1 - 7) = 1 OR Q6 = 1 - 7, 96]**

94. Did you or someone in your household contact Evergy or ICF (program management company) program staff with questions or concerns regarding installation of energy efficient equipment/upgrades, the rebate/discount, or any other reason?
    1. Yes
    2. No
    98. Do not recall

**[SHOW Q95 IF Q94 = 1]**

95. Please indicate your level of satisfaction with your interactions with Evergy or ICF staff. **[INSERT 1-10 SCALE; 1 = VERY DISSATISFIED, 10 = VERY SATISFIED, WITH 99 = NOT APPLICABLE]**

**[SHOW Q96 IF Q95 <5]**

96. Why were you dissatisfied with Evergy or ICF staff?
    **[OPEN-ENDED]**

**[SHOW Q97 IF Q4(1 - 7) = 1 OR Q6 = 1 - 7 OR 96]**

97. Do you have any other comments about the program, energy efficiency in residences, or about Evergy's services in general?
    1. Yes (Please specify) **[OPEN-ENDED]**
    2. No comments

## DEMOGRAPHICS

**[SHOW Q98 IF Q4(1 - 7) = 1 OR Q6 = 1 - 7, 96 OR Q52 = 1]**

98. The final questions in this survey are regarding your household and residence characteristics. Your responses will remain anonymous and are used to assess how well participants in this program resemble Evergy's customer population. You will still be able to receive the $5 gift card if you choose not to answer these questions. Would you like to continue to the demographic questions?
    1. Yes, continue to demographic questions
    2. No, I would like to skip to end of survey

**[SHOW Q99 - Q105 IF Q98 = 1]**

99. Do you rent or own your household?
    1. Rent
    2. Own
    99. Prefer not to answer

100. How many people, including you, live in your household?
    1. Number of people: [**OPEN-ENDED**]
    99. Prefer not to answer

101. Which of the following best describes your home?
    1. Single Family Home, detached from any other house
    2. Single-family house attached to one or more other houses (e.g., duplex, row house, or townhome)
    96. Other (Please Specify) **[OPEN-ENDED]**
    98. Not sure
    99. Prefer not to answer

102. Approximately when was your home built?
    1. Before 1960
    2. 1960 - 1969
    3. 1970 - 1979
    4. 1980 - 1989
    5. 1990 - 1999
    6. 2000 - 2009
    7. 2010 – 2019
    8. 2020 or newer
    98. Not sure
    99. Prefer not to answer

103. About how many square feet is your home? If you are unsure, an estimate is okay.

   1. Less than 1,000 square feet
   2. 1,000-1,999 square feet
   3. 2,000-2,999 square feet
   4. 3,000-3,999 square feet
   5. 4,000-4,999 square feet
   6. 5,000 or greater square feet
   98. Not sure
   99. Prefer not to answer

104. What was your total household income before taxes in 2021?

   1. Less than $10,000
   2. $10,000 to less than $20,000
   3. $20,000 to less than $30,000
   4. $30,000 to less than $40,000
   5. $40,000 to less than $50,000
   6. $50,000 to less than $75,000
   7. $75,000 to less than $100,000
   8. $100,000 to less than $150,000
   9. $150,000 to less than $200,000
   10. $200,000 or more
   98. Not sure
   99. Prefer not to answer

105. What is your highest level of education?

   1. Up to 8th grade
   2. Some high school
   3. High school graduate or GED equivalent
   4. Some college
   5. Associate degree
   6. Bachelor’s degree
   7. Master’s degree
   8. Professional degree (MD, JD, DDS, DDO)
   9. Doctorate degree (Ph.D., D.Sc.)
   98. Not sure
   99. Prefer not to answer

## GIFT CARD INFORMATION

**[SHOW Q106 IF Q98 = 1 OR 2]**

We appreciate you completing this survey on behalf of Evergy’s Energy-Efficiency Program. We would like to send you a $5 electronic gift card to thank you for your time. We will be sending it to [EMAIL]. If you would like us to send your gift card to a different e-mail address, please enter the alternate e-mail address below. You should receive an email with the link to your gift card shortly after finishing this survey.

106. Please send my electronic gift card to the following email address:
    1. **[EMAIL]**
    2. **[OPEN-ENDED]**
    99. I do not wish to receive a gift card

If you have questions regarding this survey or have any issues with your gift card (if applicable), please send an email to survey2026@surveys.admenergy.com. On behalf of Evergy, thank you for participating in the program. Have a great day!

## L.2 Heating, Cooling, and Home Comfort - Trade Ally Survey

Client: Evergy
Program: Heating, Cooling, and Home Comfort
Program Year: 2022
Group: Trade allies
Mode: Email

**PREDEFINED VARIABLES**

Prepopulated variables are shown in all caps enclosed in brackets, e.g., [PREDEFINED VARIABLE]

| Variable | Definition |
|---|---|
| NAME | Trade ally first and last name |
| BUSINESS NAME | Name of trade ally's business |
| EMAIL | Trade ally's email |

**EMAIL SURVEY MESSAGE**

Dear [NAME],

ADM Associates is the official contractor hired by Evergy to evaluate their energy-efficiency rebate/discount program. Evergy is interested in collecting feedback from registered trade allies who participated in the program in 2022. We are conducting a survey to gather information regarding your decision to participate in the program as a trade ally, as well as your overall experience with the program. This survey should take less than 15 minutes to complete and your feedback is greatly appreciated.

[Click here to complete survey]

If you have questions or require technical assistance, please email us at survey2026@surveys.admenergy.com. Thank you in advance for your time!

Kind Regards,

Katelan Scherer
ADM Associates / Contractor to Evergy

## TRADE ALLY COMPANY INFORMATION

1. What services do you offer? Please select all that apply. **[MULTI-SELECT]**
    1. Heating and air conditioning equipment
    2. Air sealing
    3. Insulation
    4. Water heating equipment
    5. Geothermal equipment
    6. Energy Auditing
    96. Other (Please specify) **[OPEN-ENDED]**

**[SHOW Q2 IF Q1 = 1, 2, 3, 4, OR 5]**

2. Are you knowledgeable of your company’s sales of [ANSWER(S) FROM Q1]?
    1. Yes
    2. No **[SKIP TO SURVEY END 2]**

3. How many people does your company employ?
    1. 1 - 5
    2. 6 - 10
    3. 11 - 15
    4. 16 - 20
    5. More than 21 staff (Please specify number of people) **[OPEN-ENDED]**

4. How many years of experience does your organization have working with utility funded energy-efficiency programs?
    1. 0 - 5 years
    2. 6 - 10 years
    3. 11 - 15 years
    4. 16 - 20 years
    5. 21 - 25 years
    6. More than 25 years
    98. Do not recall

5. What percent of your home energy-efficiency improvement projects are at residential single-family homes and what percent are at multi-family homes?
    1. Residential, single-family homes? **[NUMERIC VALUE; OPEN-ENDED]**
    2. Residential, multi-family homes? **[NUMERIC VALUE; OPEN-ENDED]**

## PROGRAM AWARENESS & INVOLVEMENT

6. How many years have you been participating in Evergy's energy-efficiency rebate programs?
    1. **[OPEN-ENDED]**
    98. Do not recall

7. Why did you decide to participate in the program? Please select all that apply. **[MULTI-SELECT]**
    1. Suggestion from ICF and/or Evergy representative
    2. To improve home efficiency for customers
    3. To be able to pass discounts/rebates onto customers
    4. To improve sales
    5. To benefit from recognition as a qualified trade ally
    96. Other (Please specify) [**OPEN-ENDED**]
    98. Do not recall

8. How professional would you say the ICF program staff are? **[INSERT 1-5 SCALE AS 1 = NOT AT ALL PROFESSIONAL TO 5 = VERY PROFESSIONAL, WITH 99 = NOT APPLICABLE**]

9. How easy is it to reach ICF staff with questions? **[INSERT 1-5 SCALE AS 1 = NOT AT ALL EASY TO 5 = VERY EASY, WITH 99 = NOT APPLICABLE**]

10. How well does the ICF staff keep you informed about the program? **[INSERT 1-5 SCALE AS 1 = NOT AT ALL INFORMED TO 5 = VERY INFORMED, WITH 99 = NOT APPLICABLE**]

11. When trying to communicate with ICF, how quickly do they respond to your emails/phone calls? **[INSERT 1-5 SCALE AS 1 = NOT AT ALL QUICKLY TO 5 = VERY QUICKLY, WITH 99 = NOT APPLICABLE**]

**[SHOW Q12 IF Q9, Q10, OR Q11 <4]**

12. What could be improved about communication between you and ICF program staff?

    **[OPEN-ENDED]**

## PROGRAM PROCEDURES

13. How satisfied have you been with the following aspects of the program in 2022? **[INSERT 1-5 SCALE AS 1 = VERY DISSATISFIED TO 5 = VERY SATISFIED, WITH 99 = NOT APPLICABLE]**
    1. The program paperwork
    2. The program measures and/or discounted/rebated equipment offered through Evergy's energy-efficiency rebate/discount program
    3. The rebate/discount payment process and/or application
    4. The Evergy energy-efficiency website

**[SHOW Q14 IF ANY OF Q13 <4]**

14. What has been less than satisfactory?

    [**OPEN-ENDED**]

**[SHOW Q15 IF ANY OF Q13 = 99]**

15. You indicated that your level of satisfaction with some of the aspects of the program were “Not applicable”? Please explain.

    [**OPEN-ENDED**]

16. Did you receive any program training in 2022?
    1. Yes
    2. No
    98. Do not recall

**[SHOW Q17 IF Q16 = 1]**

17. How helpful was the training? **[INSERT 1-5 SCALE AS 1 = NOT AT ALL HELPFUL TO 5 = VERY HELPFUL, WITH 99 = NOT APPLICABLE]**

**[SHOW Q18 IF Q17 <3]**

18. Can you tell me a bit more about why you gave that rating?

    [**OPEN-ENDED**]

**[SHOW Q19 IF Q1 = 1 OR 5]**

19. When filling out the program application/paperwork, how do you typically assign the primary heating system fuel type for each participant (i.e., gas heat vs. electric heat)?

    [**OPEN-ENDED**]

## QUALITY INSTALL (QI) PROGRAM

**[SHOW Q20 IF Q1 = 1]**

20. Did your company perform quality installations of heating and air conditioning equipment using Measure Quick or QI technology through Evergy’s energy-efficiency rebate/discount program in 2022?
    1. Yes
    2. No
    98. Not sure

**[SHOW Q21 OF Q20 = 1]**

21. What is the main benefit of using Measure Quick or QI technology?
    1. More accessible
    2. Less difficult to use
    3. Helps minimize additional tracking and reporting requirements
    96. Other (Please specify) **[OPEN-ENDED]**
    98. Not sure

**[SHOW Q22 OF Q20 = 1]**

22. What do you think the biggest challenge would be of using Measure Quick or QI technology?
    1. The initial time it would take to invest in QI installations
    2. Training employees on how to use Measure Quick/QI technology
    3. Investing money into the testing equipment
    4. The return cost of investing in Measure Quick/QI technology
    5. Getting enough customers to utilize the Measure Quick/QI technology
    96. Other (Please specify) **[OPEN-ENDED]**
    98. Not sure

**[SHOW Q23 OF Q20 = 1]**

23. Would you be willing to invest in and use the new wireless technology required to complete the QI installations?
    1. Yes
    2. No
    96. Depends (Please specify) **[OPEN-ENDED]**

**[SHOW Q24 IF Q23 = 2]**

24. Why would you <u>not</u> be willing to invest in and use the new wireless technology required to complete the QI installations?

    **[OPEN-ENDED]**

**[SHOW Q25 OF Q20 = 1]**

25. In your opinion, how beneficial would it be for your company to invest in Measure Quick or QI technology? **[INSERT 1-5 SCALE AS 1 = NOT BENEFICIAL AT ALL AND 5 = VERY BENEFICIAL, WITH 98 = NOT SURE]**

## CUSTOMER INTERACTION

26. Overall, what percent of your customers in 2022 who qualified for Evergy's energy-efficiency rebate/discount program did <u>not</u> want to participate in the program?
    1. **[OPEN-ENDED; PERCENT (0 – 100)]**
    98. Do not recall

**[SHOW Q27 IF Q26(1) >0]**

27. What is the primary reason customers typically give for not wanting to participate in the program?
    1. Cost of equipment
    2. Return on investment timeline
    3. Discount/rebate amount
    4. Requirement to use a trade ally to install the equipment
    96. Other (Please specify) **[OPEN-ENDED]**
    98. Do not recall

28. When do you initially present high efficiency options and equipment to customers?
    1. When we first interact with a customer
    2. Only when the customer requests high efficiency options
    3. We never present high efficiency options
    4. Depends on the situation (Please explain) [**OPEN-ENDED**]
    98. Do not recall

29. What do you think is the main benefit your customers receive by participating in the program?
    1. Higher efficiency equipment
    2. Home comfort
    3. Savings on equipment
    4. Lower utility bills
    96. Other (Please specify) **[OPEN-ENDED]**
    98. Not sure

## PROGRAM INFLUENCE

30. How important was Evergy's energy-efficiency rebate/discount program, including the discounts/rebates and information provided through the program, in influencing your level of marketing and selling of the energy-efficient measures to Evergy customers during 2022? [**INSERT 0 -10 SCALE AS 0 = NOT AT ALL IMPORTANT TO 10 = VERY IMPORTANT, WITH 99 = NOT APPLICABLE**]

**[SHOW Q31 IF Q30 = 99]**

31. You indicated that the influence of Evergy’s energy-efficiency rebate/discount program was “Not applicable” on your level of marketing and selling of the energy-efficient measures to Evergy customers during 2022? Please explain.
    [**OPEN-ENDED**]

32. Would you have recommended different equipment types, quantities, or efficiency levels to customers if the program were not available?
    1. Yes
    2. No
    3. Depends (Please explain) **[OPEN-ENDED]**
    98. Not sure

**MARKET**

33. Has Evergy’s energy-efficiency rebate/discount program affected the number of home energy-efficiency projects you complete? **[INSERT 1-5 SCALE AS 1 = DECREASED GREATLY, 2 = DECREASED SOMEWHAT, 3 = NEITHER INCREASED NOR DECREASED, 4 = INCREASED SOMEWHAT, 5 = INCREASEED GREATLY, WITH 99 = NOT APPLICABLE]**

34. Do you expect your total number of Evergy’s energy-efficiency rebate/discount program projects to increase, decrease, or stay the same in the next 12 months?
    1. Increase
    2. Decrease
    3. Stay the same
    98. Not sure

**[SHOW Q35 IF Q34 = 1 OR 2]**

35. Why do you think that is?
    [**OPEN ENDED**]

**CLOSING**

36. What has been the biggest challenge for you as a participating trade ally in Evergy’s energy-efficiency rebate/discount program?
    1. Communication with program staff
    2. Understanding the discount/rebate process and/or application
    3. Qualifying customers
    4. Qualifying equipment
    96. Other (Please specify) **[OPEN ENDED]**
    98. Not sure

**[SHOW Q37 IF Q36 = 1, 2, 3, 4, OR 96]**

37. Do you have any suggestions for overcoming these challenges?
    1. **[OPEN-ENDED]**
    98. Not sure

38. How would you rate your overall satisfaction with Evergy's energy-efficiency rebate/discount program? **[INSERT 1-5 SCALE AS 1 = VERY DISSATISFIED AND 5 = VERY SATISFIED, WITH 99 = NOT APPLICABLE]**

**[SHOW Q39 IF Q38 <4]**

39. What has been less than satisfactory with Evergy's energy-efficiency rebate/discount program?

    [**OPEN-ENDED**]

**[SHOW Q40 IF Q38 = 99]**

40. You indicated that your level of overall satisfaction with Evergy's energy-efficiency rebate/discount program was "Not applicable"? Please explain.

    [**OPEN-ENDED**]

41. Do you have anything else you want to mention regarding the program?
    1. **[OPEN-ENDED]**
    99. No additional comments

**SURVEY END 1**

You have now completed the survey. Thank you for your time in answering questions on behalf of Evergy's energy-efficiency rebate/discount program, have a great day!

**SURVEY END 2**

Please forward this survey to the person in your company who would have knowledge of your company's sales. On behalf of Evergy's energy-efficiency rebate/discount program, thank you for your time. Have a great day!

## L.3 Energy Saving Products - General Population Survey

Client: Evergy
Program Year: 2022
Survey Type: General Population Survey
Group: General Customer Population
Mode: Email

### INTRODUCTORY MESSAGE

**Evergy is conducting a survey regarding their customers' energy efficient product purchases. If you are an Evergy customer who purchased energy efficient products in 2022, we would appreciate your feedback. Upon completion of this survey, you will receive a $5 electronic gift card where you can choose from a variety of retailers to thank you for your time. On average this survey will should take around 15 minutes to complete.**

**If you have questions about this survey or require technical assistance, please reach out to us at survey2026@surveys.admenergy.com. Click below to see if you qualify for the survey.**

**Thank you in advance for your time!**

## SCREENING

1. Who is your current electricity service provider?
    1. Evergy
    2. Ameren [**TERMINATE SURVEY]**
    96. Other (Please specify) **[OPEN ENDED]** [**TERMINATE SURVEY]**
    98. Do not recall [**TERMINATE SURVEY]**
2. Did you purchase ENERGY STAR® certified LED lightbulbs in 2022? **We have included an example image of an LED lightbulb and the ENERGY STAR® logo below to help you remember what this item would look like.**
    1. Yes
    2. No [**SKIP TO Q36]**
    3. Do not recall [**SKIP TO Q36]**

**[SHOW Q3 AND Q4 IF Q2 = 1]**

3. What type of LED lightbulbs did you purchase? We have included an example image of standard and specialty LED lightbulbs below to help you remember what they would look like. Please select all that apply. **[MULTI-SELECT]**
    1. Standard LED bulb(s)
    2. Specialty LED bulb(s)
    96. Other (Please specify) **[OPEN ENDED]**
    98. Do not recall

Standard LED bulb example

Specialty LED bulbs examples

4. Where did you buy LED lightbulbs in 2022? [**MULTI-SELECT]**
    1. Ace Hardware
    2. Batteries Plus
    3. Costco
    4. Do It Best
    5. Dollar Tree
    6. Goodwill
    7. Habitat Restore
    8. Lowe’s
    9. Sam’s Club
    10. Target
    11. The Home Depot
    12. True Value
    13. Walmart
    96. Other (Please specify) **[OPEN-ENDED]**
    98. Do not recall

**[SHOW Q5 - Q34 IF Q4 = 1 – 96]**

**STANDARD BULBS MEASURE QUESTIONS**

**[SHOW Q5 - Q17 IF Q3 = 1]**

5. In total, about how many standard LED lightbulbs did you purchase in 2022?
    1. Number purchased: [**NUMERIC; OPEN-ENDED**]
    98. Do not recall

**[SHOW Q6 AND Q7 IF Q5(1) >0]**

6. How many of the [Q5 Response] standard LED lightbulbs you purchased in 2022 are currently installed in the following areas? **[INCLUDE VALIDATION-TOTAL MUST EQUAL Q5 RESPONSE]**
    1. Indoor - Single-family home [**NUMERIC OPEN-ENDED]**
    2. Indoor – Multi-family (e.g., apartment, duplex) **[NUMERIC OPEN-ENDED]**
    3. Outdoor – Residential or Multifamily **[NUMERIC OPEN-ENDED]**
    4. Commercial Space **[NUMERIC OPEN-ENDED]**
    5. Not Installed/In Storage **[NUMERIC OPEN-ENDED]**
    6. Do not recall **[NUMERIC OPEN-ENDED]**

**[SHOW Q7 IF SUM(Q6[1-4]) >0]**

7. How many of each of the following types of lightbulbs did you replace with new standard LED lightbulbs? [**INCLUDE VALIDATION: TOTAL MUST EQUAL Q6[1-4] RESPONSE]**
    1. Traditional incandescent/halogen [**OPEN-ENDED**]
    2. CFLs [**OPEN-ENDED**]
    3. LED [**OPEN-ENDED**]
    4. I installed bulbs in fixture or socket where there was none before [**OPEN-ENDED]**
    98. Do not recall **[NUMERIC OPEN-ENDED]**

8. Why did you buy the standard LED lightbulbs? (Please select all that apply) [**MULTI-SELECT**]
    1. Replace burned out bulbs
    2. Replace old, inefficient bulbs
    3. Replace working bulbs with a different color or brightness
    4. Install new light fixture or lamp socket
    5. To have spare bulbs on hand
    96. Other (Please specify) [**OPEN-ENDED**]

9. Which is the most important characteristic you consider when purchasing standard lightbulbs? **[RANDOMIZE 1-8]**
    1. Price
    2. Energy efficiency
    3. ENERGY STAR® certification
    4. Brightness of the bulb
    5. How long the bulb lasts
    6. The ability to dim the bulb
    7. Color of the light
    96. Other (Please specify) [**OPEN-ENDED**]
    98. Do not recall

## AWARENESS OF ENERGY EFFICIENCY INCENTIVE / PROGRAM AWARENESS

10. Were any of the standard LED lightbulbs you bought in 2022 discounted from their normal pricing?
    1. Yes
    2. No
    98. Do not recall

**[SHOW Q11 IF Q10 = 1]**

11. Were any of the standard LED lightbulbs you bought in 2022 discounted by Evergy?
    1. Yes
    2. No
    98. Do not recall

[**SHOW Q12 IF Q11 = 1**]

12. Using the scale below, how important was the Evergy discount in your decision to buy standard LED lightbulbs instead of another type of standard lightbulb? **[INSERT 1-5 SCALE WITH 1 = NOT AT ALL IMPORTANT AND 5 = EXTREMELY IMPORTANT, WITH 98 = NOT SURE, 99 = NOT APPLICABLE]**

## COST SENSITIVITY

13. Would you have bought the standard LED lightbulbs instead of a less efficient type of standard lightbulb if the LEDs had cost $1.00 more per bulb?
    1. Definitely would have purchased
    2. Probably would have purchased
    3. Not sure if you would have purchased
    4. Probably would not have purchased
    5. Definitely would not have purchased

**[SHOW Q14 IF Q13 = 1 OR 2]**

14. If the standard LED lightbulbs had cost $1.00 more per bulb would you have bought the same number of LEDs?
    1. I would have bought fewer standard LED lightbulbs
    2. I would have bought the same quantity
    98. Not sure

**[SHOW Q15 IF Q5(1) >0 AND Q14 = 1]**

15. About how many standard LED lightbulbs would you have bought if the LEDs had cost $1.00 more per bulb?
    1. Number of bulbs: **[NUMERIC; OPEN-ENDED; INCLUDE VALIDATION-CANNOT BE MORE THAN Q5(1) RESPONSE**]
    98. Not sure

16. Had you ever bought standard LED lightbulbs before 2022?
    1. Yes
    2. No
    98. Do not recall

**[SHOW Q17 IF Q16 = 1]**

17. Were the standard LED lightbulbs you bought before 2022 discounted by Evergy from the normal pricing?
    1. Yes
    2. No
    98. Do not recall

**SPECIALTY BULBS MEASURE QUESTIONS**

**[SHOW Q18 - Q30 IF Q3 = 2]**

18. In total, how many specialty LED lightbulbs did you purchase in 2022?
    1. Number purchased: [**NUMERIC; OPEN-ENDED**]
    98. Do not recall

**[SHOW Q19 AND Q20 IF Q18(1) >0]**

19. How many of the [Q18 RESPONSE] specialty LED lightbulbs you purchased in 2022 are currently installed in the following areas? **[INCLUDE VALIDATION: TOTAL MUST EQUAL Q18 RESPONSE]**
    1. Indoor - Residential [**NUMERIC OPEN-ENDED]**
    2. Indoor - Multifamily **[NUMERIC OPEN-ENDED]**
    3. Outdoor – Residential or Multifamily **[NUMERIC OPEN-ENDED]**
    4. Commercial Space **[NUMERIC OPEN-ENDED]**
    5. Not Installed/In Storage **[NUMERIC OPEN-ENDED]**
    98. Do not recall **[NUMERIC OPEN-ENDED]**

20. How many of each of the following types of lightbulbs did you replace with new specialty LED lightbulbs? **[INCLUDE VALIDATION: TOTAL MUST EQUAL SUM OF Q19[1-4] RESPONSE]**
    1. Traditional incandescent/halogen [**OPEN-ENDED**]
    2. CFLs [**OPEN-ENDED**]
    3. LED [**OPEN-ENDED**]
    4. I installed bulbs in fixture or socket where there was none before [**OPEN-ENDED**]
    98. Do not recall **[NUMERIC OPEN-ENDED]**

21. Why did you buy the specialty LED lightbulbs? (Please select all that apply) [**MULTI-SELECT**]
    1. Replace burned out bulbs
    2. Replace old, inefficient bulbs
    3. Replace working bulbs with a different color or brightness
    4. Install new light fixture or lamp socket
    5. Stock up
    96. Other (Please specify) [**OPEN-ENDED**]

22. Which is the most important characteristic you consider when purchasing specialty lightbulbs? **[RANDOMIZE 1-8]**
    1. Price
    2. Energy efficiency
    3. ENERGY STAR® certification
    4. Brightness of the bulb
    5. How long the bulb lasts
    6. The ability to dim the bulb
    7. Color of the light
    97. Other (Please specify) [**OPEN-ENDED**]
    98. Not sure

## AWARENESS OF EE INCENTIVE / PROGRAM AWARENESS

23. Were any of the specialty LED lightbulbs you bought in 2022 discounted from their normal pricing?
    1. Yes
    2. No
    98. Do not recall

**[SHOW Q24 IF Q23 = 1]**

24. Were any of the specialty LED lightbulbs you bought in 2022 discounted by Evergy?
    1. Yes
    2. No
    98. Do not recall

[**SHOW Q25 IF Q24 = 1**]

25. Using the scale below, how important was the Evergy discount in your decision to buy specialty LED lightbulbs instead of another type of specialty lightbulb? **[INSERT 1-5 SCALE WITH 1 = NOT AT ALL IMPORTANT AND 5 = EXTREMELY IMPORTANT, WITH 98 = NOT SURE, 99 = NOT APPLICABLE]**

