MidAmerican Energy Company

Residential HomeCheck® Program Impact and Process Evaluation (Illinois)

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1.0 EXECUTIVE SUMMARY

MidAmerican Energy Company (MidAmerican) offers energy efficiency programs to their customers throughout their Iowa and Illinois service territories. These programs cover electric and natural gas energy efficiency measures, as well as other services such as energy assessments provided through their Residential HomeCheck® (HomeCheck) program. This report details the activities, results, and recommendations from the evaluation of program year (PY) 2016 for the HomeCheck program in Illinois.

1.1 BACKGROUND

MidAmerican considers the HomeCheck program the primary entry point for residential customers seeking assistance through MidAmerican's energy efficiency programs. In PY2016, the program provided free residential energy assessments, direct installation of low-cost efficiency measures, and efficiency improvement recommendations to eligible MidAmerican customers. The program consisted of an on-site energy assessment implemented by A-TEC Energy and an online energy assessment implemented by Opower Inc.[1] MidAmerican claimed savings from the equipment installed during on-site assessments, but did not claim any savings from online energy assessments as their purpose is educational.

The on-site assessment provided residential customers with multiple benefits including a whole-house assessment from trained energy experts, immediate savings through direct installation of low-cost measures, and rebates on insulation, lighting, and other efficiency projects. Upon completion of the assessment, the energy expert provided a report of the home's insulation, heating, cooling, water heating equipment, and window efficiency. The report could be used to inform future energy efficiency improvements at the home. Added in 2014, customers who completed three upgrades within 12 months of receiving an on-site assessment could receive a $200 bonus incentive. The bonus was meant to encourage residential customers to act on the assessment recommendations.

In order to qualify for the on-site assessment, participants must be residential customers located in MidAmerican's service territory and MidAmerican must be their primary fuel supplier. Furthermore, participants must reside in a single family dwelling or a multifamily dwelling with three or less residential units.[2] Multifamily buildings with four or more housing units are served under the Multifamily Housing program. Participant homes must also be over 10 years of age. Renters must have the landlord's approval, and the landlord should be present at the time of the on-site assessment.

MidAmerican coordinated the Residential Assessment program with other utilities providing heating fuel to MidAmerican electric customers. A-TEC, as the primary program contractor, handled all customer

[1] A competitive bid process resulted in the online audit component changing vendors. With the transition to the new online assessment process in 2016, the online assessment portion of the program was not part of the PY2016 evaluation. The 2016 update allows customers more access to energy efficiency tips and usage comparisons and assists customers with development of their own action plan for energy efficiency improvements within their home.

[2] For Illinois and South Dakota service territories only, the residential portion of multifamily buildings, (generally defined as four or more units or three or less stories, including apartments and condominiums) and agribusinesses (farm operations facilities) are accommodated in this program; the Commercial Energy Solutions program accommodates the nonresidential portion.

interaction unless there was a major customer service issue. For PY2016, financial incentives including no cost energy assessments, full subsidies, and rebates[3] were available to HomeCheck participants.

1.2 EVALUATION METHODOLOGY

The PY2016 evaluation included both impact and process components. For the impact evaluation, the Tetra Tech team reviewed MidAmerican's engineering inputs and algorithms and the resulting energy savings to make sure they were complete and reasonable. The Tetra Tech team also reviewed the Iowa Technical Reference Manual (IA TRM)[4] approach to relevant residential measures. Additionally, the Tetra Tech team conducted primary net-to-gross research, as well as a literature review to help inform net-to-gross (NTG) findings for Illinois.

For the process evaluation, the Tetra Tech team reviewed program materials and conducted interviews with MidAmerican program staff and implementation staff from A-TEC. Following this series of internal interviews, the Tetra Tech team interviewed participating customers and trade allies. In addition to the survey with program participants, the Tetra Tech team also included equipment-related questions in an omnibus telephone survey of MidAmerican residential customers who had not participated in an energy efficiency program over the past two years, and analyzed those results to better understand the current state of the equipment market and consumers' understanding, use, and purchasing behaviors.