## COST SENSITIVITY

26. Would you have bought the specialty LED lightbulbs instead of a less efficient type of specialty lightbulb if the LEDs had cost $1.50 more per bulb?
    1. Definitely would have purchased
    2. Probably would have purchased
    3. Not sure if you would have purchased
    4. Probably would <u>not</u> have purchased
    5. Definitely would <u>not</u> have purchased

**[SHOW Q27 IF Q26 = 1 OR 2]**

27. If the specialty LED lightbulbs had cost $1.50 more per bulb would you have bought the same number of LEDs?
    1. I would have bought fewer LED lightbulbs
    2. I would have bought the same quantity
    98. Not sure

**[SHOW Q28 IF Q18 >0 AND Q27 = 1]**

28. About how many of the specialty LED lightbulbs would you have bought if the LEDs had cost $1.50 more per bulb?
    1. Number of bulbs: **[NUMERIC; OPEN-ENDED; INCLUDE VALIDATION-CANNOT BE MORE THAN Q18 (1) RESPONSE**]
    98. Not sure

29. Had you ever bought specialty LED lightbulbs before 2022?
    1. Yes
    2. No
    98. Do not recall

**[SHOW Q30 IF Q29 = 1]**

30. Were the specialty LED lightbulbs you bought before 2022 discounted by Evergy from the normal pricing?
    1. Yes
    2. No
    98. Do not recall

**[SHOW Q31 IF Q11 = 1 OR Q17 = 1 OR Q24 = 1 OR Q30 = 1]**

31. How did you first learn about Evergy's lighting discounts? **[RANDOMIZE 1-13]**
    1. Newspaper/magazine/print media
    2. In-store display
    3. Bill inserts
    4. Message printed on your bill
    5. Evergy website
    6. Friend or relative (word-of-mouth)
    7. TV ad
    8. Evergy representative
    9. Evergy newsletter
    10. Community event
    11. Social media (such as Facebook or Twitter)
    12. Home Energy Report
    13. Salesperson
    14. I wasn't aware that Evergy provided lighting discounts
    96. Other (Please specify) **[OPEN-ENDED]**
    98. Do not recall

## LEAKAGE EVALUATION

32. Please indicate how long you would be willing to drive (in minutes) to reach each of the following retail location types to purchase lightbulbs. **[GRID SHOW]**
    DIY store (e.g., Home Depot, Lowe's)
    Big box retailer (e.g., Walmart, Target)
    Wholesale membership club (e.g., Costco, Sam's Club)

    1. 0-4 minutes
    2. 5-9 minutes
    3. 10-14 minutes
    4. 15-19 minutes
    5. 20-24 minutes
    6. 25-29 minutes
    7. 30-39 minutes
    8. 40-49 minutes
    9. 50-59 minutes
    10. 60 minutes or more
    97. Not applicable
    98. Not sure

33. Using the scale below, please rate how satisfied you are with each of the following. [**INSERT SCALE AS DEFINED AS 1=VERY DISSATISFIED TO 5=VERY SATISFIED, WITH 98 = NOT SURE / NOT APPLICABLE**]
    1. The savings on your electricity bills since installing the LED lightbulbs
    2. Quality of LED lightbulbs you purchased
    3. The discount amount on the LED lightbulbs you purchased

**[SHOW Q34 IF ANY IN Q33 <3]**

34. Why were you dissatisfied with some aspects of the LED lightbulbs you purchased?
    [**OPEN-ENDED**]

35. Approximately what percentage of total lightbulbs in your home are currently LED lightbulbs?
    1. Percentage: **[OPEN-ENDED; NUMERIC VALUE]**
    98. Not sure

## SPILLOVER INTRODUCTION

36. Have you had any of the following energy-efficient equipment installed or made any of the following energy-saving upgrades to your home in 2022? (Please select all that apply) **[MULTI-SELECT]**
    1. Energy-efficient central air conditioner
    2. Energy-efficient air source heat pump
    3. Energy-efficient ground source heat pump
    4. Energy-efficient ductless mini-split heat pump
    5. Attic insulation
    6. Air sealing (e.g., weather stripping for doors/windows, door sweeps)
    7. Faucet aerators
    8. Low-flow showerheads
    9. Advanced power strips that control energy use
    10. Hot water pipe insulation
    11. Refrigerator
    12. Freezer
    13. Dishwasher
    14. Clothes washer
    15. Clothes dryer
    16. Air purifier
    17. Dehumidifier
    18. Other type of home insulation (not attic insulation)
    19. Smart thermostat
    96. Other energy efficient equipment/upgrade (Please specify) [**OPEN-ENDED**]

98. Do not recall

**[SHOW Q37 IF Q36 = 1 – 19 OR 96 OR IF Q4 = 96]**

37. Did you know that Evergy offers incentives, discounts, and rebates for qualifying energy-efficient equipment/upgrades?
    1. Yes
    2. No
    98. Not sure

**[SHOW Q38 IF Q37 = 1]**

38. Did you receive a discount or rebate from Evergy for any of the following energy-efficient equipment/upgrades that were installed in your home in 2022? **[INSERT OPTIONS DEFINED AS 1 = YES, 2 = NO, AND 98 = NOT SURE]**
    1. **[SHOW IF Q36 = 1]** Energy-efficient central air conditioner
    2. **[SHOW IF Q36 = 2]** Energy-efficient air source heat pump
    3. **[SHOW IF Q36 = 3]** Energy-efficient ground source heat pump
    4. **[SHOW IF Q36 = 4]** Energy-efficient ductless mini-split heat pump
    5. **[SHOW IF Q36 = 5]** Attic insulation
    6. **[SHOW IF Q36 = 6]** Air sealing (e.g., weather stripping for doors/windows, door sweeps)
    7. **[SHOW IF Q36 = 7]** Faucet aerators
    8. **[SHOW IF Q36 = 8]** Low-flow showerheads
    9. **[SHOW IF Q36 = 9]** Advanced power strips that control energy use
    10. **[SHOW IF Q36 = 10]** Hot water pipe insulation
    11. **[SHOW IF Q36 = 19]** Smart thermostat
    96. **[SHOW IF Q36 = 96]** Other energy efficient equipment/upgrade

**[SHOW Q39 IF ANY IN Q38 = 2]**

39. What is the main reason you did not receive an Evergy incentive, rebate, or discount for the energy-efficient equipment/upgrades you made?
    1. Did not have the time to complete rebate application
    2. Did not think the rebate amount was worth the time it took to complete a rebate application
    3. Found out about rebate too late
    4. Contractor I worked with did not offer Evergy rebates/discounts
    5. Submitted a rebate application that was rejected
    6. Equipment did not meet Evergy’s qualifications to receive a rebate
    96. For some other reason (Please describe) **[OPEN-ENDED]**
    98. Do not recall

**[SHOW Q40 IF ANY IN Q38 = 2]**

40. Have you received an incentive, discount, and/or rebate from Evergy or participated in a program through Evergy in the past 3 years?
    1. Yes
    2. No
    98. Not sure

## SPILLOVER MEASURE CHARACTERISTICS

**[SHOW Q41 IF Q38(1 –4) = 2]**

41. What is the efficiency rating of the HVAC unit that was installed?
    1. SEER: **[NUMERIC; OPEN-ENDED]**
    2. EER: **[NUMERIC; OPEN-ENDED]**
    98. Not sure

**[SHOW Q42 – Q46 IF Q38(5) = 2]**

42. Approximately, what size (in square feet) is the attic where the insulation is installed?
    1. Square feet: **[NUMERIC; OPEN-ENDED]**
    98. Not sure

43. What type of insulation was installed in the attic?
    1. Blown-in (loose)
    2. Rolls or batts of insulation
    3. Foam sprayed insulation
    98. Not sure

44. What is the R-value of the insulation that was installed?
    1. R-value: **[NUMERIC; OPEN-ENDED]**
    98. Not sure

45. About how many inches of insulation were in the attic before the new insulation was added?
    1. None
    2. About 1’ to 3” thickness of insulation
    3. 4” to 8” insulation
    4. 8” to 15” Insulation
    5. More than 15” of insulation
    98. Not sure

46. How many inches of insulation were added to the attic?
    1. About 1’ to 3” thickness of insulation
    2. 4” to 8” insulation
    3. 8” to 15” Insulation
    4. More than 15” of insulation
    98. Not sure

**[SHOW Q47 IF Q38(6) = 2]**

47. What type of air sealing did you have installed in your home? (Please select all that apply) **[MULTI-SELECT]**
    1. Installed weather stripping on exterior doors
    2. Installed weather stripping on windows
    3. Installed door sweeps on exterior doors
    4. Spray foamed holes
    5. Added caulked edges/seams
    96. Something else (Please describe) **[OPEN-ENDED]**
    98. Not sure

**[SHOW Q48 IF Q4= 96]**

48. Earlier you said you purchased LEDs lightbulbs from a different retailer listed. How many of the LED lightbulbs did you purchase AND install from [ANSWER TO Q4(96)] in 2022?
    1. **[OPEN-ENDED]**
    98. Do not recall

**[SHOW Q48 IF Q38(7) = 2]**

49. How many faucet aerator(s) did you install on a kitchen or bathroom faucet in your home?
    1. Number installed on a kitchen faucet: **[OPEN-ENDED; NUMERIC VALUE]**
    2. Number installed on a bathroom faucet: **[OPEN-ENDED; NUMERIC VALUE]**

**[SHOW Q50 IF Q49(1) > 0]**

50. Is the flow rate for the faucet aerator(s) you installed less than 2.2 gallons per minute (GPM)?
    1. Yes
    2. No
    98. Not sure

**[SHOW Q51 IF Q38(8) = 2]**

51. How many low-flow showerhead(s) did you install in your home?
    **[OPEN-ENDED; NUMERIC VALUE]**

**[SHOW Q52 IF Q51 > 0]**

52. Is the flow rate for the low-flow showerhead(s) you installed less than 2.0 gallons per minute (GPM)?
    1. Yes
    2. No
    98. Not sure

**[SHOW Q53 - Q55 IF Q38(9) = 2]**

53. You mentioned that you installed advanced power strip(s). Just to clarify, does the power strip(s) that you installed **automatically shut off power to other devices** to help you save energy?
    1. Yes
    2. No
    98. Not sure

54. How many outlets are in the power strip(s)? Please select all that apply. **[MULTI-SELECT]**
    1. 5 outlets
    2. 7 outlets
    96. A different number of outlets (Please specify) **[OPEN-ENDED]**

55. What kind of equipment do you have plugged into the control outlet of the smart power strip? (Please select more than one if you are using more than one smart power strip for different uses) **[MULTI-SELECT]**
    1. A computer
    2. A television
    3. Something else (Please describe) **[OPEN-ENDED]**
    4. Nothing
    98. Not sure

**[SHOW Q56 IF Q38(10) = 2]**

56. How many feet of hot water pipe insulation were installed?

    1. **[OPEN-ENDED; NUMERIC VALUE]**
    98. Not sure

**[SHOW Q57 IF Q36( = 11 – 17]**

57. Were the following appliance(s) that were installed ENERGY STAR® certified? **[INSERT OPTIONS DEFINED AS 1 = YES, 2 = NO, AND 98 = NOT SURE]**
    1. **[SHOW IF Q36 = 11]** Refrigerator
    2. **[SHOW IF Q36 = 12]** Freezer
    3. **[SHOW IF Q36 = 13]** Dishwasher
    4. **[SHOW IF Q36 = 14]** Clothes washer
    5. **[SHOW IF Q36 = 15]** Clothes dryer
    6. **[SHOW IF Q36 = 16]** Air purifier
    7. **[SHOW IF Q36 = 17]** Dehumidifier

**[SHOW Q58 IF Q36 = 15]**

58. Does the clothes dryer that was installed use electricity or gas to dry your clothes?
    1. Electricity
    2. Gas
    98. Not sure

**[SHOW Q57 - Q64 IF Q36 = 18]**

59. You mentioned that you had insulation installed somewhere in your home other than your attic. About what square footage in your home does the new insulation cover?
    1. Square feet **[NUMERIC VALUE; OPEN-ENDED]**
    98. Not sure

60. Where is the insulation installed in your home?
    1. Walls
    2. Floor (above crawlspace)
    3. Basement sidewall
    4. Rim/Band joist
    96. Some other location (Please specify)

61. What type of insulation was installed?
    1. Blown-in (loose)
    2. Rolls or batts of insulation
    3. Foam sprayed insulation
    98. Not sure

62. What is the R-value of the insulation that was installed?
    1. R-value: **[NUMERIC; OPEN-ENDED]**
    98. Not sure

63. About how many inches of insulation were there before the new insulation was added?
    1. None
    2. About 1” to 3” thickness of insulation
    3. 4” to 8” insulation
    4. 8” to 15” Insulation
    5. More than 15” of insulation
    98. Not sure

64. How many inches of insulation were added?
    1. About 1” to 3” thickness of insulation
    2. 4” to 8” insulation
    3. 8” to 15” Insulation
    4. More than 15” of insulation
    98. Not sure

**[SHOW Q65- Q66 IF Q38(11) = 2]**

65. Is the smart thermostat that was installed connected to the internet?
    1. Yes
    2. No
    98. Not sure

66. Does the smart thermostat control a central air conditioning system, a central heating system, or both?
    1. Central air conditioning only
    2. Central heating only
    3. Both central air conditioning and heating
    98. Not sure

### SPILLOVER ATTRIBUTION – HVAC EQUIPMENT

**[SHOW Q67 – Q71 IF Q38(1 - 4) = 2]**

67. When you were deciding to have the energy efficient heating/cooling equipment you mentioned installed, did you consider any of the following sources of information? **[INSERT OPTIONS DEFINED AS 1 = YES, 2 = NO, AND 98 = NOT SURE]**
    1. Emails from Evergy about saving energy
    2. Information from a general online search, Evergy or Spire’s website, social media advertisement, television or radio advertisement, or billboard advertisement
    3. Bill inserts or other mailings from Evergy
    4. Evergy call center or Connect call center referral
    5. Information from a community event
    6. Information from a contractor or retailer of Evergy’s incentives
    7. Information from people who received a rebate from Evergy for installing energy-efficient equipment/home upgrades

**[SHOW Q68 - Q71 IF ANY IN Q67= 1]**

68. How important was that information in your decision to have the energy efficient heating/cooling equipment installed? **[INSERT 0-10 SCALE; 0 = NOT AT ALL IMPORTANT, 10 = VERY IMPORTANT, WITH 98 = NOT SURE]**

69. How likely would you have been to have the energy efficient heating/cooling equipment installed if you had not seen that information from Evergy? **[INSERT 0-10 SCALE; 0 = NOT AT ALL LIKELY, 10 = VERY LIKELY, WITH 99 = NOT APPLICABLE]**

70. In your own words, please tell us how the information from Evergy influenced your decision to have the energy efficient heating and cooling equipment installed.

71. Why did you choose to install energy efficient heating and cooling equipment instead of standard efficiency equipment? (Please select all that apply) **[MULTI-SELECT]**
    1. To save energy
    2. To save on energy costs
    3. It was the only option recommended or available
    4. The price was good
    5. To make my home more comfortable
    96. For some other reason (Please describe) **[OPEN-ENDED]**

## SPILLOVER ATTRIBUTION – INSULATION

**[SHOW Q72 - Q75 IF Q38(5) = 2 OR Q36 = 18]**

72. When you were deciding to have the insulation you mentioned installed, did you consider any of the following sources of information? **[INSERT OPTIONS DEFINED AS 1 = YES, 2 = NO, AND 98 = NOT SURE]**
    1. Emails from Evergy about saving energy
    2. Information from a general online search, Evergy or Spire's website, social media advertisement, television or radio advertisement, or billboard advertisement
    3. Bill inserts or other mailings from Evergy
    4. Evergy call center or Connect call center referral
    5. Information from a community event
    6. Information from a contractor or retailer of Evergy's incentives
    7. Information from people who received a rebate from Evergy for installing energy-efficient equipment/home upgrades

**[SHOW Q73 - Q75 IF ANY IN Q72= 1]**

73. How important was that information in your decision to have the insulation installed? **[INSERT 0-10 SCALE; 0 = NOT AT ALL IMPORTANT, 10 = VERY IMPORTANT**

74. How likely would you have been to have the insulation installed if you had not seen that information from Evergy? **[INSERT 0-10 SCALE; 0 = NOT AT ALL LIKELY, 10 = VERY LIKELY]**

75. Why did you choose to have the insulation installed? (Please select all that apply) **[MULTI-SELECT]**
    1. To save energy
    2. To save on energy costs
    3. The price was good
    4. To make my home more comfortable
    96. For some other reason (Please describe) **[OPEN-ENDED]**

## SPILLOVER ATTRIBUTION – AIR SEALING

**[SHOW Q76 - Q79 IF Q38(6) = 2]**

76. When you were deciding to make the air sealing improvements you mentioned, did you consider any of the following sources of information? **[INSERT OPTIONS DEFINED AS 1 = YES, 2 = NO, AND 98 = NOT SURE]**
    1. Emails from Evergy about saving energy
    2. Information from a general online search, Evergy or Spire's website, social media advertisement, television or radio advertisement, or billboard advertisement
    3. Bill inserts or other mailings from Evergy
    4. Evergy call center or Connect call center referral
    5. Information from a community event
    6. Information from a contractor or retailer of Evergy's incentives
    7. Information from people who received a rebate from Evergy for installing energy-efficient equipment/home upgrades

**[SHOW Q77- Q79 IF ANY IN Q76= 1]**

77. How important was that information in your decision to make the air sealing improvements? **[INSERT 0-10 SCALE; 0 = NOT AT ALL IMPORTANT, 10 = VERY IMPORTANT]**

78. How likely would you have been to make the air sealing improvements if you had not seen that information from Evergy? **[INSERT 0-10 SCALE; 0 = NOT AT ALL LIKELY, 10 = VERY LIKELY]**

79. Why did you choose to make the air sealing improvements? (Please select all that apply) **[MULTI-SELECT]**
    1. To save energy
    2. To save on energy costs
    3. The price was good
    4. To make my home more comfortable
    96. For some other reason (Please describe) **[OPEN-ENDED]**

## SPILLOVER ATTRIBUTION – LED LIGHTBULBS

**[SHOW Q80 - Q83 IF Q48 > 0]**

80. When you were deciding to buy the LED lightbulbs from [ANSWER TO Q4(96)], did you consider any of the following sources of information? **[INSERT OPTIONS DEFINED AS 1 = YES, 2 = NO, AND 98 = NOT SURE]**
    1. Emails from Evergy about saving energy
    2. Information from a general online search, Evergy or Spire's website, social media advertisement, television or radio advertisement, or billboard advertisement

3. Bill inserts or other mailings from Evergy
4. Evergy call center or Connect call center referral
5. Information from a community event
6. Information from a contractor or retailer of Evergy's incentives
7. Information from people who received a rebate from Evergy for installing energy-efficient equipment/home upgrades

**[SHOW Q81 - Q83 IF ANY IN Q80= 1]**

81. How important was that information in your decision to buy the LED lightbulbs? **[INSERT 0-10 SCALE; 0 = NOT AT ALL IMPORTANT, 10 = VERY IMPORTANT]**

82. How likely would you have been to buy the LED lightbulbs if you had not seen that information from Evergy? **[INSERT 0-10 SCALE; 0 = NOT AT ALL LIKELY, 10 = VERY LIKELY]**

83. Why did you choose to buy LED lightbulbs instead of another type of lightbulb? (Please select all that apply) **[MULTI-SELECT]**
    1. To save energy
    2. To save on energy costs
    3. The price was good
    96. For some other reason (Please describe) **[OPEN-ENDED]**

## SPILLOVER ATTRIBUTION – FAUCET AERATORS AND LOW-FLOW SHOWERHEADS

**[SHOW Q84 - Q87 OF Q38(7) = 2 OR Q38(8) = 2]**

84. When you were deciding to install the faucet aerators or low-flow showerheads you mentioned, did you consider any of the following sources of information? **[INSERT OPTIONS DEFINED AS 1 = YES, 2 = NO, AND 98 = NOT SURE]**
    1. Emails from Evergy about saving energy
    2. Information from a general online search, Evergy or Spire's website, social media advertisement, television or radio advertisement, or billboard advertisement
    3. Bill inserts or other mailings from Evergy
    4. Evergy call center or Connect call center referral
    5. Information from a community event
    6. Information from a contractor or retailer of Evergy's incentives
    7. Information from people who received a rebate from Evergy for installing energy-efficient equipment/home upgrades

**[SHOW Q85 - Q87 IF ANY IN Q67= 1]**

85. How important was that information in your decision to install the faucet aerators or low-flow showerheads? **[INSERT 0-10 SCALE; 0 = NOT AT ALL IMPORTANT, 10 = VERY IMPORTANT]**

86. How likely would you have been to install the faucet aerators or low-flow showerheads if you had not seen that information from Evergy? **[INSERT 0-10 SCALE; 0 = NOT AT ALL LIKELY, 10 = VERY LIKELY]**

87. Why did you choose to install the faucet aerators or low-flow showerheads? (Please select all that apply) **[MULTI-SELECT]**
    1. To save energy
    2. To save water
    3. To save on energy/water costs
    4. The price was good
    96. For some other reason (Please describe) **[OPEN-ENDED]**

## SPILLOVER ATTRIBUTION – ADVANCED POWER STRIPS

**[SHOW Q88 - Q91 IF Q38(9) = 2]**

88. When you were deciding to install the advanced power strips you mentioned, did you consider any of the following sources of information? **[INSERT OPTIONS DEFINED AS 1 = YES, 2 = NO, AND 98 = NOT SURE]**
    1. Emails from Evergy about saving energy
    2. Information from a general online search, Evergy or Spire’s website, social media advertisement, television or radio advertisement, or billboard advertisement
    3. Bill inserts or other mailings from Evergy
    4. Evergy call center or Connect call center referral
    5. Information from a community event
    6. Information from a contractor or retailer of Evergy’s incentives
    7. Information from people who received a rebate from Evergy for installing energy-efficient equipment/home upgrades

**[SHOW Q89 - Q91 IF ANY IN Q88= 1]**

89. How important was that information in your decision to install the advanced power strips? **[INSERT 0-10 SCALE; 0 = NOT AT ALL IMPORTANT, 10 = VERY IMPORTANT]**

90. How likely would you have been to install the advanced power strips if you had not seen that information from Evergy? **[INSERT 0-10 SCALE; 0 = NOT AT ALL LIKELY, 10 = VERY LIKELY]**

91. Why did you choose to install the advanced power strips? (Please select all that apply) **[MULTI-SELECT]**
    1. To save energy
    2. To save on energy costs
    3. The price was good
    96. For some other reason (Please describe) **[OPEN-ENDED]**

## SPILLOVER ATTRIBUTION – HOT WATER PIPE INSULATION

**[SHOW Q92 - Q95 IF Q38(10) = 2]**

92. When you were deciding to install the hot water pipe insulation you mentioned, did you consider any of the following sources of information? **[INSERT OPTIONS DEFINED AS 1 = YES, 2 = NO, AND 98 = NOT SURE]**
    1. Emails from Evergy about saving energy
    2. Information from a general online search, Evergy or Spire’s website, social media advertisement, television or radio advertisement, or billboard advertisement
    3. Bill inserts or other mailings from Evergy
    4. Evergy call center or Connect call center referral
    5. Information from a community event
    6. Information from a contractor or retailer of Evergy’s incentives
    7. Information from people who received a rebate from Evergy for installing energy-efficient equipment/home upgrades

**[SHOW Q93 - Q95 IF ANY IN Q92= 1]**

93. How important was that information in your decision to have the hot water pipe insulation installed? **[INSERT 0-10 SCALE; 0 = NOT AT ALL IMPORTANT, 10 = VERY IMPORTANT]**

94. How likely would you have been to have the hot water pipe insulation installed if you had not seen that information from Evergy? **[INSERT 0-10 SCALE; 0 = NOT AT ALL LIKELY, 10 = VERY LIKELY]**

95. Why did you choose to install the advanced power strips? (Please select all that apply) **[MULTI-SELECT]**
    1. To save energy
    2. To save on energy costs
    3. The price was good
    96. For some other reason (Please describe) **[OPEN-ENDED]**

## SPILLOVER ATTRIBUTION – APPLIANCES

**[SHOW Q96 - Q99 IF Q36 = 11 - 17]**

96. When you were deciding to have the ENERGY STAR® appliance(s) you mentioned installed, did you consider any of the following sources of information? **[INSERT OPTIONS DEFINED AS 1 = YES, 2 = NO, AND 98 = NOT SURE]**
    1. Emails from Evergy about saving energy
    2. Information from a general online search, Evergy or Spire's website, social media advertisement, television or radio advertisement, or billboard advertisement
    3. Bill inserts or other mailings from Evergy
    4. Evergy call center or Connect call center referral
    5. Information from a community event

**[SHOW Q97- Q99 IF ANY IN Q96 = 1]**

97. How important was that information in your decision to have the ENERGY STAR® appliance(s) installed? **[INSERT 0-10 SCALE; 0 = NOT AT ALL IMPORTANT, 10 = VERY IMPORTANT]**

98. How likely would you have been to have the ENERGY STAR® appliance(s) installed if you had not seen that information from Evergy? **[INSERT 0-10 SCALE; 0 = NOT AT ALL LIKELY, 10 = VERY LIKELY]**

99. Why did you choose to install the ENERGY STAR® appliance(s)? (Please select all that apply) **[MULTI-SELECT]**
    1. To save energy
    2. To save on energy costs
    3. The price was good
    4. You liked the features or appearance of the appliance
    96. For some other reason (Please describe) **[OPEN-ENDED]**

## SPILLOVER ATTRIBUTION – SMART THERMOSTAT

**[SHOW Q100 - Q103 IF Q38(19) = 2]**

100. When you were deciding to have the smart thermostat you mentioned installed, did you consider any of the following sources of information? **[INSERT OPTIONS DEFINED AS 1 = YES, 2 = NO, AND 98 = NOT SURE]**
    1. Emails from Evergy about saving energy
    2. Information from a general online search, Evergy or Spire's website, social media advertisement, television or radio advertisement, or billboard advertisement
    3. Bill inserts or other mailings from Evergy
    4. Evergy call center or Connect call center referral

5. Information from a community event
6. Information from a contractor or retailer of Evergy's incentives
7. Information from people who received a rebate from Evergy for installing energy-efficient equipment/home upgrades

**[SHOW Q101 - Q103 IF ANY IN Q100= 1]**

101. How important was that information in your decision to have the smart thermostat installed? **[INSERT 0-10 SCALE; 0 = NOT AT ALL IMPORTANT, 10 = VERY IMPORTANT]**

102. How likely would you have been to have the smart thermostat installed if you had not seen that information from Evergy? **[INSERT 0-10 SCALE; 0 = NOT AT ALL LIKELY, 10 = VERY LIKELY]**

103. Why did you choose to install the smart thermostat? (Please select all that apply) **[MULTI-SELECT]**

1. To save energy
2. To save on energy costs
3. The price was good
4. You liked the features or appearance of the thermostat
96. For some other reason (Please describe) **[OPEN-ENDED]**

## SPILLOVER ATTRIBUTION – OTHER EQUIPMENT

**[SHOW Q104 - Q107 IF Q38(96) = 2]**

104. When you were deciding on the other energy efficient upgrades you mentioned, did you consider any of the following sources of information? **[INSERT OPTIONS DEFINED AS 1 = YES, 2 = NO, AND 98 = NOT SURE]**

1. Emails from Evergy about saving energy
2. Information from a general online search, Evergy or Spire's website, social media advertisement, television or radio advertisement, or billboard advertisement
3. Bill inserts or other mailings from Evergy
4. Evergy call center or Connect call center referral
5. Information from a community event
6. Information from a contractor or retailer of Evergy's incentives
7. Information from people who received a rebate from Evergy for installing energy-efficient equipment/home upgrades

**[SHOW Q105 – Q107 IF ANY IN Q104= 1]**

105. How important was that information in your decision to make those energy efficiency improvements? **[INSERT 0-10 SCALE; 0 = NOT AT ALL IMPORTANT, 10 = VERY IMPORTANT]**

106. How likely would you have been to make those energy efficiency improvements if you had not seen that information from Evergy? **[INSERT 0-10 SCALE; 0 = NOT AT ALL LIKELY, 10 = VERY LIKELY]**

107. Why did you choose to make those energy efficiency improvements? (Please select all that apply) **[MULTI-SELECT]**

    1. To save energy
    2. To save on energy costs
    3. The price was good
    4. To improve home comfort
    96. For some other reason (Please describe) **[OPEN-ENDED]**

**DEMOGRAPHICS**

Please answer the following questions about your household and residence. Your responses will remain confidential and will be used to assess how well participants in this program resemble Evergy's customer population. Please select "Prefer not to answer" if you do not wish to answer any one of the following demographic questions.

108. Do you rent or own your home?
    1. Rent
    2. Own
    99. Prefer not to answer

109. Which of the following best describes your home?
    1. Single-family home
    2. Manufactured or mobile home
    3. Condominium or townhome
    4. Apartment or duplex
    96. Other (Please specify) **[OPEN-ENDED]**
    98. Not sure
    99. Prefer not to answer

110. What fuel does your main hot water heater use?
    1. Electricity
    2. Natural gas
    3. Propane
    4. Heating oil
    5. Something else (Please describe) **[OPEN-ENDED]**
    98. Prefer not to answer

111. What fuel does your main heating system use?
    1. Electricity
    2. Natural gas
    3. Propane
    4. Heating oil
    5. Something else (Please describe) **[OPEN-ENDED]**
    98. Prefer not to answer

112. What type of heating system do you have?
    1. Air source heat pump
    2. Ground source heat pump
    3. Ductless heat pump system
    4. Electric forced air furnace
    5. Baseboard heaters
    96. Something else (Please describe) **[OPEN-ENDED]**
    98. Prefer not to answer

113. Approximately, when was your home built?
    1. Before 1960
    2. 1960 to 1979
    3. 1980 to 1999
    4. 2000 to 2019
    5. 2019 or newer
    98. Not sure
    99. Prefer not to answer

114. About how many square feet is your home? If you are unsure, an estimate is okay.
    1. Less than 1,000 square feet
    2. 1,000-1,999 square feet
    3. 2,000-2,999 square feet
    4. 3,000-3,999 square feet
    5. 4,000 square feet or great
    98. Not sure
    99. Prefer not to answer

## GIFT CARD INFORMATION

We appreciate you completing this customer **survey regarding energy efficient product purchases you made.** We would like to send you a $5 electronic gift card to thank you for your time. Please provide an email address below where we can send you the gift card. You should receive an email with a link to your electronic gift card within 5 business days.

1. Email: **[OPEN-ENDED]**
99. Do not wish to receive a gift card

## THANK YOU MESSAGE

If you have any questions regarding this survey or would like to know the status of your gift card, please send an email to survey2026@surveys.admenergy.com. On behalf of Evergy, thank you for participating. Have a great day!

## DISQUALIFICATION MESSAGE

Sorry, but you do not qualify to take this survey. This survey is for Evergy customers who purchased qualifying energy efficient products in 2022. Thank you for your time, have a great day!

## L.4 Energy Saving Products - LED Thank You Kit Survey

**Start of Block: Welcome Page**

Q1
*This study is conducted by ADM Associates, Inc. in contract with Evergy's Missouri utility companies.*
Start the survey by clicking the arrow below:
*(note: some questions will appear depending on responses to previous questions)*

**End of Block: Welcome Page**

---

**Start of Block: Verification**

Q2 Did you recently receive a kit from Evergy containing a total of 12 LED light bulbs?

- ○ Yes (1)
- ○ No (2)
- ○ I don't recall (3)

*Display This Question:*

*If Q2 = No*

*Or Q2 = I don't recall*

Q3 Are you sure you did not receive an "LED Thank you Kit" from Evergy in ${e://Field/Install_Month}?

- ○ Yes, I do recall that (1)
- ○ No, I do not recall that (2)
- ○ I'm not sure (7)

**End of Block: Verification**

---

**Start of Block: Installation**

*Display This Question:*

*If Q2 = Yes*

*Or Q3 = Yes, I do recall that*

Q4 Have you installed any of the LED lightbulbs provided in the LED Thank you Kit you received?

○ Yes, I installed all (12) of them (1)

○ Yes, but I only installed some of them (2)

○ No, I have not installed any of them (4)

*Display This Question:*

*If Q4 = No, I have not installed any of them*

Q5 Why haven't you installed any of the LED lightbulbs in the LED Thank you Kit? *(please select all that apply)*

☐ I didn't like any of the products (1)

☐ I haven't had time to install them yet (2)

☐ I gave the entire kit to someone else (3)

☐ Some items were broken (please specify which items): (4) ________________________________________________

☐ I don't know how to install the lightbulbs (5)

☐ Other reason (please describe): (6) ________________________________________________

*Display This Question:*

*If Q5 = I haven't had time to install them yet*

Q6 Do you plan on installing any of the LED lightbulbs in the LED Thank you Kit?

○ Yes (1)

○ No (2)

○ I'm not sure (4)

*Display This Question:*

*If Q6 = Yes*

Q7 When do you plan on installing the LED lightbulbs?

○ Within a week (1)

○ Within a month (2)

○ Within a year (3)

○ Longer than a year (4)

*Display This Question:*

*If Q6 = Yes*

Q8 How many of each type of LED lightbulb do you plan on installing?
*(please specify the amount of each type listed below)*

○ A19 LED lightbulbs (general service lightbulbs) (2) ________________________________________________

○ BR30 LED lightbulbs (flood lightbulbs) (7) ________________________________________________

○ Filament candle LED lightbulbs (decorative lightbulbs) (8) ________________________________________________

*Display This Question:*

*If Q5 = I gave the entire kit to someone else*

Q9 Were the LED lightbulbs from the kit installed at another person' address?

○ Yes, all of the items were installed (1)

○ Yes, some of the items were installed (2)

○ No (3)

○ I'm not sure (4)

*Display This Question:*

*If Q9 = Yes, some of the items were installed*

Q10 How many of each type of LED lightbulb were installed?
*(please specify the amount of each type listed below)*

○ A19 LED lightbulbs (general service lightbulbs) (2) ________________________________________________

○ BR30 LED lightbulbs (flood lightbulbs) (3) ________________________________________________

○ Filament candle LED lightbulbs (decorative lightbulbs) (4) ________________________________________________

*Display This Question:*

*If Q4 = Yes, I installed all (12) of them*

*Or Q4 = Yes, but I only installed some of them*

Q11 Were the kit contents installed in the following Zip Code?
**${e://Field/Zip}**

○ Yes (1)

○ No (2)

*Display This Question:*

*If Q11 = No*

*Or Q9 = Yes, all of the items were installed*

*Or Q9 = Yes, some of the items were installed*

Q12 In what zip code were the kit contents installed?

________________________________________________________________

**End of Block: Installation**

---

**Start of Block: LED Light Bulbs**

*Display This Question:*

*If Q4 = Yes, but I only installed some of them*

Q13 Have you installed any of the A19 LED lightbulbs (general service lightbulbs) provided in the LED Thank you Kit you received?

○ Yes (1)

○ No (2)

*Display This Question:*

*If Q13 = Yes, but I only installed some of them*

Q14 How many A19 LED lightbulbs (general service lightbulbs) have you installed?

- ○ 1 (1)
- ○ 2 (2)
- ○ 3 (3)
- ○ 4 (4)

*Display This Question:*

*If Q4 = Yes, but I only installed some of them*

Q15 Have you installed any of the BR30 LED lightbulbs (flood lightbulbs) provided in the LED Thank you Kit you received?

- ○ Yes, I installed all (4) of them (1)
- ○ Yes, but I only installed some of them (2)
- ○ No, I have not installed any of them (3)

*Display This Question:*

*If Q15 = Yes, but I only installed some of them*

Q16 How many BR30 LED lightbulbs (flood lightbulbs) have you installed?

- ○ 1 (1)
- ○ 2 (2)
- ○ 3 (3)
- ○ 4 (4)

*Display This Question:*

*If Q4 = Yes, but I only installed some of them*

Q17 Have you installed any of the filament candle LED lightbulbs (decorative lightbulbs) provided in the LED Thank you Kit you received?

○ Yes, I installed all (4) of them (1)

○ Yes, but I only installed some of them (2)

○ No, I have not installed any of them (3)

*Display This Question:*

*If Q17 = Yes, but I only installed some of them*

Q18 How many filament candle LED lightbulbs (decorative lightbulbs) have you installed?

○ 1 (1)

○ 2 (2)

○ 3 (3)

○ 4 (4)

*Display This Question:*

*If Q13 = Yes, but I only installed some of them*
*Or Q13 = No, I have not installed any of them*
*Or Q15 = Yes, but I only installed some of them*
*Or Q15 = No, I have not installed any of them*
*Or Q17 = Yes, but I only installed some of them*
*Or Q17 = No, I have not installed any of them*

Q19 Why didn't you install **all** of the LED light bulbs?
*(please select all that apply)*

- ☐ Waiting until light bulbs burn out (1)
- ☐ Don't like the color of LEDs (2)
- ☐ LEDs make a strange sound (3)
- ☐ LEDs don't fit in my lamp (4)
- ☐ Already have LEDs installed in all my sockets (5)
- ☐ Installed at another location (6)
- ☐ The ones I did not install were broken (7)
- ☐ The ones I did not install were defective (8)
- ☐ Other (please describe): (9) ________________________________________________

*Display This Question:*

*If Q19 , Waiting until light bulbs burn out Is Displayed*

Q20 What did you do with the LED light bulbs that you did not install in or around your home?
*(please select all that apply)*

☐ I gave them away to friends or family (1)

☐ I am storing them for future use (2)

☐ I disposed of them in a household hazardous waste collection site (3)

☐ I threw them in the trash (4)

☐ I recycled them (5)

☐ Other (please describe): (6) ________________________________________________

**End of Block: LED Light Bulbs**

---

**Start of Block: Freeridership**

*Display This Question:*

*If Q2 = Yes*

*Or Q3 = Yes, I do recall that*

Q21 Besides the LED lightbulbs that came in your LED Thank you Kit, what additional energy saving products would you find useful in future kits?
*(select all that apply)*

- ☐ Additional LED light bulbs (1)
- ☐ LED night lights (2)
- ☐ Advanced Power Strips (3)
- ☐ Showerheads (4)
- ☐ Electrical Outlet Timers (5)
- ☐ Faucet Aerators (6)
- ☐ Coupons for energy efficient products (7)
- ☐ Information on the products and how to use them (8)
- ☐ ⊗Can't think of anything else (9)
- ☐ Other (please describe): (10) ________________________________________________

*Display This Question:*

*If Q21 , Additional LED light bulbs Is Displayed*

Q22 Before receiving the LED Thank you Kit, did you have **prior plans** to purchase and install the following lightbulbs?

| | Yes (1) | No (2) |
|---|---|---|
| A19 LED lightbulbs (general service lightbulbs) (1) | ○ | ○ |
| BR30 LED lightbulbs (flood lightbulbs) (2) | ○ | ○ |
| Filament candle LED lightbulbs (decorative lightbulbs) (3) | ○ | ○ |

*Display This Question:*

*If Q21 , Additional LED light bulbs Is Displayed*

Q23 Would you have **purchased** the following lightbulbs if you had not received the LED Thank you Kit?

| | Yes (1) | No (2) |
|---|---|---|
| A19 LED lightbulbs (general service lightbulbs) (1) | ○ | ○ |
| BR30 LED lightbulbs (flood lightbulbs) (2) | ○ | ○ |
| Filament candle LED lightbulbs (decorative lightbulbs) (3) | ○ | ○ |

*Display This Question:*

*If Q21 , Additional LED light bulbs Is Displayed*

Q24 If you had not received the LED Thank you Kit, how likely is it that you would have purchased and installed the following types of lightbulbs on your own?
*(please answer on a scale of 1 to 5, with 5 being "Definitely **would have** purchased and installed" and 1 being "Definitely **would not have** purchased")*

| | 5 (1) | 4 (2) | 3 (3) | 2 (4) | 1 (5) |
|---|---|---|---|---|---|
| A19 LED lightbulbs (general service lightbulbs) (1) | ○ | ○ | ○ | ○ | ○ |
| BR30 LED lightbulbs (flood lightbulbs) (3) | ○ | ○ | ○ | ○ | ○ |
| Filament candle LED lightbulbs (decorative lightbulbs) (4) | ○ | ○ | ○ | ○ | ○ |

*Display This Question:*

*If Q24 [ 5] (Count) > 0*

*Or Q24 [ 4] (Count) > 0*

Q25 If you had not received the LED Thank you Kit, when might have you purchased and installed the following types of lightbulbs?

| | Within 6 months (1) | Between 6 months and 1 year (2) | More than a year (3) |
|---|---|---|---|
| A19 LED lightbulbs (general service lightbulbs) (1) | ○ | ○ | ○ |
| BR30 LED lightbulbs (flood lightbulbs) (2) | ○ | ○ | ○ |
| Filament candle LED lightbulbs (decorative lightbulbs) (3) | ○ | ○ | ○ |

**End of Block: Freeridership**

**Start of Block: Closing Questions**

Q26 Do you have any other comments?

________________________________________________________________

Q27 The survey will end after clicking the arrow below.

**End of Block: Closing Questions**

## L.5 Business Demand Response Survey

Client: Evergy
Program(s): Business Demand Response
Group: Participants in the Business Demand Response Program
Mode: Online survey

### VARIABLE LIST

| | |
|---|---|
| **Contact Name** | Customer Name |
| **Business Name** | Business Name |
| **Address** | Business Address |
| **Telephone Number** | Business phone number |
| **Email** | Business Email |

### EMAIL INVITE

Subject: Invitation to Help Improve Evergy's Business Demand Response (BDR) Program

*Hello [CONTACT_NAME],*

*Thank you for participating in Evergy's Business Demand Response Program. Participants like you help control power costs and reduce greenhouse gas emissions through your actions during peak demand events. Evergy is interested in your feedback about the program and invites you to take an online survey to let us know how we can improve it.*

*Click here to start the survey {SURVEY LINK}*

*If you have questions or require technical assistance, please contact [CONTACT] at [CONTACT INFO].*

*Thank you so much for your time.*

*ADM conducts research to support research and evaluation in the energy sector. Survey data are not shared with third parties for marketing purposes. Our full privacy statement is available here: admenergy.com/privacy*

*Kind regards,*

*ADM Associates* | *Contractor to Evergy*

*{UNSUBSCRIBE LINK}*

## SCREENING

QS1. Our records indicate that your organization participated in Evergy's Business Demand Response (BDR) Program. Is this correct?

1. Yes
2. No **[TERMINATE]**
98. Not sure **[TERMINATE]**

QS2. Who is your electricity provider?

1. Evergy
3. Ameren MO **[TERMINATE]**
98. Not sure **[TERMINATE]**

## AWARENESS

QA1. How did you hear about the Evergy Business Demand Response Program? (Please select all that apply) **[MULTI-SELECT]**

1. Evergy representative
2. Newspaper / magazine / print media
3. Utility bill insert
4. My bill
5. Evergy website
6. Word of mouth (friend, relative, coworker)
7. HVAC contractor / plumber
8. TV ad
9. Retailer / store
10. Community event
11. Social media such as Facebook or Twitter
96. Other (please specify)
98. Not sure

## PARTICIPATION

*We have just a few questions about your participation in this program.*

QP1: Why did you decide to participate in the Business Demand Response Program? (Please select all that apply) **[MULTI-SELECT]**

1. Low-risk: There are no financial penalties.
2. Customized: Evergy offers a curtailment plan specific to your site.
3. Support: There is a BDR team available for technical assistance and event success.
4. Insight: Participation will offer more insight into your actual electrical usage.
5. Awareness: Your customers and employees will have more awareness into how your organization is taking measures to lower impact on the local environment.
6. Savings: Your organization can use incentives to fund other energy efficiency projects.
7. Environmental Concerns
96. Other (please specify)
98. Not sure

QP2. Did Evergy provide you with a curtailment plan tailored to your organization?

1. Yes
2. No
96. Not sure

QP3. What type of actions did you take to reduce or curtail your energy load during peak demand events? (Please select all that apply) **[MULTI-SELECT]**

1. Reschedule shifts to off-peak times
2. Temporarily shut down equipment, production lines and perform routine maintenance
3. Reduce motor loads in elevators, compressors, conveyers, etc.
4. Dim lights in non-critical areas
5. Reduce cooling loads with small temperature adjustments
6. Utilize certified self-generation
96. Something else (please specify)
98. Not sure

QP4. Did your organization participate in any of the following Demand Response events? **[INSERT MATRIX WITH 1 = YES, 2 = NO, 98 = NOT SURE/ DO NOT RECALL]**

1. June 14, 2022, from 4-6 p.m.
2. June 21, 2022, 3-7 p.m.
3. July 6, 2022, from 3-7 p.m.
4. July 19, 2022, from 2-6 p.m.
5. July 21, 2022, from 2-6 p.m.
6. August 2, 2022, from 2-6 p.m.
7. September 20, 2022, from 2-6 p.m.

**[SHOW QP4a IF QP4 (1) = 5]**

QP4a: Why did you decide not to participate in the event on June 14, 2022, from 2-6 p.m.?

**[OPEN-ENDED]**

**[SHOW QP4B IF QP4 (2) = 5]**

QP4b: Why did you decide not to participate in the event on June 21, 2022, from 3-7 p.m.?

**[OPEN-ENDED]**

**[SHOW QP4C IF QP4 (3) = 5]**

QP4c: Why did you decide not to participate in the event on July 6, 2022, from 3-7 p.m.?

**[OPEN-ENDED]**

**[SHOW QP4D IF QP4 (4) = 5]**

QP4d: Why did you decide not to participate in the event on July 19, 2022, from 2-6 p.m.?

**[OPEN-ENDED]**

**[SHOW QP4E IF QP4 (5) = 5]**

QP4e: Why did you decide not to participate in the event on July 21, 2022, from 2-6 p.m.?

**[OPEN-ENDED]**

**[SHOW QP4F IF QP4 (6) = 5]**

QP4f: Why did you decide not to participate in the event on August 2, 2022, from 2-6 p.m.?

**[OPEN-ENDED]**

**[SHOW QP4G IF QP4 (7) = 5]**

QP4g: Why did you decide not to participate in the event on September 20, 2022, from 2-6 p.m.?

**[OPEN-ENDED]**

**[SHOW QP5 IF QP4 = 1-5]**

QP5. Prior to these events, do you recall receiving a notification for these Demand Response events via email, text, or phone call?

1. Yes
2. No

98. Not sure

## SATISFACTION

*We'd like to ask you a few questions about your satisfaction with the Business Demand Response Program.*

QS1. Using the scale below, how would you rate your satisfaction with the following aspects of the Business Demand Response Program? **[INSERT 1-5 SCALE, WHERE 1 = VERY DISSATISFIED AND 5 = VERY SATISFIED, WITH 98= NOT SURE]**

1. The curtailment plan developed by Evergy
2. Ease of enrolling in the Program
3. Notification of the Demand Response events
4. Duration of the Demand Response events
5. Amount of incentive received for participation
6. The Business Demand Response Program overall
7. Evergy as your electricity provider

**[show QS2 if any in QS1 = 1 or 5]**

QS2. Can you elaborate on why you chose that response?

**[OPEN-ENDED]**

QS3. How likely is your organization to participate in the Business Demand Response Program again in 2022?

1. “Not at all likely”
2. [Scaled Selection]
3. [Scaled Selection]
4. [Scaled Selection]
5. “Very likely

98. Not sure

## BUSINESS DEMOGRAPHICS

*We're almost done- I just need to ask you a few final questions for classification purposes only.*

QD1. What type of organization is this?

1. Retail store
2. Office
3. Hotel / Motel
4. Laundromat
5. Bank / Credit Union / Financial center
6. Hospital
7. School / College / University
8. Automobile dealership
9. Repair shop
10. Construction / Building
11. Warehouse
12. Grocery
13. Convenience store
14. Shopping center
15. Restaurant
16. Religious / House of Worship
96. Other (please specify)
98. Prefer not to answer

QD2. How many locations does your business have?

1. _________number of locations
98. Not sure

QD3. How many years have you been at this location?

1. ___________years
98. Not sure

QD4. Do you own or lease the building you are located in?

1. Own
2. Rent / Lease
98. Not sure

QD5. What is the approximate square footage of this location?

1. ___________estimated square footage
98. Not sure

QD6. Approximately how many full-time employees are at this location?

1. __________number of full-time employees
98. Not sure

**[show QD7 if QD1 = 1, 2, 3, 4, 5, 8, 9, 10, 11, 12, 13, 15, 15, 96 or 98]**

QD7. What are your approximate gross annual sales at this location?

1. Less than $50,000
2. $50,000 - $100,000
3. $100,001 - $250,000
4. $250,001 - $500,000
5. $500,001 - $1 million
6. More than $1 million
99. Prefer not to answer

*Those are all the questions we have for you. On behalf of Evergy, we thank you for your time. Have a great day!*

## L.6 Residential Demand Response Survey

Client: Evergy
Program(s): Residential Demand Response
Group: Participants in the Residential Demand Response Program
Mode: Online Survey

### VARIABLE LIST

| | |
|---|---|
| Contact Name | Customer Name |
| Address | Customer Address |
| Telephone Number | Customer Telephone Number |
| Email | Customer Email Address |
| Utility | MO Metro, MO West |

### EMAIL

*Hello [CONTACT_NAME],*

*Thank you for participating in Evergy's Thermostat Program. Participants like you help control power costs and reduce greenhouse gas emissions through your actions during Energy Savings Events. Evergy is interested in your feedback about the program and invites you to take an online survey to let us know how we can improve it.*

*Click here to start the survey {SURVEY LINK}*

*If you have questions or require technical assistance, please contact [CONTACT] at [CONTACT INFO].*

*Thank you so much for your time.*

*ADM conducts research to support research and evaluation in the energy sector. Survey data are not shared with third parties for marketing purposes. Our full privacy statement is available here: admenergy.com/privacy*

*Kind regards,*

*ADM Associates* | *Contractor to Evergy*

*{UNSUBSCRIBE LINK}*

## SCREENING

QS1. Our records indicate that your household participated in Evergy’s Thermostat Program. Is this correct?

1. Yes
2. No **[TERMINATE]**
98. Not sure **[TERMINATE]**

QS2. Who is your electricity provider?

1. Evergy
2. Ameren MO **[TERMINATE]**
98. Not sure **[TERMINATE]**

## AWARENESS

QA1. How did you hear about Evergy’s Thermostat Program?(Please select all that apply) **[MULTI-SELECT]**

1. Newspaper / Magazine / Print media
2. Utility bill insert
3. My bill
4. Evergy website
5. Word of mouth (friend, relative, coworker)
6. HVAC contractor / plumber
7. TV ad
8. Evergy representative
9. Retailer / Store
10. Community event
11. Social media such as Facebook or Twitter
12. Home Energy Report
96. Other (please specify)
98. Not sure

## PARTICIPATION

*We have just a few questions about your participation in this program.*

QP1. When did you enroll in the program? Your best guess is fine.

1. Before June 1, 2022
2. Between June 1, 2022 through July 31, 2022
3. Between August 1, 2022 through September 30, 2021
96. Not sure

QP2. Who installed your thermostat?

1. Myself / Family member (Self-installed / Bring Your Own)
2. An installation contractor
96. Not sure

QP3: Why did you decide to participate in the Thermostat Program?

**[OPEN-ENDED]**

QP4. QP4. Did you participate in any of the following Energy Savings Events? **[INSERT MATRIX 1 = YES, 2 = NO, 98 = NOT SURE]**

1. June 13, 2022 from 4-6 p.m.
2. June 14, 2022 from 4-6 p.m.
3. June 21, 2022 from 4-6 p.m.
4. July 5, 2022 from 4-6 p.m.
5. July 6, 2022 from 4-6 p.m.
6. July 19, 2022 from 4-6 p.m.
7. July 21, 2022 from 4-6 p.m.
8. August 2, 2022 from 4-6 p.m.
9. August 3, 2022 from 4-6 p.m.
10. September 7, 2022 from 3-6 p.m.
11. **[SHOW IF UTILITY = MO METRO]** September 19, 2022 from 4-6 p.m.
12. **[SHOW IF UTILITY = MO WEST]** September 20, 2022 from 4-6 p.m.

**[SHOW QP4A IF QP4(1) = 1]**

QP4a: Why did you decide not to participate in the event on June 13, 2022, from 4 – 6 p.m.?

**[OPEN-ENDED]**

**[SHOW QP4B IF QP4(2) = 1]**

QP4b: Why did you decide not to participate in the event on June 14, 2022, from 4 – 6 p.m.