1.3 SUMMARY OF KEY FINDINGS AND RECOMMENDATIONS

Overall, it is the opinion of the Tetra Tech team that the HomeCheck program operated effectively in PY2016, resulting in substantial energy and demand savings as well as high participant satisfaction. Staff roles and responsibilities were clearly defined and understood by all team members, and program and implementation staff reported strong working relationships. Participating customers and trade allies interviewed spoke highly of the program and their interactions with program staff. The program was well designed to address key implementation barriers and evidence suggests the program has influenced trade ally practices and customer purchase decisions. While the Tetra Tech team found there was no need for major program changes, we did identify a few opportunities for potential refinements.

The Tetra Tech team found that savings were calculated in accordance with MidAmerican's measure sheet for nearly all measures. The vast majority of adjustments were for furnaces, where the input capacity was incorrectly being used instead of output capacity in the measure sheet algorithms. Besides these adjustments for furnaces, adjustments were only required for four other projects. The evaluation resulted in realization rates of 100.0 percent for kWh, 100.0 percent for peak kW, 99.8 percent for natural gas therms savings, and 99.8 percent for natural gas peak therms for PY2016.

[3] MidAmerican began searching for a new financing partner in PY2016. As a result, the customer financing option has been suspended until a replacement can be found.

[4] IA TRM version dated August of 2016.

Table ES-1-1. Illinois Savings Goals and Impacts for PY2016

Impact	Goal	Reported Gross Savings*	Evaluated Gross Savings	Evaluated Realization Rate**
kWh	459,453	794,905	794,905	100.0%
Peak kW	168	386	368	100.0%
Therms	96,096	162,372	162,107	99.8%
Peak Therms	1,071	2,016	2,012	99.8%

* Reported savings shown are from PY2016 tracking data received from MidAmerican on February 2, 2017.

**The realization rate is the ratio of evaluated gross savings to reported gross savings.

The following section presents the key findings from the evaluation and associated recommendations. Additional details can be found in Section 6, Key Findings and Recommendations.

Finding #1: The CFL and LED direct install measure sheet savings appeared to be reasonable, though slightly higher per bulb than predicted by the IA TRM approach.

The measure sheets used what appears to be a reasonable 2.6 hours per day (949 hours per year) usage for CFLs and LEDs, whereas the IA TRM uses 894 hours per year based on an average, based on four Midwest metering studies. The IA TRM also appears to use a slightly lower base wattage assumption than the measure sheets for both CFLs and LEDs. The result is that CFL measure sheet savings were 9.8 percent higher than savings predicted by the IA TRM and LED measure sheet savings were 6.8 percent higher than savings predicted by the IA TRM. In addition, the IA TRM includes a cooling benefit and heating penalty as part of the algorithm and the measure sheet does not. The cooling and heating effects are based on REM/Rate modeling and efficiency levels of existing heating and cooling equipment, which the Tetra Tech team feels is a reasonable approach.

> *Recommendation #1: Review the hours of use assumptions and base case assumptions used in the measure sheet and consider including cooling benefit and heating penalty as part of the measure sheet algorithm.*

Finding #2: Attic insulation and wall insulation measure sheet algorithms do not account for the heat loss impact of structural framing.

Structural framing is a conduit for heat loss that should be taken into account when determining the savings associated with attic or wall insulation improvements. The IA TRM savings algorithm takes framing into account, but the measure sheet savings algorithm do not. In addition, savings factors are used in the measure sheet algorithms, but it was not clear what assumptions were used to develop those savings factors, though based on our industry knowledge they appear reasonable. The Tetra Tech team also noted that there was only a small difference between the CDD value used in the measure sheets and the IA TRM, but a large difference between the HDD value used in the measure sheets and the IA TRM (6,362 HDD and 5,052 HDD, respectively). This is because the measure sheets use a base 65 HDD and the IA TRM uses a base 60 HDD. We believe that although base 60 HDD may be appropriate for determining energy consumption for the general housing stock, base 65 HDD may provide a better estimate of energy consumption in poorly insulated houses that would be candidates for insulation improvements.

> *Recommendation #2: Discuss with the IA TRM Advisory Group whether HDD60 is appropriate to use for homes that have need for additional insulation.*

Finding #3: Infiltration reduction savings factors differed considerably between the measure sheet algorithm and the IA TRM non-blower door approach.