**[OPEN-ENDED]**

**[SHOW QP4C IF QP4(3) = 1]**

QP4c: Why did you decide not to participate in the event on June 21, 2021, from 4 – 6 p.m.?

**[OPEN-ENDED]**

**[SHOW QP4D IF QP4(4) = 1]**

QP4d: Why did you decide not to participate in the event on July 5, 2022, from 4 – 6 p.m.?

**[OPEN-ENDED]**

**[SHOW QP4E IF QP4(5) = 1]**

QP4e: Why did you decide not to participate in the event on July 6, 2022, from 4 – 6 p.m.?

**[OPEN-ENDED]**

**[SHOW QP4F IF QP4(6) = 1]**

QP4f: Why did you decide not to participate in the event on July 19, 2022, from 4 – 6 p.m.?

**[OPEN-ENDED]**

**[SHOW QP4G IF QP4(7) = 1]**

QP4g: Why did you decide not to participate in the event on July 21, 2022, from 4 – 6 p.m.?

**[OPEN-ENDED]**

**[SHOW QP4H IF QP4(8) = 1]**

QP4h: Why did you decide not to participate in the event on August 2, 2022, from 4 – 6 p.m.?

**[OPEN-ENDED]**

**[SHOW QP4I IG QP4(9) = 1]**

QP4i: Why did you decide not to participate in the event on August 3, 2022, from 4 – 6 p.m.?

**[OPEN-ENDED]**

**[SHOW QP4J IF QP4(10) = 1]**

QP4j: Why did you decide not to participate in the event on September 7, 2022, from 3 – 6 p.m.?

**[OPEN-ENDED]**

**[SHOW QP4J IF QP4(11) = 1]**

QP4k Why did you decide not to participate in the event on September 19, 2022, from 4 – 6 p.m.?

**[OPEN-ENDED]**

**[SHOW QP4J IF QP4(12) = 1]**

QP4l Why did you decide not to participate in the event on September 20, 2022, from 4 – 6 p.m.?

**[OPEN-ENDED]**

QP5. Prior to these events, do you recall receiving a notification for these Demand Response events via email, text, or phone call?

1. Yes
2. No
96. Not sure

## SATISFACTION

*We'd like to ask you a few questions about your satisfaction with the Thermostat Program.*

QS1. Using the scale below, how would you rate your satisfaction with the following aspects of the Thermostat Program? **[INSERT 1-5 SCALE, WHERE 1 = VERY DISSATISFIED AND 5 = VERY SATISFIED, WITH 98= NOT SURE]**

1. The operation of your thermostat
2. Ease of enrolling in the program
3. Notification of the Energy Savings Events
4. Duration of the Energy Savings Events
5. The Thermostat Program overall
6. Evergy as your electricity provider

**[SHOW QS2 IF ANY IN QS1 = 1 or 5]**

QS2. Can you elaborate on why you chose that response?

1. **[OPEN-ENDED]**

## HOME DEMOGRAPHICS

QD1. Which of the following best describes your home?

1. Manufactured or mobile home
2. Single-family home
3. Duplex or townhouse
4. Apartment or condominium

96. Other (please specify)
98. Not sure

QD2. When was your home built?

1. Before 1960
2. 1960 - 1979
3. 1980 - 1999
4. 2000 - 2009
5. 2010 or later

96. Not sure

QD3. Do you own or rent your home?

1. Own
2. Rent

99. Prefer not to answer

QD4. What is the main fuel used to heat your home?

1. Electricity
2. Natural gas
3. Propane
4. Oil

96. Other (please specify)
99. Not sure

QD5. Including yourself, how many people are living in your household?

1. (NUMBER OF PEOPLE IN THE HOME): ____________________

QD6. Is your annual household income over or under [CUTOFF]?

1. If Q = D6(1) CUTOFF = $25,500
2. If Q = D6(2) CUTOFF = $34,500
3. If Q = D6(3) CUTOFF = $43,400
4. If Q = D6(4) CUTOFF = $52,400
5. If Q = 0(5)CUTOFF = $61,400
6. If Q = 0(6)CUTOFF = $70,300
7. If Q = 0(7)CUTOFF = $79,300
8. If Q = D6(8) CUTOFF = $88,200
9. If Q = 0(9)CUTOFF = $97,200
10. If Q = 0(10) CUTOFF = $106,200
11. If Q = 0(11) CUTOFF = $115,100
12. If Q = D6(12) CUTOFF = $124,000
13. If Q = 0(13) CUTOFF = $133,000
98. Not sure
99. Prefer not to answer

*Thank you for participating in this survey. That’s all the questions we have. On behalf of Evergy, have a great day!*

## L.7 Business Smart Thermostats Survey

Client: Evergy
Program(s): Business Smart Thermostat
Group: Participants in the Business Smart Thermostat Program
Mode: Online survey

### VARIABLE LIST

| | |
|---|---|
| **Contact Name** | Customer Name |
| **Business Name** | Business Name |
| **Address** | Business Address |
| **Telephone number** | Business phone number |
| **Email** | Business Email |
| **Utility** | MO Metro, MO West |

### EMAIL INVITE

Subject: Invitation to Help Improve Evergy’s Business Smart Thermostat Program

*Hello [CONTACT_NAME],*

*Thank you for participating in Evergy’s Business Smart Thermostat Program. Participants like you help control power costs and reduce greenhouse gas emissions through your actions during Energy Savings Events. Evergy is interested in your feedback about the program and invites you to take an online survey to let us know how we can improve it.*

*Click here to start the survey {SURVEY LINK}*

*If you have questions or require technical assistance, please contact [CONTACT] at [CONTACT INFO].*

*Thank you so much for your time.*

*ADM conducts research to support research and evaluation in the energy sector. Survey data are not shared with third parties for marketing purposes. Our full privacy statement is available here: admenergy.com/privacy*

*Kind regards,*

*ADM Associates* | *Contractor to Evergy*

*{UNSUBSCRIBE LINK}*

## SCREENING

QN1. Our records indicate that your organization participated in Evergy’s Business Smart Thermostat Program. Is this correct?

1. Yes
2. No **[TERMINATE]**
98. Not sure **[TERMINATE]**

QN2. Who is your electricity provider?

1. Evergy
2. Ameren MO **[TERMINATE]**
98. Not sure **[TERMINATE]**

## AWARENESS

QA1. How did you hear about the Evergy’s Business Smart Thermostat Program? (Please select all that apply) **[MULTI-SELECT]**

1. Evergy representative
2. Newspaper / Magazine / Print media
3. Utility bill insert
4. My bill
5. Evergy website
6. Word of mouth (friend, relative, coworker)
7. HVAC contractor / Plumber
8. TV ad
9. Retailer / Store
10. Community event
11. Social media such as Facebook or Twitter
96. Other (please specify)
98. Not sure

## PARTICIPATION

*We have just a few questions about your participation in this program.*

QP1. When did you or your organization enroll in the program? Your best guess is fine.

1. Before June 1, 2022
2. Between June 1, 2022 through July 31, 2022
3. Between August 1, 2022 through September 30, 2022
96. Not sure

QP2. Who installed your smart thermostat?

1. Myself / Someone from my organization (Self-installed / Bring Your Own)
2. An installation contractor

99. Not sure

QP3: Why did you decide to participate in the Business Smart Thermostat Program?
**[OPEN-ENDED]**

QP4. Did your organization participate in any of the following Energy Savings Events?**[INSERT MATRIX 1 = YES, 2 = NO, 98 = NOT SURE]**

1. June 13, 2022 from 4-6 p.m.
2. June 14, 2022 from 4-6 p.m.
3. June 21, 2022 from 4-6 p.m.
4. July 5, 2022 from 4-6 p.m.
5. July 6, 2022 from 4-6 p.m.
6. July 19, 2022 from 4-6 p.m.
7. July 21, 2022 from 4-6 p.m.
8. August 2, 2022 from 4-6 p.m.
9. August 3, 2022 from 4-6 p.m.
10. September 7, 2022 from 3-6 p.m.
11. **[SHOW IF UTILITY = MO METRO]** September 19, 2022 from 4-6 p.m.
12. **[SHOW IF UTILITY = MO WEST]** September 20, 2022 from 4-6 p.m.

**[SHOW QP4A IF QP4(1) = 1]**

QP4a: Why did you decide not to participate in the event on June 13, 2022, from 4 – 6 p.m.?
**[OPEN-ENDED]**

**[SHOW QP4B IF QP4(2) = 1]**

QP4b: Why did you decide not to participate in the event on June 14, 2022, from 4 – 6 p.m.
**[OPEN-ENDED]**

**[SHOW QP4C IF QP4(3) = 1]**

QP4c: Why did you decide not to participate in the event on June 21, 2021, from 4 – 6 p.m.?
**[OPEN-ENDED]**

**[SHOW QP4D IF QP4(4) = 1]**

QP4d: Why did you decide not to participate in the event on July 5, 2022, from 4 – 6 p.m.?
**[OPEN-ENDED]**

**[SHOW QP4E IF QP4(5) = 1]**

QP4e: Why did you decide not to participate in the event on July 6, 2022, from 4 – 6 p.m.?

**[OPEN-ENDED]**

**[SHOW QP4F IF QP4(6) = 1]**

QP4f: Why did you decide not to participate in the event on July 19, 2022, from 4 – 6 p.m.?

**[OPEN-ENDED]**

**[SHOW QP4G IF QP4(7) = 1]**

QP4g: Why did you decide not to participate in the event on July 21, 2022, from 4 – 6 p.m.?

**[OPEN-ENDED]**

**[SHOW QP4H IF QP4(8) = 1]**

QP4h: Why did you decide not to participate in the event on August 2, 2022, from 4 – 6 p.m.?

**[OPEN-ENDED]**

**[SHOW QP4I IG QP4(9) = 1]**

QP4i: Why did you decide not to participate in the event on August 3, 2022, from 4 – 6 p.m.?

**[OPEN-ENDED]**

**[SHOW QP4J IF QP4(10) = 1]**

QP4j: Why did you decide not to participate in the event on September 7, 2022, from 3 – 6 p.m.?

**[OPEN-ENDED]**

**[SHOW QP4J IF QP4(11) = 1]**

QP4k Why did you decide not to participate in the event on September 19, 2022, from 4 – 6 p.m.?

**[OPEN-ENDED]**

**[SHOW QP4J IF QP4(12) = 1]**

QP4l Why did you decide not to participate in the event on September 19, 2022, from 4 – 6 p.m.?

**[OPEN-ENDED]**

QP5. Prior to these events, do you recall receiving a notification for these Demand Response events via email, text, or phone call?

1. Yes
2. No

98. Not sure

## SATISFACTION

*We'd like to ask you a few questions about your satisfaction with the Business Smart Thermostat Program.*

QS1. Using the scale below, how would you rate your satisfaction with the following aspects of the Business Smart Thermostat Program? **[INSERT 1-5 SCALE, WHERE 1 = VERY DISSATISFIED AND 5 = VERY SATISFIED, WITH 98= NOT SURE]**

1. The operation of your thermostat
2. Ease of enrolling in the program
3. Notification of the Energy Savings Events
4. Duration of the Energy Savings Events
5. The Business Smart Thermostat Program overall
6. Evergy as your electricity provider

**[SHOW QS2 IF ANY IN QS1 = 1 or 5]**

QS2. Can you elaborate on why you chose that response?
**[OPEN-ENDED]**

## BUSINESS DEMOGRAPHICS

*We're almost done- I just need to ask you a few final questions for classification purposes only.*

QD1. What type of organization is this?

1. Retail store
2. Office
3. Hotel / Motel
4. Laundromat
5. Bank / Credit Union / Financial center
6. Hospital
7. School / College / University
8. Automobile dealership
9. Repair shop
10. Construction / Building
11. Warehouse
12. Grocery
13. Convenience store
14. Restaurant
15. Religious / House of Worship
96. Other (please specify)
99. Prefer not to answer

QD2. How many locations does your organization have?

1. _________number of locations
96. Not sure

QD3. How many years have you been at this location?

1. ___________years
98. Not sure

QD4. Do you own or lease the building you are located in?

1. Own
2. Rent / Lease
99. Not sure

QD5. What is the approximate square footage of this location?

1. ___________estimated square footage
98. Not sure

QD6. Approximately how many full-time employees are at this location?

1. __________number of full-time employees
98. Not sure

**[SHOW QD7 IF QD1 = 1, 2, 3, 4, 5, 8, 9, 10, 11, 12, 13, 15, 96 OR 98]**

QD7. What are your approximate gross annual sales at this location?

1. Less than $50,000
3. $50,000 - $100,000
4. $100,001 - $250,000
5. $250,001 - $500,000
6. $500,001 - $1 million
7. More than $1 million
99. Prefer not to answer

*Those are all the questions we have for you. On behalf of Evergy, we thank you for your time. Have a great day!*

## L.8 Pay As You Save Survey

Client: Evergy
Program: Pay-As-You-Save Program
Program Year: 2022
Group: Participants
Mode: Email

**PREDEFINED VARIABLES**

| Variable | Definition |
|---|---|
| CUSTOMER NAME | Customer's first name |
| OP-CO | GMO or KCPLMO |
| TIER | 1 or 4 |
| EMAIL | Email address |

**EMAIL SURVEY MESSAGE**

Subject: $5 for 5 minute PAYS survey

Reply To: adm-surveys@admenergy.com

From Name: Evergy

Hi [CUSTOMER NAME],

Thanks for participating in the PAYS program; we hope you are enjoying your energy efficient upgrades. You might have already taken a survey about your experience with the PAYS program, but we have a different set of questions we'd like to ask you. We'll send you a $5 gift card if you can spare 5 minutes of your time to answer our survey.

[SURVEY LINK BUTTON: "START SURVEY"]

If you have any questions, please contact us at survey2026@surveys.admenergy.com.

Thank you in advance for your time!

Kind Regards,

[EVALUATOR NAME]

ADM Associates / Contractor to Evergy

*ADM conducts research to support research and evaluation in the energy sector. Survey data are not shared with third parties for marketing purposes. Our full privacy statement is available here: admenergy.com/privacy*

## FREE RIDERSHIP

1. Did you consider other financing options before enrolling in the PAYS program?
   1. Yes
   2. No
   100. Don't know

**[DISPLAY Q2 IF Q1 = 1]**

2. What types of financing options did you consider before enrolling in the PAYS program? Select all that apply. **[MULTISELECT]**
   1. Loan from contractor
   2. Loan from bank/credit union
   3. Home equity- line of credit
   4. Savings
   5. Cash
   96. Other (Please specify) **[TEXT BOX]**

3. Prior to participating in the PAYS program, had you ever considered installing energy saving products but then decided not to?
   1. Yes
   2. No
   98. Don't know

**[DISPLAY Q4 IF Q3 = 1]**

4. What reasons prevented you from purchasing energy-saving products before? Select all that apply. **[RANDOMIZE, MULTISELECT]**
   1. I did not have the money at that time
   2. I thought it cost too much money
   3. I did not want to or could not take out a loan at that time
   4. I was worried something might go wrong and I would not save enough energy
   5. I was not sure how long I would remain in my home
   6. I did not own the home and/or wasn't sure if I would be allowed to install energy saving products
   7. I was not convinced I would save energy each month right away
   8. I did not have a contractor I felt I could trust
   96. Other (Please specify) **[TEXT BOX]**
   98. Don't know **[EXCLUSIVE]**

**[DISPLAY Q5 IF TIER = 4]**

5. How likely is it that you would have purchased and installed these energy-saving products on your own if Evergy had **not offered** the PAYS financing program? On a five-point scale, would you say "5" Very Likely, "1" Very Unlikely" or some number in between? (DON'T KNOW =98)

| Very Likely | | | | Very Unlikely |
|---|---|---|---|---|
| 5 | 4 | 3 | 2 | 1 |

6. Have you installed any other energy-saving products on your own since enrolling in the PAYS program?
   1. Yes
   2. No
   98. Don’t know

**[DISPLAY Q7 IF Q6 = 1]**

7. What energy-saving products have you installed? Select all that apply **[MULTISELECT]**
   1. Energy efficient dishwasher
   2. Energy efficient clothes washer
   3. Energy efficient clothes dryer
   4. Energy efficient dehumidifier
   5. Energy efficient heater/furnace
   6. Energy efficient air conditioner
   7. Energy efficient refrigerator
   96. Other (Please specify) **[TEXTBOX]**
   98. Don’t remember **[EXCLUSIVE]**

**MEASURE VERIFICATION**

8. Which free energy efficient products did the Data Collector install?
   1. LEDs
   2. Bathroom faucet aerators
   3. Kitchen faucet aerators
   4. Low-flow showerheads
   5. Advanced power strips
   6. Water heater pipe wrap
   7. None of these products **[EXCLUSIVE]**
   96. Don’t remember **[EXCLUSIVE]**

**[DISPLAY Q9 IF Q8<7]**

9. Have you removed any of the following items since they were installed by the Data Collector?
   1. No items were removed **[EXCLUSIVE]**
   2. **[DISPLAY IF Q8=1]** LEDs
   3. **[DISPLAY IF Q8=2]** Bathroom faucet aerators
   4. **[DISPLAY IF Q8=3]** Kitchen faucet aerators
   5. **[DISPLAY IF Q8=4]** Low-flow showerheads
   6. **[DISPLAY IF Q8=5]** Advanced power strips
   7. **[DISPLAY IF Q8=6]** Water heater pipe wrap
   98. Don’t know **[EXCLUSIVE]**

**[DISPLAY Q10 IF Q9=2]**

10. How many of the LEDs did you remove?

    **[TEXT BOX] / [NUMERIC VALUE]**

**[DISPLAY Q11 IF Q9=3]**

11. How many of the bathroom faucet aerators did you remove?

    **[TEXT BOX] / [NUMERIC VALUE]**

**[DISPLAY Q12 IF Q9=4]**

12. How many of the kitchen faucet aerators did you remove?

    **[TEXT BOX] / [NUMERIC VALUE]**

**[DISPLAY Q13 IF Q9=5]**

13. How many of the low-flow showerheads did you remove?

    **[TEXT BOX] / [NUMERIC VALUE]**

**[DISPLAY Q14 IF Q9=6]**

14. How many of the advanced power strips did you remove?

    **[TEXT BOX] / [NUMERIC VALUE]**

## HOME CHARACTERISTICS

15. What is the primary heating system in your home?
    1. Natural gas furnace
    2. Natural gas boiler
    3. Propone furnace
    4. Oil furnace
    5. Oil boiler
    6. Heat pump
    7. Electric resistance heat
    8. Other (please specify) **[TEXTBOX]**
    96. Don’t know

16. What is the primary cooling system in your home?
    1. Central air conditioner
    2. Heat pump
    3. No cooling system
    4. Other (please specify) **[TEXTBOX]**
    96. Don’t know

17. What fuel does your main water heater use?
    1. Electricity
    2. Natural Gas
    3. Propane
    4. Oil
    96. Other (Please specify) **[TEXTBOX]**

18. Including yourself, how many people are living in your household?

    **[DROP DOWN BOX – 1-12, 13 or more, 99 Prefer not to answer]**

19. Is your annual household income over or under **[CUTOFF]**?
    1. If Q18 = 1 CUTOFF = $27,180
    2. If Q18 = 2 CUTOFF = $36,620
    3. If Q18 = 3 CUTOFF = $46,060
    4. If Q18 = 4 CUTOFF = $55,500
    5. If Q18= 5 CUTOFF = $64,940
    6. If Q18= 6 CUTOFF = $74,380
    7. If Q18= 7 CUTOFF = $83,820
    8. If Q18= 8 CUTOFF = $93,260
    9. If Q18= 9 CUTOFF = $97,980
    10. If Q18= 10 CUTOFF = $102,700
    11. If Q18= 11 CUTOFF = $107,420
    12. If Q18= 12 CUTOFF = $112,140
    13. If Q18= 13 CUTOFF = $116,860
    96. Don't know
    99. Prefer not to answer

## GIFT CARD INFORMATION

We appreciate you completing this survey on behalf of Evergy's PAYS program. We would like to send you a $5 electronic gift card to thank you for your time. We will be sending it to [EMAIL]. If you would like us to send your gift card to a different email address, please enter the alternate email address below. You should receive an email with the link to your gift card shortly after finishing this survey.

20. Please send my electronic gift card to the following email address:
    1. [EMAIL]
    96. Other (Please specify) **[TEXTBOX]**
    99. I do not wish to receive a gift card

If you have questions regarding this survey or would like to know the status of your gift card, you can send an email to survey2026@surveys.admenergy.com. On behalf of Evergy, thank you for participating and have a great day!

## L.9 Energy Saving Trees Survey

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**Start of Block: Qualification Questions 1**

Q1 According to program records, you received ${e://Field/TREE_QUANTITY} tree(s) through the Energy-Saving Trees Program around ${e://Field/PARTICIPATION_DATE}. Is this correct?

- ○ Yes (1)
- ○ No (2)
- ○ Do not recall (98)

**End of Block: Qualification Questions 1**

---

**Start of Block: Qualification Questions 2**

*Display This Question:*

*If According to program records, you received ${e://Field/TREE_QUANTITY} tree(s) through the Energy-... = No*

Q2 What do we have wrong? Select all that apply

- ○ Yes (1)
- ○ No (2)
- ○ Do not recall (98)

**End of Block: Qualification Questions 2**

---

**Start of Block: Qualification Questions 3**

*Display This Question:*

*If What do we have wrong? Select all that apply = The number of trees is incorrect*

Q3 How many trees did you receive through the program?

________________________________________________________________

Q4 According to program records, you received ${e://Field/TREE_TYPES} through the program. Is this correct?

- ○ Yes (1)
- ○ No (2)
- ○ Do not recall (98)

*Display This Question:*

*If According to program records, you received ${e://Field/TREE_TYPES} through the program. Is this c... = No*

Q5 What type of trees did you receive through the program?

________________________________________________________________

**End of Block: Qualification Questions 3**

**Start of Block: Verification Questions**

Q6 Did you plant the tree(s) that you received through the program?

- ○ I planted all the trees I received (1)
- ○ I planted some of the trees I received (2)
- ○ I didn’t plant any of the trees I received (3)
- ○ I can’t recall (98)

**End of Block: Verification Questions**

**Start of Block: Verification Questions 2**

*Display This Question:*

*If Did you plant the tree(s) that you received through the program? = I planted some of the trees I received*

*And And How many trees did you receive through the program? Text Response Is Empty*

*

Q7 How many of the trees you received did you plant?

________________________________________________________________

### End of Block: Verification Questions 2

---

### Start of Block: Verification Questions 3

*Display This Question:*

*If If How many trees did you receive through the program? Text Response Is Not Empty*

*And Did you plant the tree(s) that you received through the program? = I planted some of the trees I received*

*

Q28 How many of the trees you received did you plant?

________________________________________________________________

### End of Block: Verification Questions 3

---

### Start of Block: Verification Questions 4

*Display This Question:*

*If Did you plant the tree(s) that you received through the program? = I planted some of the trees I received*

*Or Did you plant the tree(s) that you received through the program? = I didn’t plant any of the trees I received*

Q8 Why didn’t you plant your tree(s)?

________________________________________________________________

### End of Block: Verification Questions 4

---

### Start of Block: Location and Health of Tree | Satisfaction

*Display This Question:*

*If Did you plant the tree(s) that you received through the program? != I didn’t plant any of the trees I received*

*And Did you plant the tree(s) that you received through the program? != I can’t recall*

X→

Q9 The following questions are about the location where the trees were planted. When you participated in the program, you selected a location where the tree(s) would be planted. You can see the location(s) by following the link below.

${e://Field/TREE_LOCATIONS}" rel="noopener" target="_blank">View Location

If the link above doesn't work, copy and paste the following into your browser:
${e://Field/TREE_LOCATIONS}

Were you able to follow the link and view the location pins?

○ Yes (1)

○ No (2)

---

*Display This Question:*

*If The following questions are about the location where the trees were planted. When you participate... = Yes*

X→

Q10 Do the locations marked in the link match the locations where the trees were actually planted?

○ Yes (1)

○ No (2)

○ I can’t recall (98)

---

*Display This Question:*

*If Do the locations marked in the link match the locations where the trees were actually planted? = No*

Q11 How does the location(s) marked differ from where the tree(s) was actually planted? Please be as descriptive as possible.

________________________________________________________________

*Display This Question:*

*If Did you plant the tree(s) that you received through the program? != I didn't plant any of the trees I received*

*And Did you plant the tree(s) that you received through the program? != I can't recall*

X→

Q12 How healthy was your tree(s) before this current winter began?

- ○ Healthy and growing (1)
- ○ Leafy but little growth (2)
- ○ No leaves or needles (3)
- ○ The tree died (4)
- ○ Other (96) ________________________________________________

X→

Q13 How did you **<u>first</u>** hear about the Energy-Saving Trees program?

- ○ Community event (1)
- ○ General online search (2)
- ○ Evergy website (3)
- ○ Bill insert (4)
- ○ Email (5)
- ○ Television/radio/media coverage (6)

○ Evergy call center referral (7)

○ Connect center referral (8)

○ Social media or other online ad (i.e., Facebook) (9)

○ Family, friend, or neighbor (word-of-mouth) (10)

○ Other source (96) ________________________________________________

○ Do not recall (98)

*Display This Question:*

*If Did you plant the tree(s) that you received through the program? = I planted all the trees I received*

*Or Did you plant the tree(s) that you received through the program? = I planted some of the trees I received*

X→

Q14 Did the tree(s) you received meet your expectations when you first received it?

○ Yes (1)

○ No (2)

○ I can’t recall (98)

*Display This Question:*

*If Did the tree(s) you received meet your expectations when you first received it? = No*

Q15 Please tell us why your tree(s) didn’t meet your expectations

________________________________________________________________

X→

Q16 Please rate how helpful the system for selecting a tree and choosing a planting location was for each of the following:

| | 1 - Not at all helpful (1) | 2 (2) | 3 (3) | 4 (4) | 5 - Extremely helpful (5) | I don't know (98) |
|---|---|---|---|---|---|---|
| Avoiding overhead utility lines (1) | ○ | ○ | ○ | ○ | ○ | ○ |
| Avoiding underground utility lines (2) | ○ | ○ | ○ | ○ | ○ | ○ |
| Planting in a location that reduces energy consumption (3) | ○ | ○ | ○ | ○ | ○ | ○ |
| Learning about the benefits that trees provide (4) | ○ | ○ | ○ | ○ | ○ | ○ |

---

*Display This Question:*

*If Did you plant the tree(s) that you received through the program? != I didn’t plant any of the trees I received*

X→

Q17 Which of the following describes your tree planting experience? Check all that apply.