The measure sheet algorithm for infiltration reduction savings used a savings factor that was multiplied by square footage to determine electricity cooling and natural gas heating savings. The IA TRM recommends a blower door testing approach as the preferred approach, but does offer a second method that also uses savings factors (referred to as the Conservative Deemed Approach). The IA TRM savings factors for this method are significantly lower than the savings factors used in the measure sheets (0.05 kWh per square foot compared with 0.2017 kWh per square foot for cooling savings and 0.013 therms per square foot compared with 0.0531 therms per square foot for heating). The resulting savings were therefore much higher using the measure sheet algorithm.

> *Recommendation #3: If MidAmerican plans to continue with the current HomeCheck program design, where a blower door test is not required for infiltration, MidAmerican should work with the IA TRM Advisory Group to determine the source of the IA TRM savings factors and whether or not they should be updated.*

Finding #4: The measure sheets treated the residential HVAC mechanical equipment measures and their quality installation as two separate savings algorithms, which was a less accurate approach to calculating savings than combining the measures.

Efficient HVAC equipment and its quality installation has a combined effect—while the equipment itself is more efficient than the baseline, the quality installation improves the operation of that equipment. Thus, a more accurate representation of the entire system would be for the new high efficiency equipment to be installed and include a SAVE quality installation in order to achieve the equipment's nameplate efficiency. Absent quality installation, the measure would likely not achieve its nameplate efficiency. To account for this, the IA TRM provides de-rate factors for equipment that is installed using a standard installation whereas the measure sheet algorithms use a savings factor multiplied by capacity to determine quality installation savings and a separate algorithm to determine savings for the efficient equipment. While the Tetra Tech team finds the de-rate factors in the IA TRM to be reasonable, performing both a SAVE test-in and test-out for quality installation retrofits could inform more appropriate de-rate assumptions.

> *Recommendation #4: Consider consolidating the standard installation algorithm and quality installation algorithm into one and utilize a de-rate factor for base equipment, similar to the approach taken by the IA TRM.*

Finding #5: The current measure sheet algorithms for air-source heat pumps and ground source heat pumps incorrectly used cooling capacity to determine both cooling and heating.

Heat pump heating capacities are generally lower than their cooling capacities. In addition, air-source heat pumps in particular have substantially lower heating capacities at lower temperatures. Using heat pump cooling capacity in both the heating and cooling portion of the savings calculation tends to overstate heating-mode energy savings.

> *Recommendation #5: Use cooling capacity for the portion of the algorithm that calculates cooling energy savings and heating capacity for the portion of the algorithm that calculates heating energy savings.*

Finding #6: Reported furnace savings estimates used input capacities in the measure sheet algorithms rather than output capacities, resulting in savings being overstated.

The measure sheet algorithm for furnace energy savings included a calculation of furnace capacity divided by furnace AFUE. Although the measure sheet does not specify whether furnace input capacity or furnace output capacity should be used, the fact that AFUE is in the denominator of the algorithm indicates that the furnace output capacity would be the correct capacity to use. The lack of specification in the measure sheet may have caused confusion, as in almost all cases the input capacity was used in the savings calculation even though output capacity was listed on the application as the capacity of the furnace.

> *Recommendation #6: Specify the use of furnace output capacity in the furnace measure sheet algorithm, or modify the furnace measure sheet algorithm so that furnace input capacity is the correct input for the algorithm.*

Finding #7: Measure sheet savings approaches for furnace fans, thermostats, refrigerators, and freezers were reasonable.

The furnace fan measure sheet used a deemed savings value of 469 kWh. This is similar to the value used in the IA TRM for single family homes in Des Moines (553 kWh), and perhaps even slightly conservative. Thermostat savings appeared to be reasonable, but the measure sheet did not include documentation of assumptions beyond referencing the 2014-2023 Iowa Statewide Assessment of Energy Efficiency Potential. Refrigerator and freezer savings are to be determined from the ENERGY STAR database based on model number energy use in comparison to standard refrigerator energy use. The Tetra Tech team was able to replicate savings for all of these measures.

> *Recommendation #7: We recommend no changes to the current measure sheets for refrigerators, freezers, furnace fans, and thermostats.*

Finding #8: The IA TRM savings algorithms and input assumptions appear reasonable, with the exception of Equivalent Full Load Hours (EFLH) for furnaces.

The Equivalent Full Load Hours (EFLH) heating value listed in the IA TRM for the high efficiency furnaces is 612 EFLH, which seems unreasonably low. This estimate is considerably lower than EFLH assumptions referenced in TRMs in nearby territories with similar climates, include Illinois and Missouri. In addition, despite being a predominantly heating climate, the heating EFLH estimate is lower than the EFLH cooling value specified in the IA TRM for Des Moines (811 EFLH cooling). The Tetra Tech team reviewed the equivalent full load hour heating values specified for Rockford, IL in the IL TRM (1,969 EFLH heating), as well as the approach described for calculating this value. Based on these reviews and our own independent calculations, we determined that a more reasonable estimate for EFLH heating value for Des Moines may be 1,830 EFLH heating.

> *Recommendation #8: Consider suggesting a revised Equivalent Full Load Hour heating value for the IA TRM high efficiency furnace measure, perhaps even based on actual furnace energy use data and furnace capacity data for Iowa.*

Finding #9: Program marketing and outreach efforts have been successful in raising general customer awareness of MidAmerican rebates—word of mouth, bill inserts, and trade allies have been most successful in driving participation.

The vast majority of participants surveyed recognized MidAmerican's "Save Some Green" messaging (84 percent). Most participating trade allies thought that customers were generally aware of the availability of MidAmerican rebates, although trade allies indicated customers were less knowledgeable

about specifics on eligibility criteria or rebate amounts. This feedback underscores the importance of leveraging trade allies to help educate customers on program specifics.

Participants surveyed most commonly reported learning about the HomeCheck program through word of mouth (40 percent) or MidAmerican bill inserts (33 percent). Trade allies and television ads contributed another 10 percent each to awareness. Although energy experts reported the door hangers they leave in neighborhoods create spikes in interest, participants did not specify them as a source of awareness, although they may be included in word of mouth as a neighbor would have received an assessment. In addition, energy experts indicated that mass media sources (e.g., newspaper, television, radio, billboards) have been effective in promoting the program in larger markets.

> *Recommendation #9: Continue to look for opportunities to promote the HomeCheck program using new messages, the online assessment, trade allies, and the assessment implementer. In addition, keep trade allies updated on program opportunities and changes so they have the correct information to present to customers.*

Finding #10: The on-site assessment, energy expert thoroughness, and bonus rebates are motivating participants to follow through with energy saving projects rebated by MidAmerican.

Participant feedback indicated that they felt the HomeCheck energy experts were professional, thorough, and provided valuable education on how their homes were performing. The goal after an assessment is to motivate customers to engage in energy efficient projects. To that end, the program provides two follow-up communications with participants as well as a $200 bonus rebate for those who upgrade three qualifying recommended items within 12 months of their assessment. Thirty-seven percent of HomeCheck participants were aware of the bonus rebate. While participants reported a modest likelihood (2.6 rating)[5] of completing three projects in 12 months to be eligible for bonus, energy experts report that is often due to the number of recommendations that would qualify for rebates, not a participant's unwillingness to take action. And those participants who have received the bonus found it easy to complete three projects in 12 months (4.7 average rating).[6]

> *Recommendation #10: Continue to focus resources on follow up communication with HomeCheck participants, including tracking activity against recommendations and opportunities with the new tracking system to schedule and automate reminders.*

Finding #11: There is high program satisfaction among participating customers and energy experts, although a few minor suggestions for improvements were shared by energy experts.

Participating surveyed customers generally expressed high satisfaction with the program overall as well as individual aspects of their participation experience. More than 90 percent of survey respondents said they were either "extremely satisfied" or "very satisfied" with the program overall. Seventy-five percent of participants found the information from both the energy expert and written reports to be very useful. Participants also characterized the assessment as thorough, professional, and educational. Reinforcing the high satisfaction ratings, at least 75 percent of all participant respondents reported having recommended the HomeCheck program to others.

Energy experts felt that the assessment leave-behind informational packets were some of the best they had seen and full of good information. Energy experts report that they appreciated the concise, two-page format of the current assessment form, and that the form collects the most critical information, although most would like to have an electronic option. While the paper form on its own is easy to use, it differs significantly from forms the energy experts use for other utilities and it may take more than one

[5] Using a 1 to 5 scale where 1 was "not at all likely" and 5 was "very likely."
[6] Using a 1 to 5 scale where 1 was "very difficult" and 5 was "very easy."

try for an energy expert to get a correctly completed form that is readable for the customer. Electronic forms benefit from the ability to correct and print easy-to-read versions. Additionally, feedback from a few survey participants suggests that customers are beginning to request electronic versions of the form that are easier to read and store electronically for future reference.