☐ I planted my tree(s) within a week of receiving it (2)

☐ I mulched my tree’s root zone (3)

☐ I watered my tree(s) regularly (4)

☐ ⊗ I didn’t plant my tree(s) (5)

☐ ⊗ I don't know (98)

Q18 Please tell us how much you agree with the following statements after participating in the program:

| | 1 - Strongly disagree (1) | 2 (2) | 3 (3) | 4 (4) | 5 - Strongly agree (5) | I don't know (98) |
|---|---|---|---|---|---|---|
| I have more positive views about planting trees (1) | ○ | ○ | ○ | ○ | ○ | ○ |
| I have an improved opinion of Evergy (2) | ○ | ○ | ○ | ○ | ○ | ○ |
| I am more likely to plant a tree in the future (3) | ○ | ○ | ○ | ○ | ○ | ○ |
| I made my community a better place by planting a tree (4) | ○ | ○ | ○ | ○ | ○ | ○ |
| I involved family members in my tree planting experience (5) | ○ | ○ | ○ | ○ | ○ | ○ |
| I am interested in additional trees (6) | ○ | ○ | ○ | ○ | ○ | ○ |

Q19 How satisfied are you with the following elements of the program?

| | 1 - Very dissatisfied (1) | 2 (2) | 3 (3) | 4 (4) | 5 - Very satisfied (5) | I don't know (98) |
|---|---|---|---|---|---|---|
| The tree selection process (1) | ○ | ○ | ○ | ○ | ○ | ○ |
| Selecting a planting location online (2) | ○ | ○ | ○ | ○ | ○ | ○ |
| The planting video shown during the checkout process (3) | ○ | ○ | ○ | ○ | ○ | ○ |
| The online checkout process (4) | ○ | ○ | ○ | ○ | ○ | ○ |
| The process of receiving your tree (5) | ○ | ○ | ○ | ○ | ○ | ○ |

Q20 How satisfied are you with the program as a whole?

○ 1 - Extremely dissatisfied (1)

○ 2 (2)

○ 3 (3)

○ 4 (4)

○ 5 - Extremely satisfied (5)

○ I don't know (98)

Q21 Do you have any additional comments that you would like to share with us regarding your experience with the program?

________________________________________________________________

X→

Q22 How likely is it that you would recommend this program to a friend or colleague?

○ 1 - Not at all likely (1)

○ 2 (2)

○ 3 (3)

○ 4 (4)

○ 5 - Extremely likely (5)

○ Prefer not to answer (99)

*Display This Question:*

*If How likely is it that you would recommend this program to a friend or colleague? = 4*

*Or How likely is it that you would recommend this program to a friend or colleague? = 5 - Extremely likely*

Q23 Why would you be likely to recommend this program?

________________________________________________________________

*Display This Question:*

*If How likely is it that you would recommend this program to a friend or colleague? = 1 - Not at all likely*

*Or How likely is it that you would recommend this program to a friend or colleague? = 2*

Q24 Why would you be unlikely to recommend this program?

________________________________________________________________

Q25 Would you like someone to contact you about your experience with the program?

○ Yes (1)

○ No (2)

*Display This Question:*

*If Would you like someone to contact you about your experience with the program? = Yes*

Q26 What is the best phone number to reach you?

________________________________________________________________

**End of Block: Location and Health of Tree | Satisfaction**

**Start of Block: HOME DEMOGRAPHICS**

*The final questions in this survey are regarding your household and residence. Your responses will remain anonymous and are used to assess how well participants in this program resemble Evergy's customer population. Please select "Prefer not to answer" if you do not wish to answer any of the following questions.*

Q27 Do you rent or own your household?

○ Rent (1)

○ Own (2)

○ Prefer not to answer (99)

Q28 Which of the following best describes your home?

○ Single Family Home, detached from any other house (1)

○ Single-family house attached to one or more other houses (e.g., duplex, row house, or townhome) (2)

○ Other (Please specify) (96) ________________________________________________

○ Not sure (98)

○ Prefer not to answer (99)

Q29 Approximately when was your home built?

○ Before 1960 (1)

○ 1960 - 1969 (2)

○ 1970 - 1979 (3)

○ 1980 - 1989 (4)

○ 1990 - 1999 (5)

○ 2000 - 2009 (6)

○ 2010 – 2019  (7)

○ 2020 or newer  (8)

○ Not sure  (98)

○ Prefer not to answer  (99)

---

Q30 About how many square feet is your home? If you are unsure, an estimate is okay.

○ Less than 1,000 square feet  (1)

○ 1,000-1,999 square feet  (2)

○ 2,000-2,999 square feet  (3)

○ 3,000-3,999 square feet  (4)

○ 4,000-4,999 square feet  (5)

○ 5,000 or greater square feet  (6)

○ Not sure  (98)

○ Prefer not to answer  (99)

---

Q31 What is the primary fuel type used to heat your home?

- ○ Electricity (1)
- ○ Natural Gas (2)
- ○ Propane (3)
- ○ Other (Please specify) (96) ________________________________________________
- ○ Not sure (98)
- ○ Prefer not to answer (99)

Q32 What was your total household income before taxes in 2021?

- ○ Less than $10,000 (1)
- ○ $10,000 to less than $20,000 (2)
- ○ $20,000 to less than $30,000 (3)
- ○ $30,000 to less than $40,000 (4)
- ○ $40,000 to less than $50,000 (5)
- ○ $50,000 to less than $75,000 (6)
- ○ $75,000 to less than $100,000 (7)
- ○ $100,000 to less than $150,000 (8)
- ○ $150,000 to less than $200,000 (9)
- ○ $200,000 or more (10)
- ○ Not sure (98)

○ Prefer not to answer  (99)

---

Q33 What is your highest level of education?

○ Up to 8th grade  (1)

○ Some high school  (2)

○ High school graduate or GED equivalent  (3)

○ Some college  (4)

○ Associate degree  (5)

○ Bachelor’s degree  (6)

○ Master’s degree  (7)

○ Professional degree (MD, JD, DDS, DDO)  (8)

○ Doctorate degree (Ph.D., D.Sc.)  (9)

○ Not sure  (98)

○ Prefer not to answer  (99)

**End of Block: HOME DEMOGRAPHICS**

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**Start of Block: Gift Card Information**

Q34 We appreciate your time and would like to send you a $5 electronic gift card to thank you. You should receive the electronic gift card within 5-10 business days. Where would you like us to send your electronic gift card?

○ ${e://Field/EMAIL1} (1)

○ Another email address: (2)
________________________________________________

○ I don’t want a gift card. (3)

**End of Block: Gift Card Information**

# Appendix M Deemed Savings and Algorithms

## M.1 Heating, Cooling and Home Comfort Program

### M.1.1 Gross Impact Calculation Algorithms

Energy savings and demand reductions for all measures in the Heating, Cooling, and Home Comfort Program were calculated as specified in the Evergy TRM. The gross energy savings and demand impacts algorithms are outlined in the sections below.

***LED Lightbulbs***

ADM calculated energy savings and demand reductions using prescriptive algorithms from the Evergy TRM, IL TRM, and other relevant program sources, as necessary, with adjusted baseline hours of use. Additionally, HVAC interactive effects were accounted for using algorithms from the Evergy TRM dependent upon heating and cooling systems serving areas where lighting systems were installed. Savings algorithms for omni-directional LED lightbulbs were taken from the Evergy TRM. The kWh savings and kW demand reductions from the installation of LED bulbs were determined using Equation M-1 through Equation M-2 below:

*Equation M-1: kWh Energy Savings from LED Bulbs*

$$\Delta kWh = (Watts_{base} - Watts_{ee})/1000 * HOU * WHF_{e} * ISR * (1 - Leakage)$$

*Equation M-2: kW Peak Demand Reduction from LED Bulbs*

$$\Delta kW = (Watts_{base} - Watts_{ee})/1000 * CF * WHF_{d} * ISR * (1 - Leakage)$$

Where:

$Watts_{base}$ = *Input wattage of the existing or baseline system*

$Watts_{ee}$ = *Actual wattage of LED purchased/installed*

*HOU* = *Hours of use*

*Leakage* = *Adjustment to account for the percentage of program bulbs that move out (and if deemed appropriate) of the Utility Jurisdiction*

$WHF_{e}$ = *Waste heat factor for energy to account for cooling energy savings from efficient lighting*

$WHF_{d}$ = *Waste heat factor for demand to account for cooling savings from efficient lighting*

*ISR* = *Installation rate*

*CF* = *Summer Peak Coincidence Factor for measure*

***Faucet Aerators***

ADM utilized savings algorithms found in the Evergy TRM for all faucet aerators (kitchen and bathroom) in the program. Final savings were based on the number of faucet aerators per household, the number of faucet aerators retrofitted, and the type of water heating unit in the home. The kWh savings and kW demand reductions from the installation of faucet aerators were determined using Equation M-3 through Equation M-4 below:

*Equation M-3: kWh Energy Savings for Faucet Aerators*

$$\Delta kWh = \%ElectricDHW * ((GPM\_base * L\_base - GPM\_low * L\_low) * Household * 365.25 * DF / FPH) * EPG\_electric * ISR$$

Where:

*%ElectricDHW* = *proportion of water heating supplied by electric resistance heating*

*GPM_base* = *Average flow rate, in gallons per minute, of the baseline faucet "as used." This includes the effect of existing low flow fixtures and therefore the free ridership rate for this measure should be 0.*

= *Measured full throttle flow * 0.83 throttling factor*

*GPM_low* = *Average flow rate, in gallons per minute, of the low-flow faucet aerator "as-used"*

= *Rated full throttle flow * 0.95 throttling factor*

*L_base* = *Average baseline daily length faucet use per capita for faucet of interest in minutes*

*L_low* = *Average retrofit daily length faucet use per capita for faucet of interest in minutes*

*Household* = *Average number of people per household*

*DF* = *Drain Factor*

*FPH* = *Faucets Per Household*

*EPG_electric* = *Energy per gallon of water used by faucet supplied by electric water heater*

*= 0.0795 kWh/gal (Bath), 0.0969 kWh/gal (Kitchen), 0.0919 kWh/gal (Unknown)*

*WaterTemp* = *Assumed temperature of mixed water*

*= 86ºF for Bath, 93ºF for Kitchen, 91ºF for Unknown*

*SupplyTemp* = *Assumed temperature of water entering house*

*= 54.1ºF*

*RE_electric* = *Recovery efficiency of electric water heater*

*= 98%*

*ISR* = *In service rate of faucet aerators dependent on install method*

*= 0.95 (direct install – single family)*

*Equation M-4: kW Peak Demand Reduction for Faucet Aerators*

$$\Delta kW = \Delta kWh / Hours * CF$$

Where:

*ΔkWh* = *kWh savings from faucet aerators*

*Hours* = *Annual electric DHW recovery hours for faucet use per faucet*

*= ((GPM_base * L_base) * Household/FPH * 365.25 * DF) * 0.545 / GPH*

*GPH* = *Gallons per hour recovery of electric water heater calculated for 70.9ºF temp rise (125-54.1), 98% recovery efficiency, and typical 4.5kW electric resistance storage tank*

*= 27.4*

*CF* = *Coincidence Factor for electric load reduction*

*= 0.022*

### *Low Flow Showerheads*

ADM utilized savings algorithms found in the Evergy TRM all low flow showerheads in the program. Final savings were based on the number of showerheads per household, the number of showerheads retrofitted, and the type of water heating unit in the home. The kWh savings and kW demand reductions from the installation of faucet aerators were determined using Equation M-5 through Equation M-6 below:

*Equation M-5: kWh Energy Savings for Low Flow Showerheads*

$$\Delta kWh = \%ElectricDHW * ((GPM\_base * L\_base - GPM\_low * L\_low) * Household * SPCD * 365.25 / SPH) * EPG\_electric * ISR$$

Where:

*%ElectricDHW* = *proportion of water heating supplied by electric resistance heating*

*GPM_base* = *Flow rate of the baseline showerhead*

= *2.24*

*GPM_low* = *As-used flow rate of the low-flow showerhead*

*L_base* = *Shower length in minutes with baseline showerhead*

= *7.8 min*

*L_low* = *Shower length in minutes with low-flow showerhead*

= *7.8 min*

*Household* = *Average number of people per household*

*SPCD* = *Showers Per Capita Per Day*

= *0.6*

*SPH* = *Showerheads per household so that per-showerhead savings fractions can be determined*

*EPG_electric* = *Energy per gallon of hot water supplied by electric*

= *0.117 kWh/gal*

*ShowerTemp* = *Assumed temperature of water*

= *101ºF*

*SupplyTemp* = *Assumed temperature of water entering house*

= *54.1ºF*

RE_electric = Recovery efficiency of electric water heater

= 98%

ISR = In service rate of showerhead

*Equation M-6: kW Peak Demand Reduction for Low Flow Showerheads*

$$\Delta kW = \Delta kWh / Hours * CF$$

Where:

ΔkWh = kWh savings from low flow showerheads

Hours = Annual electric DHW recovery hours for showerhead use

= ((GPM_base * L_base) * Household * SPCD * 365.25) * 0.712 / GPH

GPH = Gallons per hour recovery of electric water heater calculated for 65.9 °F temp rise (120 °F-54.1 °F), 98% recovery efficiency, and typical 4.5 kW electric resistance storage tank

= 27.4

CF = Coincidence Factor for electric load reduction

= 0.0278

**Pipe Insulation**

ADM utilized savings algorithms found in the Evergy TRM for all pipe insulation in the program. Final savings were based on the length of pipe that the pipe wrap insulation covers. Default savings were provided per 3ft length and were appropriate up to 6ft of the hot water pipe and 3ft of the cold. The baseline is an un-insulated hot water pipe. The kWh savings and kW demand reductions from the installation of pipe insulation were determined using Equation M-7 through Equation M-8 below:

*Equation M-7: kWh Energy Savings for Pipe Insulation*

$$\Delta kWh = ((C_{exist} / R_{exist} - C_{new} / R_{new}) * L * \Delta T * 8{,}766) / \eta DHW / 3412$$

Where:

$R_{exist}$ = Pipe heat loss coefficient of uninsulated pipe (existing) [(hr-°F-ft)/Btu]

= 1.0

*$R_{new}$* = *Pipe heat loss coefficient of insulated pipe (new) [(hr-°F-ft)/Btu]*

= *Actual (1.0 + R value of insulation)*

*L* = *Length of pipe from water heating source covered by pipe wrap (ft)*

*$C_{exist}$* = *Circumference of pipe (ft) (Diameter (in) * π/12)*

= *Actual (0.5” pipe = 0.131ft, 0.75” pipe = 0.196ft)*

*$C_{new}$* = *Circumference of pipe (ft) (Diameter (in) * π/12)*

= *Actual (0.5” pipe and 3/8” foam ((0.5 + 3/8 + 3/8) * π/12) = 0.327 ft)*

*ΔT* = *Average temperature difference between supplied water and outside air temperature (°F)*

= *60 °F*

*ηDHW* = *Recovery efficiency of electric hot water heater*

= *0.98*

*Equation M-8: kW Peak Demand Reduction for Pipe Insulation*

$$\Delta kW = \Delta kWh / 8766$$

Where:

*ΔkWh* = *kWh savings from pipe wrap installation*

***Advanced Power Strips***

ADM utilized savings algorithms found in the Evergy TRM for all advanced power strips in the program. This measure characterization provided savings for a 7-plug strip. The assumed baseline was a standard power strip that does not control connected loads. The kWh savings and kW demand reductions from the installation of advanced power strips were determined using Equation M-9 through Equation M-10 below:

*Equation M-9: kWh Energy Savings for Advanced Power Strips*

$$\Delta kWh = kWh * ISR$$

*kWh* = *Assumed annual kWh savings per unit*

= *56.5 kWh for 5-plug units or 103 kWh for 7-plug units*

*ISR* = *In Service Rate, dependent on delivery mechanism*

*Equation M-10: kW Peak Demand Reduction for Advanced Power Strips*

$$\Delta kW = \Delta kWh \,/\, Hours * CF$$

Where:

*Hours* = *Annual number of hours during which the controlled standby loads are turned off by the Tier 1 Advanced Power Strip*

= *7,129*

*CF* = *Summer Peak Coincidence Factor for measure*

= *0.8*

*ΔkW* = *Peak Demand Reduction for 7-plug, direct install*

= *0.0116 kW*

***Air Sealing***

Thermal shell air leaks were sealed through strategic use and location of air-tight materials. Leaks were detected and leakage rates measured with the assistance of a blower-door test. The initial and final tested leakage rates were performed in such a manner that the identified reductions can be properly discerned, particularly in situations wherein multiple building envelope measures may have been implemented simultaneously. ADM utilized savings algorithms found in the Evergy TRM for all air sealing in the program. The kWh savings and kW demand reductions from the air sealing were determined using Equation M-11 through Equation M-15:

*Equation M-11: kWh Energy Savings for Air Sealing*

$$\Delta kWh = \Delta kWh\_cooling + \Delta kWh\_heatingElectric + \Delta kWh\_heatingGas$$

Where:

*ΔkWh_cooling* = *If central cooling, reduction in annual cooling requirement due to air sealing*

*ΔkWh_heatingElectric* = *If electric heat (resistance or heat pump), reduction in annual electric heating due to air sealing*

*ΔkWh_heatingGas* = *If gas furnace heat, kWh savings for reduction in fan run time*

*Equation M-12: kWh Savings for Reduction in Annual Cooling Requirement Due to Air Sealing*

$$\Delta kWh\_cooling = [(((CFM50\_existing - CFM50\_new)/N\_cool) * 60 * 24 * CDD * DUA * 0.018) / (1000 * \eta Cool)] * LM\ ADJ_{AirSealingCool}] * IE_{NetCorrection} * \%Cool$$

Where:

| | |
|---|---|
| *CFM50_existing* | *= Infiltration at 50 Pascals as measured by blower door before air sealing* |
| *CFM50_new* | *= Infiltration at 50 Pascals as measured by blower door after air sealing* |
| *N_cool* | *= Conversion factor from leakage at 50 Pascal to leakage at natural conditions* |
| | *= Dependent on location and number of stories* |
| *CDD* | *= Cooling Degree Days* |
| | *= Dependent on location* |
| *DUA* | *= Discretionary Use Adjustment (reflects the fact that people do not always operate their air conditioner when conditions may call for it)* |
| | *= 0.75* |
| $\eta Cool$ | *= Efficiency (SEER) of air conditioning equipment (kBtu/kWh)* |
| *LM* | *= Latent multiplier to account for latent cooling demand* |
| $ADJ_{AirSealingCool}$ | *= Adjustment for cooling savings to account for inaccuracies in engineering algorithms* |
| | *= 121% for air sealing and attic insulation* |
| | *= 100% for air sealing without attic insulation* |
| $IE_{NetCorrection}$ | *= 100% if not income eligible or air sealing is installed without attic insulation* |
| | *= 100% if installing air sealing and attic insulation in income eligible projects with a deemed NTG value of 1.0 to offset net savings adjustment inherent when using* $ADJ_{AirSealingCool}$ *of 121%* |
| *%Cool* | *= Percent of homes that have cooling* |

*Equation M-13: kWh Savings for Reduction in Annual Electric Heating Due to Air Sealing*

$$\Delta kWh\_heatingElectric = [(((CFM50\_existing - CFM50\_new)/N\_heat) * 60 * 24 * HDD * 0.018) / (\eta Heat * 3{,}412)] * \%ElectricHeat$$

Where:

*N_heat* = *Conversion factor from leakage at 50 Pascal to leakage at natural conditions*

= *Based on climate zone, building height and exposure level*

*HDD* = *Heating Degree Days*

= *Dependent on location*

*ηHeat* = *Efficiency of heating system*

*%ElectricHeat* = *Percent of homes that have electric space heating*

*Equation M-14: kWh Savings for Reduction in Fan Run Time (Gas Furnace Heat) Due to Air Sealing*

$$\Delta kWh\_heatingGas = \Delta Therms * Fe * 29.3 * ADJ_{AirSealingHeatFan} * IE_{NetCorrection}$$

Where:

*ΔTherms* = *Therm Savings if Natural Gas Heating*

*Fe* = *Furnace fan energy consumption as a percentage of annual fuel consumption*

= *3.14%*

$ADJ_{AirSealingHeatFan}$ = *Adjustment for fan savings during heating season to account for inaccuracies in engineering algorithms*

= *107% for air sealing and attic insulation*

= *100% for air sealing without attic insulation*

$IE_{NetCorrection}$ = *100% if not income eligible or air sealing is installed without attic insulation*

= *110% if installing air sealing and attic insulation in income eligible projects with a deemed NTG value of 1.0 to offset net savings adjustment inherent when using* $ADJ_{AirSealingHeatFan}$ *of 107%*

*Equation M-15: Natural Gas Savings Due to Air Sealing Methodology 1: Blower Door Test (used in Equation M-14)*

$$\Delta Therms = (((CFM50\_existing - CFM50\_new)/N\_heat) * 60 * 24 * HDD * 0.018) / (\eta Heat * 100{,}000) * ADJ_{AirSealingGasHeat} * IE_{NetCorrection}$$

Where:

$N\_heat$ = *Conversion factor from leakage at 50 Pascal to leakage at natural conditions*

= *Based on climate zone and building height*

$HDD$ = *Heating Degree Days*

= *Dependent on location*

$\eta Heat$ = *Efficiency of heating system*

= *Equipment efficiency * distribution efficiency*

$ADJ_{AirSealingGasHeat}$ = *Adjustment for gas heating savings to account for inaccuracies in engineering algorithms*

= *72% for air sealing and attic insulation*

= *100% for air sealing without attic insulation*

$IE_{NetCorrection}$ = *100% if not income eligible or air sealing is installed without attic insulation*

= *110% if installing air sealing and attic insulation in income eligible projects with a deemed NTG of 1.0 to offset net savings adjustment inherent when using* $ADJ_{AirSealingGasHeat}$ *of 72%*

*Other factors as defined above.*

*Equation M-16: Natural Gas Savings Due to Air Sealing Methodology 2: Prescriptive Infiltration Reduction Measures (used in Equation M-14)*

$$\Delta Therms = (\Delta Therms_{gasket} * n_{gasket} + \Delta Therms_{windows} * sf_{windows} + \Delta Therms_{sweep} * n_{sweep} + \Delta Therms_{sealing} * lf_{sealing} + \Delta Therms_{wx} * lf_{wx}) * ADJ_{RxAirsealing} * ISR$$

Where:

$\Delta therms_{gasket}$ = *Annual therm savings from installation of air sealing gasket on an electric outlet*

$n_{gasket}$ = *Number of gaskets installed*

$\Delta therms_{windows}$ = Annual therm savings from installation of Shrink-Fit Window Kit

$sf_{windows}$ = square footage of shrink-fit window film

$\Delta therms_{sweep}$ = Annual therm savings from installation of door sweep

$n_{sweep}$ = Number of sweeps installed

$\Delta therms_{sealing}$ = Annual therm savings from foot of caulking, sealing, or polyethlylene tape

$lf_{sealing}$ = linear feet of caulking, sealing, or polyethylene tape

$\Delta therms_{wx}$ = Annual therm savings from window weatherstripping or door weatherstripping

$lf_{wx}$ = linear feet of window weatherstripping or door weatherstripping

$ADJ_{RxAirsealing}$ = Adjustment for air sealing savings to account for prescriptive estimates overclaiming savings

= 80%

ISR = In service rate of weatherization kits dependent on install method

*Equation M-17: kW Peak Demand Reduction for Air Sealing*

$$\Delta kW = (\Delta kWh\_cooling / FLH\_cooling) * CF$$

Where:

FLH_cooling = Full load hours of air conditioning

= Dependent on location

CF = Summer System Peak Coincidence Factor (during system peak hour)

= 68% (for Central A/Cs)

= 72% (for Heat Pumps)

### Ceiling/Attic Insulation

Insulation was added to a home’s ceiling/attic. This measure required a member of the implementation staff evaluating the pre and post R-values and measure surface areas. The existing condition was evaluated by implementation staff and was likely to be little or no attic insulation. ADM utilized savings algorithms found in the Evergy TRM for all ceiling/attic insulation in the program. The kWh savings and kW demand reductions from the installation of ceiling/attic insulation were determined using Equation M-18 through Equation M-20:

*Equation M-18: kWh Energy Savings for Ceiling/Attic Insulation*

$$\Delta kWh = \Delta kWh\_cooling + \Delta kWh\_heatingElectric + \Delta kWh\_heatingGas$$

Where:

$\Delta kWh\_cooling$ = *If central cooling, reduction in annual cooling requirement due to insulation*

$\Delta kWh\_heatingElectric$ = *If electric heat (resistance or heat pump), reduction in annual electric heating due to insulation*

$\Delta kWh\_heatingGas$ = *If gas furnace heat, kWh savings for reduction in fan run time*

*Equation M-19: kWh Savings for Reduction in Annual Cooling Requirement Due to Ceiling/Attic Insulation*

$$\Delta kWh\_cooling = ((((1/R\_old - 1/R\_attic) * A\_attic * (1\text{-}Framing\_factor\_attic)) * 24 * CDD * DUA) / (1000 * \eta Cool)) * ADJ_{AtticCool} * IE_{NetCorrection} * \%Cool$$

Where:

$R\_attic$ = *R-value of new attic assembly (including all layers between inside air and outside air)*

$R\_old$ = *R-value value of existing assemble and any existing insulation (Minimum of R-3 for uninsulated assemblies)*

$A\_attic$ = *Total area of insulated ceiling/attic* ($ft^2$)

$Framing\_factor\_attic$ = *Adjustment to account for area of framing*

= *7%*

$CDD$ = *Cooling Degree Days*

= *Dependent on location*

$DUA$ = *Discretionary Use Adjustment (reflects the fact that people do not always operate their air conditioner when conditions may call for it)*

= *0.75*

$\eta Cool$ = *Seasonal Energy Efficiency Ratio of cooling system (kBtu/kWh)*

$ADJ_{AtticCool}$ = *Adjustment for cooling savings to account for inaccuracies in engineering algorithms*