> *Recommendation #11: Continue to provide high-quality on-site assessments for residential customers with the goal of transitioning to an electronic assessment form as this provides a more professional, readable, and storable form for customers. In addition, continue to investigate opportunities to standardize forms across utilities for a more consistent form that will help alleviate errors.*

2.0 INTRODUCTION

This report presents the detailed results for the program year (PY) 2016 impact and process evaluation of the Residential HomeCheck® (HomeCheck) program offering in MidAmerican Energy's (MidAmerican) Illinois service territory.

2.1 PROGRAM DESCRIPTION

The HomeCheck program was designed to be a primary entry point for residential customers seeking assistance through MidAmerican's energy efficiency programs. In PY2016, the program provided free residential walk-through energy assessments, direct installation of low-cost efficiency measures, and efficiency improvement recommendations to eligible MidAmerican customers. The program consisted of an on-site energy assessment implemented by A-TEC Energy and an online energy assessment implemented by Opower Inc.[7] MidAmerican claimed savings from the equipment installed during on-site assessments, but did not claim any savings from online energy assessments as their purpose is educational.

Post inspection quality assurance and quality control (QA/QC) was performed by MidAmerican on one percent of insulation projects for each approved contractor, 25 percent of self-installed upgrades over $500, and 10 percent of sites installed by non-program contractors. Additionally, A-TEC performed follow up after the HomeCheck on-site assessment with a random sampling of customers for each of their assessors.

The on-site assessment provided residential customers with multiple benefits including a whole-house walk-through assessment from trained energy experts, immediate savings through direct installation of low-cost measures, and information on rebates and discounts on insulation, lighting, and other efficiency projects. Upon completion of the assessment, the energy expert provided a report of the home's insulation, heating, cooling, water heating equipment, and window efficiency. The report could be used to inform future energy efficiency improvements at the home. Added in 2014, customers who completed three qualifying recommended upgrades within 12 months of receiving an on-site assessment could receive a $200 bonus incentive. The bonus was meant to encourage residential customers to act on the assessment recommendations.

In order to qualify for the on-site assessment, participants must be residential customers located in MidAmerican's service territory and MidAmerican must be their primary fuel supplier. Furthermore, participants must reside in a single family dwelling or a multifamily dwelling with three or less residential units.[8] Multifamily buildings with four or more housing units are served under the Multifamily Housing program. Participant homes must also be over 10 years of age. Renters must have the landlord's approval, and the landlord should be present at the time of the on-site assessment. Additionally, MidAmerican coordinated the HomeCheck program with other utilities providing heating fuel to MidAmerican electric customers. A-TEC, as the primary program contractor, handled all customer interaction unless there was a major customer service issue.

[7] A competitive bid process resulted in the online audit component changing vendors. With the transition to the new online assessment process in 2016, the online assessment portion of the program was not part of the PY2016 evaluation.

[8] For Illinois and South Dakota only, the residential portion of multifamily buildings, (generally defined as four or more units or three or less stories, including apartments and condominiums) and agribusinesses (farm operations facilities) are accommodated in this program; the Commercial Energy Solutions program accommodates the nonresidential portion.

In PY2016, the following financial incentives were available to HomeCheck participants:

- **No cost energy assessments** were offered for HomeCheck online and on-site participants.
- **Full subsidies** were offered for low-cost measures directly installed during the on-site assessment with the intent to fully overcome market barriers concerning cost, perceived quality, and time and effort to install. Free direct install measures included pipe insulation, faucet aerators, low-flow showerheads, water heater blankets, programmable thermostats, compact fluorescent lamps (CFLs), light emitting diodes (LEDs), and smart strips. If MidAmerican Energy or partnering utilities did not provide electric service, then only gas measures were installed.
- **Rebates** were offered for insulation and infiltration measures if they were recommended during the on-site assessment. Rebates were set at either a percent of qualified installation costs, or per linear foot of band joist insulation. Bonus rebates were available for customers installing multiple follow-up measures including air conditioners, natural gas furnaces, heat pumps, refrigerators or freezers[9], heat pump water heaters, and insulation.
- **Financing** was not offered in PY2016, although it had been available as an alternative to rebates for HomeCheck participants for qualified insulation and infiltration measures. However, beginning in PY2016, HomeCheck's financing partner had not renewed their contract with MidAmerican. Consequently, MidAmerican began searching for a new financing partner and suspended the customer financing option until a replacement could be found.