= *121%*

*IENetCorrection* = *100% if not income eligible or attic insulation is installed without air sealing*

= *110% if installing air sealing and attic insulation in income eligible projects with a deemed NTG of 1.0 to offset net savings adjustment inherent when using* $ADJ_{AtticCool}$ *of 121%*

*%Cool* = *Percent of homes that have cooling*

*Equation M-20: kWh Savings for Reduction in Annual Electric Heating (Resistance or Heat Pump) Due to Ceiling/Attic Insulation*

$$\Delta kWh\_heating = ((((1/R\_old - 1/R\_attic) * A\_attic * (1\text{-}Framing\_factor\_attic)) * 24 * HDD] / (\eta Heat * 3412)) * ADJ_{AtticElectricHeat} * \%ElectricHeat$$

Where:

*HDD* = *Heating Degree Days*

= *Dependent on location*

*ηHeat* = *Efficiency of heating system*

$ADJ_{AtticElectricHeat}$ = *Adjustment for electric heating savings to account for inaccuracies in engineering algorithms*

= *60%*

*%ElectricHeat* = *Percent of homes that have electric space heating*

*Equation M-21: kWh Savings for Reduction in Fan Run Time (Gas Furnace Heat) Due to Air Sealing*

$$\Delta kWh\_heatingGas = \Delta Therms * F_e\ 29.3 * ADJ_{AtticHeatFan} * IE_{NetCorrection}$$

Where:

*ΔTherms* = *Therm Savings if Natural Gas Heating*

$F_e$ = *Furnace Fan energy consumption as a percentage of annual fuel consumption*

= *3.14%*

$ADJ_{AtticHeatFan}$ = *Adjustment for fan savings to account for inaccuracies in engineering algorithms*

= *107%*

*IENetCorrection = 100% if not income eligible or attic insulation is installed without air sealing*

*= 110% if installing air sealing and attic insulation in income eligible projects with a deemed NTG value of 1.0 to offset net savings adjustment inherent when using $ADJ_{AtticHeatFan}$ of 107%*

*Equation M-22: Natural Gas Savings Due to Ceiling/Attic Insulation (used in Equation M-21)*

$$\Delta Therms = ((((1/R\_old - 1/R\_attic) * A\_attic * (1 - Framing\_factor\_attic)) * 24 * HDD) / (\eta Heat * 100{,}000\ Btu/therm) * ADJ_{AtticGasHeat} * IE_{NetCorrection} * \%GasHeat$$

Where:

*HDD = Heating Degree Days*

*= Dependent on location*

*$\eta_{Heat}$ = Efficiency of heating system*

*= Equipment efficiency * distribution efficiency*

*$ADJ_{AtticGasHeat}$ = Adjustment for gas heating savings to account for inaccuracies in engineering algorithms*

*IENetCorrection = 100% if not income eligible or attic insulation is installed without air sealing*

*= 110% if installing air sealing and attic insulation in income eligible projects with a deemed NTG value of 1.0 to offset net savings adjustment inherent when using $ADJ_{AtticGasHeat}$ of 72%*

*Other factors as defined above.*

*Equation M-23: kW Peak Demand Savings for Air Sealing*

$$\Delta kW = (\Delta kWh\_cooling / FLH\_cooling) * CF$$

Where:

*FLH_cooling = Full load hours of air conditioning*

*= Dependent on location*

*CF* *= Summer System Peak Coincidence Factor (during system peak hour)*

*=68% (Central A/C)*

*= 72% (Heat Pumps)*

### *Central Air Conditioners*

This measure characterizes time of sale and early replacement central air conditioners following the Evergy TRM. ADM utilized savings algorithms found in the Evergy TRM for all central air conditioners in the program. The kWh savings and kW demand reductions from the installation of central air conditioners were determined using Equation M-24 through Equation M-27 below:

*Equation M-24: kWh Energy Savings for Central Air Conditioners (Time of Sale)*

$$\Delta kWH = (FLHcool * Capacity * (1/(SEERbase * (1 - DeratingCool_{Base})) - 1/(SEERee * SEERadj * (1 - DeratingCool_{Eff}))))/1000$$

*Equation M-25: kWh Energy Savings for Central Air Conditioners (Early Replacement)*

$$\Delta kWH \text{ for remaining life of existing unit (first 6 years)} = (FLHcool * Capacity * (1/(SEERexist * (1 - DeratingCool_{Base})) - 1/(SEERee * SEERadj * (1 - DeratingCool_{Eff}))))/1000$$

$$\Delta kWH \text{ for remaining measure life (next 12 years)} = (FLHcool * Capacity * (1/(SEERbase * (1 - DeratingCool_{Base})) - 1/(SEERee * SEERadj * (1 - DeratingCool_{Eff}))))/1000$$

Where:

*FLHcool* *= Full load cooling hours*

*= Dependent on location and building type*

*Capacity* *= Size of new equipment in Btu/hr (note 1 ton = 12,000 Btu/hr)*

*SEERbase* *= Seasonal energy-efficiency ratio of baseline unit (kBtu/kWh)*

*= 13*

*SEERexist* *= Seasonal energy-efficiency ratio of existing unit (kBtu/kWh)*

*SEERee* *= Rated seasonal energy-efficiency ratio of ENERGY STAR® unit (kBtu/kWh)*

*SEERadj* = *Adjustment percentage to account for in-situ performance of the unit*

= $[0.805 * (EER_{ee} / SEER_{ee}) + 0.367]$

*DeratingCool*$_{Eff}$ = *Efficient central air conditioner cooling derating*

= *0% if Quality Installation is performed*

= *10% if Quality Installation is not performed or unknown*

*DeratingCool*$_{Base}$ = *Baseline central air conditioner cooling derating*

= *10%*

*Equation M-26: kW Peak Demand Reduction for Central Air Conditioners (Time of Sale)*

$$\Delta kW = (Capacity * (1/(EERbase * (1 - DeratingCool_{Base})) - 1/(EERee * (1 - DeratingCool_{Eff}))))/1000 * CF$$

*Equation M-27: kW Peak Demand Reduction for Central Air Conditioners (Early Replacement)*

$$\Delta kW \text{ for remaining life of existing unit (first 6 years)} = (Capacity * (1/(EERexist * (1 - DeratingCool_{Base})) - 1/(EERee * (1 - DeratingCool_{Eff}))))/1000 * CF$$

$$\Delta kW \text{ for remaining measure life (next 12 years)} = (Capacity * (1/(EERbase * (1 - DeratingCool_{Base})) - 1/(EER_{ee} * (1 - DeratingCool_{Eff}))))/1000 * CF$$

Where:

*EERbase* = *EER Efficiency of baseline unit*

= *10.5*

*EERexist* = *EER Efficiency of existing unit*

*EERee* = *EER Efficiency of ENERGY STAR® unit*

*CF* = *Coincidence Factor for Central A/Cs (during system peak hour)*

= *68%*

*Other variables as defined above.*

### *Air Source Heat Pumps*

This measure characterizes time of sale and early replacement air source heat pumps following the Evergy TRM. ADM utilized savings algorithms found in the Evergy TRM for all air source heat pumps in the program. The kWh savings and kW demand reductions from the installation of air source heat pumps were determined using Equation M-28 through Equation M-31:

*Equation M-28: kWh Energy Savings for Air Source Heat Pumps (Time of Sale)*

$$\Delta kWh = ((\text{FLH\_cooling} * \text{Capacity\_cooling} * (1/(\text{SEER\_base} * (1 - \text{DeratingCool}_{Base})) - 1/(\text{SEER\_ee} * \text{SEERadj} * (1 - \text{DeratingCool}_{Eff})))) / 1000) + ((\text{FLH\_heat} * \text{Capacity\_heating} * (1/(\text{HSPF\_base} * (1 - \text{DeratingHeat}_{Base})) - 1/(\text{HSPF\_ee} * \text{HSPFadj} * (1 - \text{DeratingHeat}_{Eff})))) / 1000)$$

*Equation M-29: kWh Energy Savings for Air Source Heat Pumps (Early Replacement)*

$$\Delta kWH \text{ for remaining life of existing unit (first 6 years)} = ((\text{FLH\_cooling} * \text{Capacity\_cooling} * (1/(\text{SEER\_exist} * (1 - \text{DeratingCool}_{Base})) - 1/(\text{SEER\_ee} * \text{SEERadj} * (1 - \text{DeratingCool}_{Eff})))) / 1000) + ((\text{FLH\_heat} * \text{Capacity\_heating} * (1/(\text{HSPF\_exist} * (1 - \text{DeratingHeat}_{Base})) - 1/(\text{HSPF\_ee} * \text{HSPF\_adj} * (1 - \text{DeratingHeat}_{Eff})))) / 1000)$$

$$\Delta kWH \text{ for remaining measure life (next 12 years)} = ((\text{FLH\_cooling} * \text{Capacity\_cooling} * (1/(\text{SEER\_base} * (1 - \text{DeratingCool}_{Base})) - 1/(\text{SEER\_ee} * \text{SEERadj} * (1 - \text{DeratingCool}_{Eff})))) / 1000) + ((\text{FLH\_heat} * \text{Capacity\_heating} * (1/(\text{HSPF\_base} * (1 - \text{DeratingHeat}_{Base})) - 1/(\text{HSPF\_ee} * \text{HSPF\_adj} * (1 - \text{DeratingHeat}_{Eff})))) / 1000)$$

Where:

*FLH_cooling = Full load hours of air conditioning*

*= Dependent on location*

*Capacity_cooling = Cooling Capacity of Air Source Heat Pump (Btu/hr)*

*SEER_exist = Seasonal Energy Efficiency Ratio of existing cooling system (kBtu/kWh)*

*SEER_base = Seasonal Energy Efficiency Ratio of baseline Air Source Heat Pump (kBtu/kWh)*

*= 14*

*SEER_ee* = *Rated Seasonal Energy Efficiency Ratio of ENERGY STAR® unit (kBtu/kWh)*

*SEERadj* = *Adjustment percentage to account for in-situ performance of the unit*

= $[0.805 \times (EER_{ee} / SEER_{ee}) + 0.367]$

$DeratingCool_{Eff}$ = *Efficient air source heat pump cooling derating*

= *0% if Quality Installation is performed*

= *10% if Quality Installation is not performed or unknown*

$DeratingCool_{Base}$ = *Baseline Cooling derating*

= *10%*

*FLH_heat* = *Full load hours of heating*

= *Dependent on location and home type*

*Equation M-30: kW Peak Demand Reduction for Air Source Heat Pumps (Time of Sale)*

$$\Delta kW = (\text{Capacity\_cooling} * (1/(\text{EER\_base} * (1 - DeratingCool_{Base})) - 1/(\text{EER\_ee} * (1 - DeratingCool_{Eff})))) / 1000 * CF$$

*Equation M-31: kW Peak Demand Reduction for Air Source Heat Pumps (Early Replacement)*

$$\Delta kW \text{ for remaining life of existing unit (first 6 years)} = (\text{Capacity\_cooling} * (1/(\text{EER\_exist} * (1 - DeratingCool_{Base})) - 1/(\text{EER\_ee} * (1 - DeratingCool_{Eff})))) / 1000 * CF$$

$$\Delta kW \text{ for remaining measure life (next 12 years)} = (\text{Capacity\_cooling} * (1/(\text{EER\_base} * (1 - DeratingCool_{Base})) - 1/(\text{EER\_ee} * (1 - DeratingCool_{Eff})))) / 1000 * CF$$

Where:

*EER_exist* = *Energy Efficiency Ratio of existing cooling system (kBtu/hr / kW)*

*EER_base* = *Energy Efficiency Ratio of baseline air source heat pump (kBtu/hr / kW)*

= *11*

*EER_ee* = *Energy Efficiency Ratio of efficient air source heat pump (kBtu/hr / kW)*

*CF* = *Coincidence Factor for heat pumps (during system peak hour)*

= *72%*

*Other variables as defined above.*

### Ground Source Heat Pumps

This measure characterizes time of sale and early replacement ground source heat pumps (non-fuel switch) following the Evergy TRM. ADM utilized savings algorithms found in the Evergy TRM for all ground source heat pumps in the program. The kWh savings and kW demand reductions from the installation of ground source heat pumps were determined using Equation M-32 through Equation M-35 below:

*Equation M-32: kWh Energy Savings for Ground Source Heat Pumps (Time of Sale)*

$$\Delta kWh = [FLHcool * Capacity\_cooling * (1/SEER_{base} - 1/EER_{PL})/1000] + [FLHheat * Capacity\_heating * (1/HSPF_{base} - 1/(COP_{PL} * 3.412))/1000] + [ElecDHW * \%DHWDisplaced * ((1/EF_{ELEC} * GPD * Household * 365.25 * \gamma Water * (T_{OUT} - T_{IN}) * 1.0) / 3412)]$$

*Equation M-33: kWh Energy Savings for Ground Source Heat Pumps (Early Replacement)*

$$\Delta kWH \text{ for remaining life of existing unit (first 8 years)} = [FLHcool * Capacity\_cooling * (1/SEER_{exist} - 1 / EER_{PL})/1000] + [ElecHeat * FLHheat * Capacity\_heating * (1/HSPF_{exist} - 1/(COP_{PL} * 3.412))/1000] + [ElecDHW * \%DHWDisplaced * ((1/ EF_{ELEC} * GPD * Household * 365.25 * \gamma Water * (T_{OUT} - T_{IN}) * 1.0) / 3412)]$$

$$\Delta kWH \text{ for remaining measure life (next 17 years)} = [FLHcool * Capacity\_cooling * (1/SEER_{base} - 1/EER_{PL})/1000] + [ElecHeat * FLHheat * Capacity\_heating * (1/HSPF_{base} - (1/(COP_{PL} * 3.412))/1000] + [ElecDHW * \%DHWDisplaced * ((1/EF_{ELEC} * GPD * Household * 365.25 * \gamma Water * (T_{OUT} - T_{IN}) * 1.0) / 3412)]$$

Where:

*FLHcool* = *Full load cooling hours*

*Capacity_cooling* = *Cooling Capacity of ground source heat pump (Btu/hr)*

$SEER_{base}$ = *SEER Efficiency of new replacement baseline unit*

$SEER_{exist}$ = *SEER Efficiency of existing cooling unit*

*$EER_{PL}$ = Part Load EER Efficiency of efficient ground source heat pump unit*

*ElecHeat = 1 if existing building is electrically heated*

*= 0 if existing building is not electrically heated*

*FLHheat = Full load heating hours*

*= Dependent on location*

*Capacity_heating = Heating Capacity of ground source heat pump (Btu/hr) (1 ton = 12,000 Btu/hr)*

*$HSPF_{base}$ = Heating System Performance Factor of new replacement baseline heating system (kBtu/kWh)*

*$HSPF_{exist}$ = Heating System Performance Factor of existing heating system (kBtu/kWh)*

*$COP_{PL}$ = Part Load Coefficient of Performance of efficient unit*

*ElecDHW = 1 if existing DHW is electrically heated*

*= 0 if existing DHW is not electrically heated*

*%DHWDisplaced = Percentage of total DHW load that the ground source heat pump will provide*

*$EF_{ELEC}$ = Energy Factor (efficiency) of electric water heater*

*GPD = Gallons Per Day of hot water use per person*

*= 45.5 gallons hot water per day per household/2.59 people per household*

*= 17.6*

*Household = Average number of people per household*

*γWater = Specific weight of water*

*$T_{OUT}$ = Tank temperature*

*= 125 °F*

*$T_{IN}$ = Incoming water temperature from well or municipal system*

*= 54 °F*

*Equation M-34: kW Peak Demand Reduction for Ground Source Heat Pumps (Time of Sale)*

$$\Delta kW = (Capacity\_cooling * (1/EER\_base - 1/EER_{FL}))/1000 * CF$$

*Equation M-35: kW Peak Demand Reduction for Ground Source Heat Pumps (Early Replacement)*

$$\Delta kW \text{ for remaining life of existing unit (first 8 years)} = (Capacity\_cooling * (1/EER\_exist - 1/EER_{FL}))/1000 * CF$$

$$\Delta kW \text{ for remaining measure life (next 17 years)} = (Capacity\_cooling * (1/EER\_base - 1/EER_{FL}))/1000 * CF$$

Where:

*EERbase* = *Energy Efficiency Ratio of new replacement baseline unit*

*EERexist* = *Energy Efficiency Ratio of existing cooling unit (kBtu/kWh)*

$EER_{FL}$ = *Full Load Energy Efficiency Ratio of ENERGY STAR® ground source heat pump unit*

*CF* = *Coincidence Factor for heat pumps (during system peak hour)*

= *72%*

*Other variables as defined above.*

### *Ductless Mini-Split Heat Pumps*

This measure characterizes time of sale and early replacement ductless mini-split heat pumps (non-fuel switch) following the Evergy TRM. ADM utilized savings algorithms found in the Evergy TRM for all ductless mini-split heat pumps in the program. The kWh savings and kW demand reductions from the installation of ductless mini-split heat pumps were determined using Equation M-36 through Equation M-39 below:

*Equation M-36: kWh Energy Savings for Ductless Mini-Spilt Heat Pumps (Time of Sale)*

$$\Delta kWh = [Cooling\ Savings] + [Heating\ Savings]$$

$$\Delta kWh = [(Capacity_{cool} * EFLH_{cool} * (1/SEER_{base} – 1/SEER_{ee}))/1000] + [(Capacity_{heat} * EFLH_{heat} * (1/HSPF_{base} – 1/HSPF_{ee})) / 1000]$$

### Equation M-37: kWh Energy Savings for Ductless Mini-Spilt Heat Pumps (Early Replacement)

$$\Delta kWh \text{ for remaining life of existing unit (first 6 years)} = [(Capacity_{cool} * EFLH_{cool} * (1/SEER_{exist} - 1/SEER_{ee}))/1000] + [(Capacity_{heat} * EFLH_{heat} * (1/HSPF_{exist} - 1/HSPF_{ee})) / 1000]$$

$$\Delta kWh \text{ for remaining measure life (next 12 years)} = [(Capacity_{cool} * EFLH_{cool} * (1/SEER_{base} - 1/SEER_{ee}))/1000] + [(Capacity_{heat} * EFLH_{heat} * (1/HSPF_{base} - 1/HSPF_{ee})) / 1000]$$

Where:

| | |
|---|---|
| $Capacity_{cool}$ | = the cooling capacity of the ductless heat pump unit in Btu/hr |
| $EFLH_{cool}$ | = Equivalent Full Load Hours for cooling |
| | = Depends on location |
| $SEER_{base}$ | = SEER rating of new replacement baseline unit (kBtu/kWh) |
| SEERexist | = SEER rating of existing equipment (kBtu/kwh) |
| $SEER_{ee}$ | = SEER rating of new equipment (kBtu/kwh) |
| $Capacity_{heat}$ | = Heating capacity of the ductless heat pump unit in Btu/hr |
| $EFLH_{heat}$ | = Equivalent Full Load Hours for heating |
| | = Depends on location |
| $HSPF_{base}$ | = Heating System Performance Factor of new replacement baseline heating system (kBtu/kWh) |
| $HSPF_{exist}$ | = HSPF rating of existing equipment (kBtu/kwh) |
| $HSPF_{ee}$ | = HSPF rating of new equipment (Bbtu/kwh) |

### Equation M-38: kW Peak Demand Reduction for Ductless Mini-Split Heat Pumps (Time of Sale)

$$\Delta kW = (Capacity_{cool} * (1/EER_{base} - 1/EER_{ee})) / 1000) * CF$$

*Equation M-39: kW Peak Demand Reduction for Ductless Mini-Split Heat Pumps (Early Replacement)*

$$\Delta kW \text{ for remaining life of existing unit (first 6 years)} = (Capacity_{cool} * (1/EER_{exist} - 1/EER_{ee}) / 1000) * CF$$

$$\Delta kW \text{ for remaining measure life (next 12 years)} = (Capacitycool * (1/EER_{base} - 1/EER_{ee})) / 1000) * CF$$

Where:

$EER_{base}$ = Energy Efficiency Ratio of new replacement unit

$EER_{exist}$ = Energy Efficiency Ratio of existing cooling system (kBtu/hr/kW)

$EER_{ee}$ = Energy Efficiency Ratio of new ductless mini-split heat pumps (kBtu/hr/kW)

CF = Summer System Peak Coincidence Factor for heat pumps (during utility peak hour)
= 72%

### A/C Mini-Splits

This measure characterizes time of sale and early replacement of A/C mini-splits (non-fuel switch) following the Evergy TRM. ADM utilized savings algorithms found in the Evergy TRM for all A/C mini-splits in the program. The kWh savings and kW demand reductions from the installation of A/C mini-split were determined using Equation M-40 through Equation M-43 below sourced from the MN TRM V3.0:

*Equation M-40: kWh Energy Savings for A/C Mini-splits (Time of Sale) (Natural gas furnace and air conditioner baseline (not New Construction))*

$$\Delta kWh = Cap_{COOL} * 12 * EFLH_{COOL} * (1 / SEER_{BASE} – 1 / SEER_{EE}) - Cap_{HEAT} * 12 * EFLH_{HEAT} / HSPF_{EE}$$

*Equation M-41: kWh Energy Savings for A/C Mini-splits (Early Replacement) (Natural gas furnace and air conditioner baseline (not New Construction))*

$$\Delta kWh \text{ for remaining life of existing unit (first 6 years)} = Cap_{COOL} * 12 * EFLH_{COOL} * (1 / SEER_{EXIST} – 1 / SEER_{EE}) - Cap_{HEAT} * 12 * EFLH_{HEAT} / HSPF_{EE}$$

$$\Delta kWh \text{ for remaining measure life (next 12 years)} = Cap_{COOL} * 12 * EFLH_{COOL} * (1 / SEER_{BASE} – 1 / SEER_{EE}) - Cap_{HEAT} * 12 * EFLH_{HEAT} / HSPF_{EE}$$

Equation M-42: kW Peak Demand Reduction for A/C Mini-splits (Time of Sale) (Natural gas furnace and air conditioner baseline (not New Construction))

$$\Delta kW = Cap_{COOL} * 12 * (1 / EER_{BASE} – 1 / EER_{EE}) * CF$$

Equation M-43: kW Peak Demand Reduction for A/C Mini-splits (Early Replacement) (Natural gas furnace and air conditioner baseline (not New Construction))

$$\Delta kW \text{ for remaining life of existing unit (first 6 years)} = Cap_{COOL} * 12 * (1 / EER_{EXIST} – 1 / EER_{EE}) * CF$$

$$\Delta kW \text{ for remaining measure life (next 12 years)} = Cap_{COOL} * 12 * (1 / EER_{BASE} – 1 / EER_{EE}) * CF$$

Where:

| | |
|---|---|
| $Cap_{COOL}$ | = Mini-split ductless cooling capacity in tons (1 ton = 12,000 Btu/h) |
| $Cap_{HEAT}$ | = Mini-split ductless heating capacity in tons (1 ton = 12,000 Btu/h) |
| $EFLH_{COOL}$ | = Equivalent full-load cooling hours |
| $SEER_{BASE}$ | = SEER in cooling mode for the baseline HVAC system |
| $SEER_{EXIST}$ | = SEER in cooling mode for the existing HVAC system |
| $SEER_{EE}$ | = Actual SEER of the mini-split ductless system |
| $EFLH_{HEAT}$ | = Equivalent full-load heating hours |
| $HSPF_{EE}$ | = Actual HSPF in heating mode for the proposed mini-split |
| $EER_{BASE}$ | = EER of baseline system |
| | = 0.875 * $SEER_{BASE}$ |
| $EER_{EXIST}$ | = EER of existing system |
| $EER_{EE}$ | = Actual SEER of the mini-split ductless system |
| | = actual, or 0.875 * $SEER_{EE}$ |
| CF | = 0.90 |

## M.2 Energy Saving Products Program

Gross energy savings and demand reductions for lighting measures in the Energy Saving Products Program were calculated using the algorithms as listed in Equation M-1 and Equation M-2.

Base wattages were calculated based on the bulb type and lumen range, as established in the IL TRM. Measure wattage was taken from program tracking data and confirmed using the ENERGY STAR® database. Hours of use, waste heat factors, coincident factors, and in-service rates were estimated based on responses to the general population survey.

## M.3 Income-Eligible Multi-Family Program

### M.3.1 Gross Impact Calculation Algorithms

Energy savings and demand reductions for all measures in the Income-Eligible Multi-Family Program were calculated as specified in the Evergy TRM. The gross energy savings and demand impacts algorithms are outlined in the sections below.

### *Air Source Heat Pump*

Air source heat pumps are part of the prescriptive and custom measures offered through the IEMF Program.

*Equation M-44: Electric Energy Savings for Air Source Heat Pump*

$$\Delta kWh = ((FLH\_cooling * Capacity\_cooling * (1/(SEER\_base * (1 - DeratingCool_{Base})) - 1/(SEER\_ee * SEERadj * (1 - DeratingCool_{Eff})))) / 1000) + ((FLH\_heat * Capacity\_heating * (1/(HSPF\_base * (1 - DeratingHeat_{Base})) - 1/(HSPF\_ee * HSPFadj * (1 - DeratingHeat_{Eff})))) / 1000)$$

Where:

*FLH_cooling* = *Full load hours of air conditioning*

= *dependent on location*

*Capacity_cooling* = *Cooling Capacity of Air Source Heat Pump (Btu/hr)*

= *Actual (1 ton = 12,000 Btu/hr)*

*SEER_base* = *Seasonal Energy Efficiency Ratio of baseline unit (kBtu/kWh). For early replacement measures, the actual SEER rating where it is possible to measure or reasonably estimate should be used for the remaining useful life of the existing equipment (6 years for ASHP and Central AC)*

*SEER_ee* = *Rated Seasonal Energy Efficiency Ratio of ENERGY STAR® unit (kBtu/kWh)*

= *Actual, or 15 if unknown*

*SEERadj* = *Adjustment percentage to account for in-situ performance of the unit*

*= [(0.805 × ($EERee$ / $SEERee$) + 0.367]*

$DeratingCool_{Eff}$ = *Efficient ASHP Cooling derating*

*= 0% if Quality Installation is performed*

*= 10% if Quality Installation is not performed or unknown*

$DeratingCool_{Base}$ = *Baseline Cooling derating*

*= 10%*

*FLH_heat* = *Full load hours of heating*

*= Dependent on location and home type*

*Capacity_heating* = *Heating Capacity of Air Source Heat Pump (Btu/hr)*

*= Actual (1 ton = 12,000 Btu/hr)*

*HSPF_base* = *Heating System Performance Factor of baseline heating system (kBtu/kWh). For early replacement measures, use actual HSPF rating where it is possible to measure or reasonably estimate for the remaining useful life of the existing equipment (6 years for ASHP, 16 years for electric resistance)*

*HSPF_ee* = *Heating System Performance Factor of efficient Air Source Heat Pump (kBtu/kWh)*

*= Actual or 8.5 if unknown*

*HSPFadj* = *Adjustment percentage to account for the heating capacity ratio of the efficient unit*

*= [(17 $°F\ Capacity$ / 47 $°F\ Capacity$) × 0.158 + 0.899]*

*= Actual using AHRI lookup values for efficient unit heating capacities rated at 17°F and 47°F. If not available assume 1.*

$DeratingHeat_{Eff}$ = *Efficient ASHP Heating derating*

*= 0% if Quality Installation is performed*

*= 10% if Quality Installation is not performed*

$DeratingHeat_{Base}$ = *Baseline Heating derating*

*= 10%*

*Equation M-45: Summer Coincident Peak Demand Savings for Air Source Heat Pump*

$$\Delta kW = (Capacity\_cooling * (1/(EER\_base * (1 - DeratingCool_{Base})) - 1/(EER\_ee * (1 - DeratingCool_{Eff})))) / 1000 * CF$$

Where:

EER_base = Energy Efficiency Ratio of baseline unit (kBtu/kWh). For early replacment measures, the actual EER rating where it is possible to measure or reasonably estimate should be used for the remaining useful life of the existing equipment (6 years for ASHP and Central AC). If using rated efficiencies, derate efficiency value by 1% per year to account for degradation over time.

EER_ee = Energy Efficiency Ratio of efficient Air Source Heat Pump (kBtu/hr / kW)

= Actual. If unknown, assume 12.5 EER

$CF_{SSP\ SF}$ = Summer System Peak Coincidence Factor for Heat Pumps in single-family homes (during system peak hour)

= 72%%

$CF_{PJM\ SF}$ = PJM Summer Peak Coincidence Factor for Heat Pumps in single-family homes (average during peak period)

= 46.6%

$CF_{SSP,\ MF}$ = Summer System Peak Coincidence Factor for Heat Pumps in multi-family homes (during system peak hour)

= 67%

$CF_{PJM,\ MF}$ = PJM Summer Peak Coincidence Factor for Heat Pumps in multi-family homes (average during peak period)

= 28.5%

### Bathroom Exhaust Fan

High efficiency bathroom exhaust fans are part of the prescriptive measures offered through the IEMF Program.

*Equation M-46: kWh Energy Savings for High Efficiency Bathroom Exhaust Fan*

$$\Delta kWh = (CFM * (1/\eta,_{BASELINE} - 1/\eta_{EFFICIENT})/1000) * Hours$$

Where:

*CFM* = *Nominal Capacity of the exhaust fan*

= *Actual or use defaults provided below*

= *Assume 50CFM for continuous ventilation*

$\eta_{BASELINE}$ = *Average efficacy for baseline fan (CFM/watts)*

$\eta_{EFFICIENT}$ = *Average efficacy for efficient fan (CFM/watts)*

= *Actual or use defaults provided below*

*Hours* = *assumed annual run hours*

= *1,089 for standard usage*

= *8,766 for continuous ventilation*

*Equation M-47: Summer Coincident Peak Demand Savings for High Efficiency Bathroom Exhaust Fan*

$$\Delta kW = (CFM * (1/\eta_{BASELINE} - 1/_{EFFICIENT})/1000) * CF$$

Where:

*CF* = *Summer Peak Coincidence Factor*

= *0.135 for standard usage*

= *1.0 for continuous operation*

### ***Central Air Conditioner***

This measure characterizes time of sale and early replacement central air conditioners following the Evergy TRM. ADM utilized savings algorithms found in the Evergy TRM for all central air conditioners in the program. The kWh savings and kW demand reductions from the installation of central air conditioners were determined using Equation M-48 through Equation M-51 below:

*Equation M-48: kWh Energy Savings for Central Air Conditioners (Time of Sale)*

$$\Delta kWH = (FLHcool * Capacity * (1/(SEERbase * (1 – DeratingCool_{Base})) – 1/(SEERee * SEERadj * (1 – DeratingCool_{Eff}))))/1000$$

### Equation M-49: kWh Energy Savings for Central Air Conditioners (Early Replacement)

$$\Delta kWH \text{ for remaining life of existing unit (first 6 years)} = (FLHcool * Capacity * (1/(SEERexist * (1 – DeratingCool_{Base})) – 1/(SEERee * SEERadj * (1 – DeratingCool_{Eff}))))/1000$$

$$\Delta kWH \text{ for remaining measure life (next 12 years)} = (FLHcool * Capacity * (1/(SEERbase * (1 – DeratingCool_{Base})) – 1/(SEERee * SEERadj * (1 – DeratingCool_{Eff}))))/1000$$

Where:

| | |
|---|---|
| FLHcool | = Full load cooling hours |
| | = Dependent on location and building type |
| Capacity | = Size of new equipment in Btu/hr (note 1 ton = 12,000 Btu/hr) |
| SEERbase | = Seasonal energy-efficiency ratio of baseline unit (kBtu/kWh) |
| | = 13 |
| SEERexist | = Seasonal energy-efficiency ratio of existing unit (kBtu/kWh) |
| SEERee | = Rated seasonal energy-efficiency ratio of ENERGY STAR® unit (kBtu/kWh) |
| SEERadj | = Adjustment percentage to account for in-situ performance of the unit |
| | = $[0.805 * (EER_{ee} / SEER_{ee}) + 0.367]$ |
| $DeratingCool_{Eff}$ | = Efficient central air conditioner cooling derating |
| | = 0% if Quality Installation is performed |
| | = 10% if Quality Installation is not performed or unknown |
| $DeratingCool_{Base}$ | = Baseline central air conditioner cooling derating |
| | = 10% |

### Equation M-50: kW Peak Demand Reduction for Central Air Conditioners (Time of Sale)

$$\Delta kW = (Capacity * (1/(EERbase * (1 - DeratingCool_{Base})) - 1/(EERee * (1 - DeratingCool_{Eff}))))/1000 * CF$$

*Equation M-51: kW Peak Demand Reduction for Central Air Conditioners (Early Replacement)*

$$\Delta kW \text{ for remaining life of existing unit (first 6 years)} = (Capacity * (1/(EERexist * (1 - DeratingCool_{Base})) - 1/(EERee * (1 - DeratingCool_{Eff}))))/1000 * CF$$

$$\Delta kW \text{ for remaining measure life (next 12 years)} = (Capacity * (1/(EERbase * (1 - DeratingCool_{Base})) - 1/(EER_{ee} * (1 - DeratingCool_{Eff}))))/1000 * CF$$

Where:

*EERbase* = *EER Efficiency of baseline unit*

= *10.5*

*EERexist* = *EER Efficiency of existing unit*

*EERee* = *EER Efficiency of ENERGY STAR® unit*

*CF* = *Coincidence Factor for Central A/Cs (during system peak hour)*

= *68%*

*Other variables as defined above.*

### ***Clothes Washing Machine***

Clothes washing machines are part of the prescriptive measures offered through the IEMF Program.

*Equation M-52: Electric Energy Savings for Washing Machine*

$$IMEFsavings = Capacity * (1/IMEFbase - 1/IMEFeff) * Ncycles$$

Where:

*Capacity* = *Clothes Washer capacity (cubic feet)*

= *Actual. If capacity is unknown assume 3.50 cubic feet*

*IMEFbase* = *Integrated Modified Energy Factor of baseline unit*

= *1.75*

*IMEFeff* = *Integrated Modified Energy Factor of efficient unit*

= *Actual. If unknown assume average values provided below*

*Ncycles* = *Number of Cycles per year*

= *295*

*Equation M-53: Coincident Peak Demand Savings for Clothes Washing Machine*

$$\Delta kW = \Delta kWh/Hours * CF$$

Where:

*ΔkWh* = *Energy Savings as calculated above*

*Hours* = *Assumed Run hours of Clothes Washer*

= *295 hours*

*CF* = *Summer Peak Coincidence Factor for measure*

= *0.038*

### Clothes Dryer

Clothes dryers are part of the prescriptive measures offered through the IEMF Program.

*Equation M-54: Electric Energy Savings for Clothes Dryer*

$$\Delta kWh = (Load/CEFbase - Load/CEFeff) * Ncycles * \%Electric$$

*Where:*

*Load* = *The average total weight (lbs) of clothes per drying cycle. (Standard=8.45, Compact=3)*

*CEFbase* = *Combined energy factor (CEF) (lbs/kWh) of the baseline unit is based on existing federal standards energy factor and adjusted to CEF as performed in the ENERGY STAR® analysis.*

*CEFeff* = *CEF (lbs/kWh) of the ENERGY STAR® unit based on ENERGY STAR® or ENERGY STAR® Most Efficient requirements.*

*N cycles* = *Number of dryer cycles per year. If unknown, use 283 cycles per year.*

*% Electric* = *The percent of overall savings coming from electricity.*

*Equation M-55: Coincident Peak Demand Savings for Clothes Dryer*

$$\Delta kW = \Delta kWh/Hours * CF$$

*Where:*

*ΔkWh* = *Energy Savings as calculated above*

*Hours* = *Annual run hours of clothes dryer. Use actual data if available. If unknown, 283 hours per year.*

*CF* = *Summer Peak Coincidence Factor = 3.8%*

***Dishwasher***

Dishwashers are part of the prescriptive measures offered through the IEMF Program.

*Equation M-56: Electric Energy Savings for Dishwasher*

$$\Delta kWh = ((kWh_{Base} - kWh_{ESTAR}) * (\%kWh\_op + (\%kWh\_heat * \%Electric\_DHW )))$$

Where:

$kWh_{BASE}$ = *Baseline kWh consumption per year*

$kWh_{ESTAR}$ = *ENERGY STAR® kWh annual consumption*

*Standard* = *307 kWh/year*

*Compact* = *222 kWh/year*

*%kWh_op* = *Percentage of dishwasher energy consumption used for unit operation*

= *1% - 56%*

= *44%*

*%kWh_heat* = *Percentage of dishwasher energy consumption used for water heating*

= *56%*

*%Electric_DHW* = *Percentage of DHW savings assumed to be electric*

*Equation M-57: Summer Coincident Peak Demand Savings*

$$\Delta kW = \Delta kWh/Hours * CF$$

Where:

*ΔkWh* = *Annual kWh savings from measure as calculated above. Note do not include the secondary savings in this calculation.*

*Hours* = *Annual operating hours*

= *353 hours*

*CF* = *Summer Peak Coincidence Factor*

= *2.6%*

### *Ductless Heat Pump*

Ductless heat pumps are prescriptive measures offered through the IEMF Program.

*Equation M-58: Electric Energy Savings for Ductless Heat Pump*

$$\Delta kWh = FLH\_cooling * Capacity\_cooling * (1/SEER\_base - 1/SEER\_ee) / 1000) + FLH\_heat * Capacity\_heating * (1/HSPF\_base - 1/HSPF\_ee) / 1000$$

Where:

*FLH_cooling* = *Full load hours of air conditioning*

= *dependent on location*

*Capacity_cooling* = *Cooling Capacity of Air Source Heat Pump (Btu/hr)*

= *Actual (1 ton = 12,000 Btu/hr)*

*SEER_base* = *Seasonal Energy Efficiency Ratio of baseline unit (kBtu/kWh). For early replacement measures, the actual SEER rating where it is possible to measure or reasonably estimate should be used for the remaining useful life of the existing equipment (6 years for ASHP and Central AC)*

*SEER_ee* = *Rated Seasonal Energy Efficiency Ratio of ENERGY STAR® unit (kBtu/kWh)*

= *Actual, or 15 if unknown*

*FLH_heat* = *Full load hours of heating*

= *Dependent on location and home type*

*Capacity_heating* = *Heating Capacity of Air Source Heat Pump (Btu/hr)*

= *Actual (1 ton = 12,000 Btu/hr)*

*HSPF_base* = *Heating System Performance Factor of baseline heating system (kBtu/kWh). For early replacement measures, use actual HSPF rating where it is possible to measure or reasonably estimate for the remaining useful life of the existing equipment (6 years for ASHP, 16 years for electric resistance)*

*HSPF_ee* = *Heating System Performance Factor of efficient Air Source Heat Pump (kBtu/kWh)*

= *Actual or 8.5 if unknown*

*Equation M-59: Summer Coincident Peak Demand Savings for Ductless Heat Pump*

$$\Delta kW = (Capacity\_cooling * (1/EER\_base * - 1/EER\_ee ) / 1000 * CF$$

Where:

*EER_base* = *Energy Efficiency Ratio of baseline unit (kBtu/kWh). For early replacement measures, the actual EER rating where it is possible to measure or reasonably estimate should be used for the remaining useful life of the existing equipment (6 years for ASHP and Central AC). If using rated efficiencies, derate efficiency value by 1 percent per year to account for degradation over time.*

*EER_ee* = *Energy Efficiency Ratio of efficient Air Source Heat Pump (kBtu/hr / kW)*

= *Actual. If unknown, assume 12.5 EER*

*CF* = *Summer System Peak Coincidence Factor for Heat Pumps in single-family homes (during system peak hour)*

= *72%*

***ECM Auto Fan***

ECM auto fans are prescriptive measures offered through the IEMF Program.

*Equation M-60: Electric Energy Savings for ECM Auto Fan*

$$\Delta kWh = Tons * EFLH_{COOL} * 12\ kBtu/ton * (1/SEER_{BASE} - 1/SEER_{ECM}) * \%\ AC + HOU_{HEAT} * \Delta kW_{HEAT} + HOU_{CIRC} * \Delta kW_{CIRC}$$

Where:

*Tons* = *Air conditioner capacity in tons*

= *2.425*

$EFLH_{COOL}$ = *Equivalent full-load cooling hours*

= *varies by city*

$SEER_{BASE}$ = *Baseline SEER*

$SEER_{ECM}$ = Efficient condition SEER

= 13

% AC = Percentage of furnaces with AC

= 92.5%

$HOU_{HEAT}$ = Hours of heating operation

= 1,158

$\Delta kW_{HEAT}$ = Energy savings in heating

= 0.116 kW

$HOU_{CIRC}$ = Hours of fan-only operation

= 1,020

$\Delta kW_{CIRC}$ = Energy savings in fan-only

= 0.207 kW

*Equation M-61: Summer Coincident Peak Demand Savings for ECM Fan*

$$\Delta kW = Tons * 12kBtu/ton * (1/EER_{BASE} - 1/EER_{ECM}) * CF * \%AC$$

Where:

$EER_{BASE}$ = Baseline EER

$EER_{ECM}$ = Efficient condition EER (

= 11

CF = Coincidence factor (

= 68%

### Lighting

Energy-efficient lighting is part of the direct install measures offered through the IEMF Program. Lighting measures include retrofits of existing fixtures, screw-in LED lamps in units and common areas, linear fluorescent bulbs and fixtures, and outdoor lighting. These types of measures reduce energy demand, though operating hours for fixtures are generally the same before and after retrofit.

ADM checked that LED model numbers listed in the program tracking data appear in the ENERGY STAR® databases to verify that each model distributed was ENERGY STAR® certified. ADM then analyzed the savings from verified lighting measures using data for new/retrofitted fixtures on wattages before and after retrofit. The energy savings and demand reductions were calculated using prescriptive algorithms from the Evergy TRM and other relevant program sources, as necessary. If needed, ADM adjusted the baseline hours of use. HVAC interactive effects were accounted for using deemed algorithms from the Evergy TRM, dependent upon heating and cooling systems serving areas where lighting measures were installed.

The Evergy TRM specifies the use of savings algorithms. Total kWh savings and kW demand reductions from the installation of LED and Fluorescent bulbs will be determined using Equation M-62 and Equation M-63 below:

*Equation M-62: kWh Energy Savings from Efficient Lighting*

$$kWh = \frac{W_{base} - W_{ee}}{1000} * HOU * WHF_e * ISR$$

*Equation M-63: kW Peak Demand Reduction from Efficient Lighting*

$$kW = \frac{W_{base} - W_{ee}}{1000} * CF * WHF_d * ISR$$

Where:

$W_{base}$ = *Input wattage of the existing or baseline system*

$W_{ee}$ = *Actual wattage of the lighting measure installed*

*HOU* = *Average hours of use per year*

$WHF_e$ = *Waste heat factor for energy to account for cooling energy savings from efficient lighting*

*= 1.04 (interior), 1.00 (exterior)*

$WHF_d$ = *Waste heat factor for demand to account for cooling savings from efficient lighting*

*= 1.07 (interior), 1.00 (exterior)*

*CF* = *Summer peak coincidence factor*

*= 0.128 (interior), 0.273 (exterior)*

*ISR* = *Measure in-service rate, determined from program surveys*

### *Low-Flow Faucet Aerator*

Faucet aerators are part of the direct install measures offered through the IEMF Program. The Evergy TRM specifies the use of savings algorithms. Energy savings and peak demand reduction for low-flow faucet aerators will be calculated using Equation M-64 and

Equation M-65 below. Savings and demand reductions are dependent on the installation location (kitchen or bathroom), as specified in the program tracking data.

*Equation M-64: Electric Energy Savings for Faucet Aerator*

$$\Delta kWh = ((GPM\_base * L\_base - GPM\_low * L\_low) * Household * 365.25 * DF / FPH) * EPG\_electric * ISR$$

Where:

GPM_base = Average flow rate, in gallons per minute, of the baseline faucet

L_base = Average baseline daily length faucet use per capita for faucet of interest in minutes

GPM_low = Average flow rate, in gallons per minute, of the low-flow faucet aerator “as-used”

L_low = Average retrofit daily length faucet use per capita for faucet of interest in minutes

Household = Average number of people per household

DF = Drain Factor[52]

FPH = Faucets Per Household

EPG_electric = Energy per gallon of water used by faucet supplied by electric water heater

= (8.33 * 1.0 * (WaterTemp - SupplyTemp)) / (RE_electric * 3,412)

= (8.33 * 1.0 * (86 – 54.1)) / (0.98 * 3,412)

= 0.0795 kWh/gal (Bath), 0.0969 kWh/gal (Kitchen)

ISR = In service rate of faucet aerators dependent on install method

= Direct Install for Multifamily Kitchen value 0.91

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[52] Because faucet usages are at times dictated by volume, only usage of the sort that would go straight down the drain will provide savings. VEIC is unaware of any metering study that has determined this specific factor and so through consensus with the Illinois Technical Advisory Group have deemed these values to be 75% for the kitchen and 90% for the bathroom. If the aerator location is unknown an average of 79.5% should be used which is based on the assumption that 70% of household water runs through the kitchen faucet and 30% through the bathroom (0.7*0.75)+(0.3*0.9) = 0.795.

*= Direct Install –Multifamily Bathroom value 0.95*

*Equation M-65: Summer Coincident Peak Demand Savings for Faucet Aerator*

$$\Delta kW = \Delta kWh / Hours * CF$$

Where:

*Hours* *= Annual electric DHW recovery hours for faucet use per faucet*

*= ((GPM_base * L_base) * Household/FPH * 365.25 * DF) * 0.545 / GPH*

*GPH* *= Gallons per hour recovery of electric water heater calculated for 70.9F temp rise, 98 percent recovery efficiency, and typical 4.5kW electric resistance storage tank*

*= 27.4*

*CF* *= Coincidence Factor for electric load reduction*

*= 0.022*

### *Low-Flow Showerhead*

Showerheads are part of the direct install and custom measures offered through the IEMF Program. The Evergy TRM specifies the use of savings algorithms. Energy savings, and peak demand reduction for low-flow showerheads will be calculated using Equation M-66 and Equation M-67 below.

*Equation M-66: Electric Energy Savings for Showerhead*

$$\Delta kWh = ((GPM\_base * L\_base - GPM\_low * L\_low) * Household * SPCD * 365.25 / SPH) * EPG\_electric * ISR$$

Where:

*GPM_base* *= Average flow rate, in gallons per minute, of the baseline faucet*

*GPM_low* *= As-used flow rate of the low-flow showerhead*

*L_base* *= Shower length in minutes with baseline showerhead*

*= 7.8 min*

*L_low* *= Shower length in minutes with low-flow showerhead*

*= 7.8 min*

*Household* = *Average number of people per household*

*SPCD* = *Showers Per Capita Per Day*

= *0.6*

*SPH* = *Showerheads Per Household*

*EPG_electric* = *Energy per gallon of hot water supplied by electric*

= *(8.33 * 1.0 * (ShowerTemp - SupplyTemp)) / (RE_electric * 3,412)*

= *(8.33 * 1.0 * (101 – 54.1)) / (0.98 * 3,412)*

= *0.117 kWh/gal*

*Equation M-67: Summer Coincident Peak Demand Savings for Showerhead*

$$\Delta kW = \Delta kWh/Hours * CF$$

Where:

*Hours* = *Annual electric DHW recovery hours for showerhead use*

= *((GPM_base * L_base) * Household * SPCD * 365.25 ) * 0.712726 / GPH*

= *208 for MF Direct Install*

*GPH* = *Gallons per hour recovery of electric water heater calculated for 65.9F temp rise, 98 percent recovery efficiency, and typical 4.5kW electric resistance storage tank*

= *27.4*

*CF* = *Coincidence Factor for electric load reduction*

= *0.0278*

### Refrigerator

Refrigerators are part of the prescriptive and custom measures offered through the IEMF Program.

*Equation M-68: Electric Energy Savings*

$$\Delta kWh = UEC_{BASE} – UE_{CEE} \text{ (Time of Sale)}$$

*Early Replacement*

$\Delta kWh$ for remaining life of existing unit (1st 6 years) = $UEC_{EXIST} - UEC_{EE}$

$\Delta kWh$ for remaining measure life (next 11 years) = $UEC_{BASE} - UEC_{EE}$

Where:

$UEC_{EXIST}$ = Annual Unit Energy Consumption of existing unit

$UEC_{BASE}$ = Annual Unit Energy Consumption of baseline unit

$UEC_{EE}$ = Annual Unit Energy Consumption of ENERGY STAR® unit

*Equation M-69: Summer Coincident Peak Demand Savings*

$$\Delta kW = (\Delta kWh/8{,}766) * TAF * LSAF$$

Where:

TAF = Temperature Adjustment Factor

= 1.25

LSAF = Load Shape Adjustment Factor

= 1.057

**Programmable Thermostat**

Programmable thermostats are part of the prescriptive measures offered through the IEMF Program.

*Equation M-70: Electric Energy Savings for Programmable Thermostat*

$$\Delta kWh = \%ElectricHeat * Elec\_Heating\_Consumption * Heating\_Reduction * HF * Eff\_ISR$$

Where:

%ElectricHeat = Percentage of heating savings assumed to be electric

Elec_Heating_Consumption = Estimate of annual household heating consumption for electrically heated homes

Heating_Reduction = Assumed percentage reduction in total household heating energy consumption due to programmable thermostat

= 6.2%

*HF* = *Household factor, to adjust heating consumption for non-single-family households, based on square footage and exposure to exterior.*

*=0.65 for MF Eff_ISR = Effective In-Service Rate, the percentage of thermostats installed and programmed effectively*

***Smart Thermostat***

Smart thermostats are part of the custom measures offered through the IEMF Program.

*Equation M-71: Electric Energy Savings for Smart Thermostats*

$$\Delta kWh = \Delta kWh_{heating} + \Delta kWh_{cooling}$$

$$\Delta kWh_{heating} = \%ElectricHeat * Elec\_Heating\_Consumption * Heating\_Reduction * HF * Eff\_ISR$$

$$\Delta kWh_{cool} = \%AC * ((FLH * Capacity * 1/SEER)/1000) * Cooling\_Reduction * Eff\_ISR$$

Where:

*%ElectricHeat* = *Percentage of heating savings assumed to be electric*

*Elec_Heating_Consumption* = *Estimate of annual household heating consumption for electrically heated homes*

*Heating_Reduction* = *Assumed percentage reduction in total household heating energy consumption due to advanced thermostat including accounting for Thermostat*

*HF* = *Household factor, to adjust heating consumption for non-single-family households, based on square footage and exposure to exterior.*

*=0.65 for MF*

*Eff_ISR* = *Effective In-Service Rate*

*%AC* = *Fraction of customers with thermostat-controlled air-conditioning*

*FLH* = *Estimate of annual household full load cooling hours for air conditioning equipment based on location and home type*

*Capacity* = *Btu/hr of AC unit*

*= Use actual when program delivery allows size of AC unit to be known*

*SEER* = *the cooling equipment's Seasonal Energy Efficiency Ratio rating (kBtu/kWh)*

= *Use actual SEER rating where it is possible to measure or reasonably estimate*

*Cooling_Reduction* = *Assumed average percentage reduction in total household cooling energy consumption due to installation of advanced thermostat including accounting for Thermostat Optimization*

= *8.4%*

*Equation M-72: Summer Coincident Peak Demand Savings*

$$\Delta kW = \%AC * (Cooling\_DemandReduction * Capacity * (1/EER)/1000) * EFF\_ISR * CF$$

Where:

*Cooling_DemandReduction* = *Assumed average percentage reduction in total household cooling demand due to installation of advanced thermostat including accounting for Thermostat Optimization services*

= *16.4%*

*EER* = *Energy Efficiency Ratio of existing cooling system (kBtu/hr/kW)*

= *Use actual EER rating where it is possible to measure or reasonably estimate*

$CF_{SSP}$ = *Summer System Peak Coincidence Factor for Central A/C (during system peak hour)*

= *34%*

$CF_{PJM}$ = *PJM Summer Peak Coincidence Factor for Central A/C (average during PJM peak period)*

= *23.3%*

## M.4 Pay As You Save Program

### M.4.1 Gross Impact Methodologies

ADM's analysis was divided into the following steps:

1. Data preparation and cleaning, including true-up, calendarization, combination with weather data, and removal of cross-program participants;

2. Estimation of monthly and annual billed consumption differences between pre-installation and post-installation of measures via regression modeling; and
3. Engineering analysis validating savings according to the Evergy TRM.