2.1.1 2016 Budget and Savings Goals

Table 2-1 below summarizes the program budget, gross savings goals, and peak savings goals for PY2016. Actual budget and savings typically exceed plan goals due to a new tracking process instituted after the program plan was filed—MidAmerican now records all follow-up projects, not just insulation projects, within the HomeCheck program if the customer ever received an assessment.

Table 2-1. PY2016 Target Budget and Savings for Illinois

Type	PY2016 Target
kWh Budget	$369,370
kWh	459,453
Peak kW	168
Gas Budget	$560,170
Therms	96,096
Peak Therms	1,071

Source: Appendix A. MidAmerican Energy Company Energy Efficiency Monitoring and Verification Plan, provided as part of the MidAmerican EM&V Request for Proposal and Program Staff.

[9] Iowa only.

2.2 EVALUATION METHODS

2.2.1 Summary of Researchable Questions and Evaluation Activities

This section describes the analytic methods and data collection activities implemented as part of the PY2016 impact and process evaluation of the MidAmerican HomeCheck program. The Tetra Tech team designed a methodology to evaluate the program and address the researchable questions outlined in the program's Detailed Evaluation Plan, as well as addressed other issues that became relevant during the evaluation process.

2.2.1.1 Key Researchable Questions

Based on discussions with MidAmerican staff, the implementation contractor, and a documentation review, key researchable questions were developed and prioritized for the evaluation of the HomeCheck program, and then addressed within the customer and market actor research as well as the impact evaluation activities. The table below outlines the researchable questions that this evaluation examined.

Table 2-2. HomeCheck Program Researchable Questions

Researchable Questions	Activity to Support the Question
Program Design	
What is the effect of the enhanced incentive in encouraging customers to complete multiple installations? How effective are the HVAC tune-up coupons? Are there additional measures that should be included in the program design?	• Market actor interviews • Participant surveys
What are the primary barriers preventing customers from participating in the program? How effective has the program been at addressing these barriers and what options might be considered?	• Market actor interviews • General population survey • Participant surveys
What is the conversion rate from assessments to equipment installation? Are direct install measures actually installed? What measure types are being converted?	• Program staff interviews • Implementation staff interviews • Market actor interviews • Program tracking database review • Participant surveys
Customer Education, Outreach, and Marketing	
What is the level of consumer understanding of benefits of conducting an assessment? Is the guidance and level of education provided by the program around these topics sufficient and effective?	• Market actor interviews • Participant surveys
How effective are marketing efforts undertaken as part of the program? Do customers trust the auditors and contractors? Is there additional education that could benefit customers? How understandable and effective are the assessment reports?	• Market actor interviews • Participant surveys

Researchable Questions	Activity to Support the Question
Program Administration, Processes, and Resources	
What activities does A-TEC undertake to verify program processes are followed? What are the current QA/QC procedures in place?	• Program staff interviews • Implementation staff interviews • Market actor interviews • Engineering review • Program and tracking data review
Are there any program processes that could be more efficient and/or effective? If so, how can those processes be improved?	• Program staff interviews • Implementation staff interviews • Market actor interviews • Program information review • Participant surveys
Program Satisfaction	
What is the perspective on the program from A-TEC assessors and participating contractors? What do they think the program is doing right? How could it be improved?	• Implementer staff interviews • Market actor interviews
What is the level of contractor and participant satisfaction with the program? How can satisfaction be improved, if at all?	• Market actor interviews • Participant surveys
Program Impacts	
What are gross savings for the evaluation period?	• Engineering review • Program information review
Does information gathered from literature review, program secondary review, tracking data, or on-site measurement indicate that alternative savings algorithms should be considered	• Engineering review • Program information review
What is an appropriate net-to-gross (NTG) ratio for the program in Illinois?	• Participant surveys • Market actor interviews

2.2.2 Detailed Evaluation Activities

Table 2-3 documents the activities that were completed as part of this evaluation. The evaluation focused on estimating and verifying program impacts and providing key feedback on the functionality of program processes.