The following sections describe each of these steps in detail.

### *Data Preparation and Cleaning*

Oracle provided the following data to support the analysis:

- Pre-installation and post-installation monthly electric billing data for all homes. ADM received data from June 1, 2012 through January 1, 2023;
- Participant tracking data, including date of installation and reported electricity savings (kWh) and demand reduction (kW) for each measure installed through the program.

### *True-Up*

In some cases, Oracle uses estimated meter readings. As part of the data preparation process, ADM corrected for estimated readings by adjusting actual readings to account for them, otherwise known as a “true-up” process. For each metered reading and all estimated readings immediately preceding it, ADM summed the billed usage and number of days spanning those bills. The total billed usage for that cumulative period was then divided by the total number of days to calculate an average usage per day. This average usage per day was multiplied by the number of days in each individual bill to generate a corrected usage value.

Because the number of estimated readings per actual reading is inconsistent, the number of estimated readings prior to the first actual reading in the provided dataset cannot be assumed. Therefore, the first metered reading in the billing data, and all estimated readings preceding, were excluded from the dataset. Similarly, estimated readings that did not have a corresponding actual reading (generally towards the tail end of provided billing data) were also excluded from analysis. Equation M-73 provides the method of calculating the adjusted usage for billing data after the first metered reading and all prior estimated readings have been excluded:

*Equation M-73: Billing Data Adjustment Calculation*

$$Adjusted\ usage_m = Billing\ days_m \times \sum_i^n \frac{Billed\ usage}{\sum_i^n Billing\ days}$$

Where:

*i* = *First estimated bill in a sequence of estimated bills leading to a metered bill*

*n* = *A metered bill providing an adjustment factor for preceding estimated bills*

*m* = *The billing month of interest*

*Billed usage* = *The total kWh billed in a monthly bill*

*Billing days* = *The total number of days in a monthly bill's billing period*

### Calendarization

Monthly billing periods in utility bill data do not fall on consistent dates between participants. For example, one customer’s June bill may run from May 16 to June 17 while another may run from May 20 to July 5. To make the monthly billing data consistent between participants and to represent each month accurately, ADM calendarized the data such that monthly billing data matched calendar dates. For example, if 15 days in a billing period belonged to June and 15 days belonged to July, 50 percent of the billed usage would be attributed to June and 50 percent attributed to July. The proportioned usage and number of days that fall under a given calendar month are then summed to generate a calendarized usage value and the number of billed days for that month. Equation M-74 provides the method for calculating the monthly usage by calendar month:

*Equation M-74 Monthly Billing Data Calculation*

$$Monthly\ usage_m = \sum_{i}^{n} \left( Adjusted\ usage_i \times \frac{Month\ days_i}{Billing\ days_i} \right)$$

Where:

$i$ = *First bill containing the month of interest*

$n$ = *Last bill containing the month of interest*

$m$ = *The month of interest*

$Monthly\ usage$ = *The calendarized monthly usage for a given month*

$Month\ days$ = *The number of days belonging to the month of interest in a billing period*

$Billing\ days$ = *The number of days in a billing period*

### Restrictions

After calendarization was completed, an average daily usage value was calculated by dividing the monthly usage by the number of billed days in a month. Additionally, data was filtered using the following criteria:

- Customer billing data that had inconsistent or missing account inactivation and/or activation dates were removed from the initial data set.

- Customer billing data that extended outside the active account date ranges were excluded.
- Bills that had less than 10 or more than 90 days duration were removed.
- Customer data with less than 7 months pre-period data and 3 months of post-period data were removed.
- Customer data which had average daily usage that differed from the first quartile or third quartile by three times the inter-quartile range or more were excluded from analysis. Such records were considered outlier data since the average daily kWh usage was unusually small or unusually large. These levels of consumption are unrealistic for residential households and can be reasonably categorized as the result of a reading error rather than a valid reading from high or low users.

Overall, ADM aimed to remove erroneous readings rather than remove high and low users, as these subgroups contribute real behaviors to the average savings estimates.

### *Weather Data*

ADM identified the US Air Force code for each airport closest to each customer's listed ZIP code. Weather data from the National Oceanic and Atmospheric Administration was utilized to calculate heating degree days (HDD) and cooling degree days (CDD) for each unique weather station. This data was then combined with customers' calendarized billing data to assign HDD and CDD values, matching based on US Air Force airport code, billing start date, billing end date, and customer ID.

HDD and CDD are defined as the difference between the daily temperature and a pre-defined temperature setpoint during the heating and cooling seasons, respectively. These values were estimated using a range of setpoints (55- to 75-degree temperature base), with the HDD and CDD combination that yielded the largest model R-square value used in the final analysis. This accounts for the "dead-band" in residential heating and cooling loads, as there is a range of temperatures in which a residential customer will be neither heating nor cooling.

### *Cross Participants*

The additional participation of PAYS recipients in other Evergy programs can lead to an increase in regression-derived savings, referred to as uplift. When a household participates in multiple efficiency programs, the utility might count their savings twice: once in the regression-based estimate of PAYS program savings and again in the estimate of savings for the other energy efficiency program. Although uplift rarely displays a statistically significant difference, the UMP recommends removing uplift at the household level.

Evergy delivered customer-level tracking data for other programs offered to residential customers. The residential Evergy programs included are the HER Program, the HCHC Program, the IEMF Program, and the BST Program. Nearly all participants in the PAYS Program were also part of the HER Program. These participants were included in the PAYS regression analyses as participation in the HER Program began prior to 2021 and would therefore not influence the regression results which rely on 2021 and 2022 billing data. ADM removed savings associated with cross participation for all other programs from the final results.

### *Regression Modeling*

Three distinct regression models were used to compare participants' pre-installation energy consumption to their post-installation consumption:

1) Mixed-model regressions of groups based on installed measures (Equation M-75). Regression grouping consisted of participants with a) Air Sealing + Ceiling Insulation measures, b) Air Sealing + Ceiling Insulation + Air Conditioning measures, and c) Air Sealing + Ceiling Insulation + Heat Pump measures;
2) A full participant mixed-model regression with dummy variables for each measure in the program (Equation M-76); and
3) A regression for each customer at the premise level, individually (Equation M-77).

Since the program population was already small, ADM chose not to attempt the regression analyses with a matched control group out of concern for dropping premises from the model if no sufficient match was identified. This choice retained as many homes as possible in the pre-post regression models.

The model specification contained customer-specific dummy variables to account for the natural variation in household electricity usage that cannot be explicitly controlled for. The specification of customer specific effects allowed the model to capture much of the baseline differences across customers while obtaining reliable estimates of the impact of participation in the program.

Independent variables, such as CDD and HDD, were included to account for the impact that weather has on energy usage. ADM then fit linear regression models to estimate energy usage differences between pre-installation and post-installation energy consumption.

*Equation M-75: Grouped Linear Regression Model Specification*

$$MC_{it} = \alpha_{0i} + \beta_1(Post)_{it} + \beta_2(DI)_{it} + \beta_3(Month)_{it} + \beta_4(CDD)_{it} + \beta_5(HDD)_{it} + \varepsilon_{it}$$

Where:

*t* = *The monthly period for which energy usage is being predicted*

*i* = *Subscript corresponding to customer-level random effect*

$MC_{it}$ = Monthly consumption (dependent variable) in home i during period t

$\alpha\_{}_{0i}$ =The model intercept for home i

$Post\_{}_{it}$ = Dummy variable indicating whether period t was in pre- or post-retrofit

$DI\_{}_{it}$ = Variable indicating the direct install date at home i

$Month\_{}_{it}$ = Variable indicating the month during period t

$CDD\_{}_{it}$ = Average cooling degree days during period t at home i

$HDD\_{}_{it}$ = Average heating degree days during period t at home i

$\varepsilon_{it}$ = Customer-level random error

$\{\beta_1,\beta_2,\beta_3,\beta_4,\beta_5\}$ = Coefficients determined via regression

*Equation M-76: Full Linear Regression Model Specification*

$$\begin{aligned} MC_{it} = \alpha_{0i} + \beta_1(Post)_{it} + \beta_2(DI)_{it} + \beta_3(Month)_{it} + \beta_4(Measure)_{it} + \beta_5(CDD)_{it} \\ + \beta_6(HDD)_{it} + \varepsilon_{it} \end{aligned}$$

Where:

$t$ = The monthly period for which energy usage is being predicted

$i$ = Subscript corresponding to customer-level random effect

$MC_{it}$ = Monthly consumption (dependent variable) in home i during period t

$\alpha\_{}_{0i}$ =The model intercept for home i

$Post\_{}_{it}$ = Dummy variable indicating whether period t was in pre- or post-retrofit

$DI\_{}_{it}$ = Variable indicating the direct install date at home i

$Month\_{}_{it}$ = Variable indicating the month during period t

$Measure\_{}_{it}$ = Dummy variables indicating whether household i had a specific measure or not

$CDD\_{}_{it}$ = Average cooling degree days during period t at home i

$HDD\_{}_{it}$ = Average heating degree days during period t at home i

$\varepsilon_{it}$ = Customer-level random error

$\{\beta_1,\beta_2,\beta_3,\beta_4,\beta_5,\beta_6\}$ = Coefficients determined via regression

*Equation M-77: Customer Level Linear Regression Model Specification*

$$MC_t = \alpha_0 + \beta_1(Post)_t + \beta_2(CDD)_t + \beta_3(HDD)_t + \varepsilon_t$$

Where:

*$t$ = The monthly period for which energy usage is being predicted*

*$MC_t$ = Monthly consumption (dependent variable) during period t*

*$\alpha$_$_0$ =The model intercept*

*Post_$_t$ = Dummy variable indicating whether period t was in pre- or post-retrofit*

*CDD_$_t$ = Average cooling degree days during period t*

*HDD_$_t$ = Average heating degree days during period t*

*$\varepsilon_{it}$ = Customer-level random error*

*$\{\beta_1,\beta_2,\beta_3\}$ = Coefficients determined via regression*

### *Engineering Analysis*

Due to the low sample size and insufficient post-installation data, the regression analyses were not able to produce accurate results. ADM undertook three distinct regression analyses; 1) grouping customers based on installed measures and running the models for each group, 2) an analysis of all customers with dummy variables for each measure, and 3) analyses for each customer at the premise level, individually. While the regression analyses for each customer individually produced the best results, numerous customers were below the 90 percent confidence intervals and lacked statistical significance. Given the results from the regression analyses, ADM compared savings attributed to the retrofit measures installed through the PAYS program by validating savings according to the relevant unit energy savings methodology from the Evergy TRM. ADM's evaluation consisted of:

- Reviewing the assumptions and inputs associated with the deemed savings values
- Verifying that the deemed per-unit impacts were applied appropriately

Algorithms used can be found in Section M.4.2. Applied savings values were verified at the measure-level for each project completed through the PAYS program.

### *Estimating Demand Savings*

ADM estimated demand savings for the program using the TRM specified engineering algorithms for each measure.

### M.4.2 Gross Impact Calculation Algorithms

Energy savings and demand reductions for all measures in the Pay As You Save Program were calculated as specified in the Evergy TRM. The gross energy savings and demand impacts algorithms are outlined in the sections below.

#### *LED Lightbulbs*

See Equation M-1 and Equation M-2. ADM also calculated in-service rate based on the combined partial and full participant survey.

#### *Faucet Aerators*

See Equation M-3 and Equation M-4. ADM also calculated in-service rate based on the combined partial and full participant survey.

#### *Low Flow Showerheads*

See Equation M-5 and Equation M-6. ADM also calculated in-service rate based on the combined partial and full participant survey.

#### *Pipe Insulation*

See Equation M-7 and Equation M-8. ADM also calculated in-service rate based on the combined partial and full participant survey.

#### *Advanced Power Strips*

See Equation M-9 and Equation M-10. ADM also calculated in-service rate based on the combined partial and full participant survey.

#### *Air Sealing*

See Equation M-11 through Equation M-15. ADM verified air sealing square footage did not exceed the reported square footage of conditioned space reported for the home. Savings were calculated based on the fuel type reported for each home. Where heating fuel type was missing, the proportion of surveyed full participants with electric heat (21 percent) was applied to the heating saving portion of the algorithm. Home cooling data was incomplete in the program tracking data, so ADM applied the proportion of surveyed full participants with air conditioning (96 percent) to all cooling savings and demand reduction.

#### *Ceiling/Attic Insulation*

See Equation M-18 through Equation M-20. Savings were calculated based on the fuel type reported for each home. Where heating fuel type was missing, the proportion of surveyed full participants with electric heat (21 percent) was applied to the heating saving portion of the algorithm. Home cooling data was incomplete in the program tracking data so ADM applied the proportion of surveyed full participants with air conditioning (96 percent) to all cooling savings and demand reduction.

### *Central Air Conditioners*

See Equation M-24 through Equation M-27.

### *Air Source Heat Pumps*

See Equation M-28 through Equation M-31.

### *Smart Thermostat*

See Equation M-71 and Equation M-72.

### *Duct Sealing*

ADM utilized savings algorithms found in the Evergy TRM for all duct sealing in the program. Savings were calculated based on the fuel type reported for each home. Where heating fuel type was missing, the proportion of surveyed full participants with electric heat (21 percent) was applied to the heating saving portion of the algorithm. Home cooling data was incomplete in the program tracking data, so ADM applied the proportion of surveyed full participants with air conditioning (96 percent) to all cooling savings and demand reduction.

The electricity savings (kWh) and demand reduction (kW) from the installation of ceiling/attic insulation were determined using Equation M-78 through Equation M-81:

*Equation M-78: Energy Savings for Duct Sealing*

$$\Delta kWh = \Delta kWh_{cooling} + \Delta kWh_{heating}$$

Where:

$\Delta kWh_{cooling}$ = *If central cooling, reduction in annual cooling requirement due to insulation*

$\Delta kWh_{heating}$ = *If electric heat (resistance or heat pump), reduction in annual electric heating due to insulation*

*Equation M-79: Energy Savings for Reduction in Annual Cooling Requirement Due to Duct Sealing*

$$\Delta kWh_{cooling} = ((((DE_{after} – DE_{before})/ DE_{after}) * FLHcool * CapacityCool * TRFcool * \%Cool)/ 1000/ \eta Cool)$$

Where:

*$DE_{after}$* = *Distribution Efficiency after duct sealing*

*$DE_{before}$* = *Distribution Efficiency before duct sealing*

*FLHcool* = *Full load cooling hours*

*CapacityCool* = *Capacity of Air Cooling system (Btu/hr)*

= *Actual*

*TRFcool* = *Thermal Regain Factor for cooling by space type*

= *1.0 for Unconditioned Spaces*

= *0.4 for Semi-Conditioned Spaces*

*%Cool* = *Percent of homes that have cooling*

*1000* = *Converts Btu to kBtu*

*ηCool* = *Seasonal Energy Efficiency Ratio of cooling system (kBtu/kWh)*

*Equation M-80: Energy Savings for Reduction in Annual Electric Heating (Resistance or Heat Pump) Due to Duct Sealing*

$$\Delta kWh_{heating} = ((DE_{after} – DE_{before})/ DE_{after}) * FLHheat * OutputCapacityHeat * TRFheat * \%ElectricHeat) / \eta Heat / 3412$$

Where:

*OutputCapacityHeat*= *Heating output capacity (Btu/hr) of the electric heat*

= *Actual*

*FLHheat* = *Full load heating hours*

*TRFheat* = *Thermal Regain Factor for heating space*

= *1.0 for Unconditioned Spaces*

= *0.4 for Semi-Conditioned Spaces*

*%ElectricHeat* = *Percent of homes that have electric space heating*

*$\eta$Heat* = *Efficiency in COP of Heating Equipment*

*COP* = *Coefficient of Performance of electric heating system*

*Equation M-81: Summer Peak Demand Reduction for Duct Sealing*

$$\Delta kW = \Delta kW_{cooling} / FLHcool * CF$$

Where:

*FLHcool* = *Full load hours of air conditioning*

*CF* = *Summer System Peak Coincidence Factor*

## M.5 Products & Services Incubator Programs

Gross energy savings and demand reductions for the lighting measure in the Market Rate Multi-Family (MRMF) Pilot within the Research and Pilots Program were calculated using the algorithms as listed in Equation M-1 and Equation M-2. Air Conditioner measure savings and demand reductions in MRMF were calculated using the algorithms as listed in Equation M-24 though Equation M-27. Air Source Heat Pump measure savings and demand reductions in MRMF were calculated using the algorithms as listed in Equation M-28 through Equation M-31. Equation M-10 was utilized to determine the savings of the power strip offered in the MRMF kits, with the inclusion of an ISR. Where applicable, the values for multifamily units were used in the equations. Equation M-5 and Equation M-6 were used to determine the savings and demand reduction for the low flow showerheads given in the MRMF kits.

### M.5.1 Gross Impact Calculation Algorithms

Energy savings and demand reductions for all measures in the Research and Pilots Program were calculated as specified in the Evergy TRM. The gross energy savings and demand impacts algorithms are outlined in the sections below.

***Refrigerator Recycling***

ADM utilized savings algorithms found in the Evergy TRM for all recycled refrigerators in the program. Final savings were based on the age, size, type, and location of the recycled refrigerator. The kWh savings and kW demand reductions from the recycling of refrigerators were determined using Equation M-82 through Equation M-83 below:

*Equation M-82: kWh Energy Savings for Refrigerator Recycling*

$$\Delta kWh = [83.32 + (Age * 3.68) + (Pre\text{-}1990 * 485.04) + (Size * 27.15) + (Side\text{-}by\text{-}side * 406.78) + (Proportion\ of\ Primary\ Appliances * 161.86) + (CDD/365.25 * unconditioned * 15.37) + (HDD/365.25 * unconditioned * -11.07)] * Part\ Use\ Factor$$

Where:

*Age* = *Age of retired unit*

*Pre-1990* = *Pre-1990 dummy (=1 if manufactured pre-1990, else 0)*

*Size* = *Capacity (cubic feet) of retired unit*

*Side-by-side* = *Side-by-side dummy (=1 if side-by-side, else 0)*

*Primary Usage* = *Primary Usage Type (in absence of the program) dummy (=1 if Primary, else 0)*

*CDD* = *Cooling Degree Days*

*Unconditioned* = *Located in unconditioned space (=1 if in unconditioned space)*

*HDD* = *Heating Degree Days*

*Part Use Factor* = *To account for those units that are not running throughout the entire year.*

*Equation M-83: kW Peak Demand Reduction for Refrigerator Recycling*

$$\Delta kW = kWh/8766 * CF$$

Where:

*kWh* = *kWh savings from refrigerator recycling*

*CF* = *Coincident factor defined as summer kW/average kW*

= *1.081 for Refrigerators*

***Freezer Recycling***

ADM utilized savings algorithms found in the Evergy TRM for all recycled freezers in the program. Final savings were based on the age, size, configuration, and location of the recycled freezer. The kWh savings and kW demand reductions from the recycling of freezers were determined using Equation M-84 through Equation M-85 below:

*Equation M-84: kWh Energy Savings for Freezer Recycling*

$$\Delta kWh = [132.12 + (Age * 12.13) + (Pre\text{-}1990 * 156.18) + (Size * 31.84) + (Chest\ Freezer * -19.71) + (CDD * unconditioned * 9.78) + (HDD * unconditioned * -12.75)] * Part\ Use\ Factor$$

Where:

*Age* = *Age of retired unit*

*Pre-1990* = *Pre-1990 dummy (=1 if manufactured pre-1990, else 0)*

*Size* = *Capacity (cubic feet) of retired unit*

*Chest Freezer* = *Chest Freezer dummy (=1 if chest freezer, else 0)*

*Unconditioned* = *Located in unconditioned space (=1 if in unconditioned space)*

*CDD* = *Cooling Degree Days*

*HDD* = *Heating Degree Days*

*Part Use Factor* = *To account for those units that are not running throughout the entire year.*

*Equation M-85: kW Peak Demand Reduction for Freezer Recycling*

$$\Delta kW = kWh/8766 * CF$$

Where:

*kWh* = *kWh savings from refrigerator recycling*

*CF* = *Coincident factor defined as summer kW/average kW*

= *1.028 for Freezers*

### Air Conditioner Recycling

ADM utilized savings algorithms found in the Evergy TRM for all recycled air conditioners in the program. Final savings were based on the full load hours, size and efficiency of the recycled air conditioner. The kWh savings and kW demand reductions from the recycling of air conditioners were determined using Equation M-86 through Equation M-87 below:

*Equation M-86: kWh Energy Savings for Air Conditioner Recycling*

$$\Delta kWh = ((FLH\_RoomAC * Btu/hr * (1/EERexist))/1000)$$

Where:

*FLH_RoomAC* = *Full Load Hours of room air conditioning unit*

*Btu/hr* = *Size of retired unit.*

= *If unknown assume 8500 Btu/hr*

*EERexist* = *Efficiency of existing unit*

= *9.8*

*Equation M-87: kW Peak Demand Reduction for Air Conditioner Recycling*

$$\Delta kW = (Btu/hr * (1/EERexist))/1000) * CF$$

Where:

*CF* = *Summer Peak Coincidence Factor for measure*

= *0.3*

***Dehumidifier Recycling***

ADM utilized savings algorithms found in the Evergy TRM for all recycled dehumidifiers in the program. Final savings were based on the run hours, average capacity, and liters of water consumed by the recycled dehumidifier. The kWh savings and kW demand reductions from the recycling of dehumidifiers were determined using through Equation M-88 and Equation M-89 below:

*Equation M-88: kWh Energy Savings for Dehumidifier Recycling*

$$\Delta kWh = ((Avg\ Capacity * 0.473) / 24) * (1 / (L/kWh\_Base))$$

Where:

*Avg Capacity* = *Average capacity of the unit (pints/day)*

*0.473* = *Constant to convert Pints to Liters*

*24* = *Constant to convert Liters/day to Liters/hour*

*Hours* = *Run hours per day*

= *1632*

*L/kWh_Base* = *Liters of water per kWh consumed*

*Equation M-89: kW Peak Demand Reduction for Dehumidifier Recycling*

$$\Delta kW = \Delta kWh/Hours * CF$$

Where:

*Hours* = *Annual operating hours*

= *1632 hours*

*CF* = *Summer Peak Coincidence Factor for measure*

= *0.37*

### *Energy Saving Trees*

The Evergy TRM provides specified deemed savings values sourced from the Arbor Day Foundation for energy saving trees, shown below. Final savings were based on the tree species. The kWh savings from the planting of energy saving trees were determined using Equation M-90 below:

*Equation M-90: kWh Electric Energy Savings for Energy Saving Trees*

$$\Delta kWh = kWh$$

Where:

*kWh* = *Assumed annual kWh savings per unit*

= *153.97 kWh for Tuliptree – Years 16-20*

= *67.20 kWh for Sugar Maple – Years 16-20*

= *134.64 kWh for Shumard Oak – Years 16-20*

= *228.23 kWh for Short Leaf Pine – Years 16-20*

= *67.20 kWh for Black Gum – Years 16-20*

### *Connected LED Lightbulbs*

ADM utilized savings algorithms found in the IL TRM v11 for the Wi-Fi Connected LED Lightbulbs in the Market Rate Multi-Family kits. This version of the IL TRM was utilized as this is the first instance of the connected LED measure being included in the IL TRM and this measure is not found in the 2022 Evergy TRM. Final savings were based on the wattage, hours of use and percentage of energy saved by using lighting control. The kWh savings and kW demand reductions from the installation of connected LED lightbulbs were determined using through Equation M-91 and Equation M-92 below:

*Equation M-91: kWh Electric Energy Savings for Connected LED Lightbulbs*

$$\Delta kWh = (((Watts\_EE / 1000) * Hours * SVGe * WHFe) - Standby\_kWh) * ISR * (1 - Leakage)$$

Where:

*WattsEE* = *Actual wattage of LED*

*Hours* = *Average hours of use per year*

= *1,089 for Residential and in-unit Multi-Family*

= *1,159 for Unknown location*

*SVGe = Percentage of annual lighting energy saved by lighting control*

*= 0.37*

*ISR = In Service Rate, the percentage of lamps rebated that are actually in service*

*Leakage = Adjust to account for the percentage of program bulbs that move out (and in if deemed appropriate) of the Utility Jurisdiction*

*= 0*

*WHFe = Waste heat factor for energy to account for cooling savings*

*= 1.04 for multifamily in unit*

*= 1.051 for unknown location*

*StandbykWh = Standby power draw of the controlled lamp.*

*= 0.63 kWh*

*Equation M-92: kW Peak Demand Reduction for Connected LED Lightbulbs*

$$\Delta kWh = (Watts\_EE / 1000) * SVGd * WHFd * ISR * (1 – Leakage) * CF$$

Where:

*WattsEE = Actual wattage of LED*

*SVGd = Percentage of annual lighting demand saved by lighting control*

*= 0.37*

*WHFd = Waste heat factor for demand to account for cooling savings from efficient lighting*

*= 1.07 for multifamily in unit*

*= 1.093 for unknown location*

*ISR = In Service Rate, the percentage of lamps rebated that are actually in service*

*Leakage = Adjust to account for the percentage of program bulbs that move out (and in if deemed appropriate) of the Utility Jurisdiction*

*= 0*

*CF* = *Summer Peak Coincidence Factor for measure*

= *0.128 for interior bulb location*

= *0.135 for unknown bulb location*

### *Smart Plug*

Smart plugs are not offered in any TRMs in the country. The savings from a smart plug comes from the phantom load reduction as well as lighting hours reduction. Smart plugs have a phantom load of their own, which likely cancels out the benefits. The lighting hours reductions only work if a lamp is plugged in. Thus, an estimation based on the kWh savings and the kW demand reduction of a smart bulb offered in the same kit as the smart plug was used. It was assumed that smart plugs would have 50 percent of the smart bulb savings. The kWh savings and kW demand reductions from the installation of smart plugs were determined using through Equation M-93 and Equation M-94 below:

*Equation M-93: kWh Electric Energy Savings for Smart Plugs*

$$\Delta kWh = kWh\_SB * 0.5$$

Where:

*kWh_SB* = *kWh savings of a smart bulb in the same kit*

*Equation M-94: kW Demand Reduction for Smart Plugs*

$$\Delta kW = kW\_SB * 0.5$$

Where:

*kW_SB* = *kW demand reduction of a smart bulb in the same kit*