Table 2-3. Summary of HomeCheck Program Evaluation Activities

	Activities
Overarching Evaluation Activities	**Program staff interviews:** Conducted six in-depth interviews with the product manager, product administrator, energy efficiency director, and program implementation staff. **Program documentation review:** Reviewed program tracking databases, reported savings, and related program documentation. **Net-to-Gross (NTG):** Estimated free-ridership and spillover effects from participant customer self-reports, triangulated with trade ally views (qualitative only), and a secondary review. NTG also informed program design elements.
Impact Evaluation Activities	**Engineering/desk reviews, including review of supporting impact data documentation:** Conducted a total of 17 engineering desk reviews on a sample of PY2016 completed projects. Reviewed measure sheet engineering inputs, assumptions, calculations, and documentation. Compared MidAmerican's measure sheets to the IA TRM.
Process Evaluation Activities	**Participant customer surveys:** Completed 274 customer surveys. The survey was conducted with a random sample of the population of Illinois PY2016 program participants. **Market actor interviews:** Conducted four interviews with A-TEC staff that conducted HomeCheck on-site assessments, and 12 in-depth interviews with trade allies that installed measures as a result of the assessment recommendations.[10]

Below is more detail related to the methodologies used for the different evaluation activities associated with MidAmerican's HomeCheck program evaluation.

- **Program and implementation staff interviews.** Tetra Tech team members interviewed the current and previous MidAmerican product manager and energy efficiency director, and the A-TEC implementation and marketing staff. The Tetra Tech team completed these interviews to gain a better understanding of the program design and delivery, to discuss program successes and challenges, and to identify and prioritize researchable issues for the evaluation.
- **Program documentation review.** The Tetra Tech team reviewed the program's EEMIS tracking data, reported savings, and related documentation. As part of assessing the appropriateness and effectiveness of program marketing, point-of-sale, and educational materials, the Tetra Tech team also reviewed assessment forms, program marketing, and informational materials made available to customers and trade allies.
- **Participant customer survey.** We conducted a total of 274 customer surveys with a sample of PY2016 program participants in Illinois to inform both process and impact evaluation objectives. Specifically, the surveys investigated program delivery processes, interactions with the program staff, preferred communication channels, satisfaction with different facets of the program, NTG, and demographic information. The participant customer survey was administered through Tetra Tech's in-house computer-assisted telephone interview (CATI) Survey Research Center between February 23 and March 9, 2017. A copy of the participant survey can be found in Appendix B.

[10] Due to the smaller number of market actors in the Illinois service territory, Iowa and Illinois market actor survey results are combined to help ensure confidentiality. Additionally, the program is implemented the same in both Iowa and Illinois.

- **Market actor interviews.** The Tetra Tech team conducted semi-structured interviews with four A-TEC assessors (energy experts) and 12 participating trade allies (five insulation and seven equipment) to understand the program delivery from their perspectives and gather information to address researchable questions. Energy expert interviews focused on interaction with the customer when providing education, information, and recommendations for energy saving opportunities. Trade ally interviews focused on customer interaction during the installation process, customer decision-making, market trends, and interaction with program staff. A copy of the trade ally interview guide can be found in Appendix D and the energy expert guide can be found in Appendix C.
- **Net-to-Gross (NTG) assessment.** The participant customer survey gathered information to estimate free-ridership and participant spillover effects based on customer self-reports. The trade ally interviews also investigated qualitative indicators of the program's influence on customer decision-making and trade ally practices. In addition to primary research, the Tetra Tech team reviewed relevant studies addressing residential NTG for states or service territories with measures similar to MidAmerican's program.
- **Engineering/desk reviews.** The Tetra Tech team reviewed MidAmerican's assumptions in their filed measure sheets regarding engineering inputs and algorithms for HomeCheck measures and compared these assumptions to industry practices. The Tetra Tech team also reviewed a random sample of 17 project applications to check that the measure sheet algorithms have been applied correctly and that the savings appear reasonable. This included reviewing supporting impact inputs, assumptions, and documentation and compared MidAmerican's measure sheets to the Iowa Technical Reference Manual (IA TRM).[11] Project-specific results where adjustments were made can be found in Appendix A.
- **Education and outreach evaluation activities.** As part of the cross-cutting Education program evaluation, the Tetra Tech team developed a set of standardized questions to ask of each customer surveyed as part of the residential participant and nonparticipant surveys. These questions focused on initial source of awareness, notice of MidAmerican's messaging, use of MidAmerican's website, etc. We also developed a set of standardized questions to ask of trade allies to investigate awareness of and engagement as an EnergyAdvantage Trade Ally Partner, awareness of and participation in training initiatives, their primary sources of information and education (outside of utility programs), and other needs they have from MidAmerican to most effectively promote energy efficiency to their customers.
- **Secondary research.** In addition to primary research activities, we also conducted secondary research to gather information on peer utility program rebate and financing offerings, incentive levels, and NTG estimates for other similar programs in nearby territories to provide additional context to evaluation results.

[11] IA TRM version dated August 2016.

3.0 PROGRAM SAVINGS AND IMPACT EVALUATION FINDINGS

This section presents the results of the quantitative and qualitative gross impact results for the PY2016 HomeCheck impact evaluation. The impact evaluation was designed around the key researchable questions identified in the methodology section 2.2.1. Key impact evaluation activities involved interviews with program and implementation staff, a review of MidAmerican's filed program measure sheets, and project-level documentation. First, we present the program savings and then discuss the tracking, engineering, and data reviews.

3.1 PROGRAM SAVINGS

The Tetra Tech team sampled 17 projects for review across a range of measures. In this subsection we present the electric and natural gas energy and demand savings results. We provide detailed results for the project level reviews in Appendix A of this report for those projects where the evaluation made adjustments (three projects and six measures out of 17 total sampled projects and 61 sampled measure). These adjustments were the result of input capacity for furnaces incorrectly being used instead of output capacity in the furnace measure sheet algorithms.

The Tetra Tech team leveraged PY2016 program data through October 2016 to select a sample for desk reviews that was stratified based on measure end use, and weighted based on overall reported energy savings in MMBtu (combined electricity and natural gas savings). The table below shows the number of sampled projects by measure end use compared with participants and reported electricity and natural gas savings through October 2016. Of the 17 participant projects that were sampled, 61 total measures were reviewed (3.6 measures per project), and required desk reviews by measure end use category were exceeded for most end uses because most projects included more than one measure.

Table 3-1. HomeCheck Engineering/Desk Review Sample by Measure End Use*

Measure End Use	Measure Count	Tracked Savings (kWh)	Tracked Savings (therms)	Number of Sampled Projects	Total Measures Reviewed
Direct install—CFL	378	81,115	N/A	1	1
Direct install—LED	668	117,358	N/A	2	4
Direct install—Other	740	77,089	9,577	2	7
Insulation	325	100,482	72,391	5	36
Thermostat	82	5,732	1,434	1	6
Furnace	88	27,674	14,955	2	3
Central AC	101	45,090	N/A	1	1
Heat Pump	7	11,882	N/A	1	1
Room AC	8	227	N/A	1	1
Windows	1	180	N/A	1	1
Total	**2,398**	**466,829**	**98,357**	**17**	**61**

* Numbers reflected in this table do not match those reported, as this table reflects the data through October 2016, when sampling was completed.

Overall, the impact evaluation found realization rates on most electric measures to be 100.0 percent, and realization rates on natural gas measures to be just under 100.0 percent (99.8 percent).

As shown in the table below, total reported electricity savings were 794,905 kWh and 386 peak kW. Total evaluated electricity savings for all Illinois projects were 794,905 kWh and 386 peak kW, resulting in overall realization rates of 100.0 percent for kWh savings and 100.0 percent for peak kW savings. Overall realization rates on natural gas measures were 99.8 percent for therm savings and 99.8 percent for peak therm savings. The gas realization rates were driven by an error that the Tetra Tech team identified in the way furnace savings were calculated. Furnace savings accounted for 20.4 percent of the reported 162,372 therm savings and 21.3 percent of the reported 2,016 peak therm savings. Evaluated natural gas savings were therefore 162,107 therms and 2,012 peak therms.

Table 3-2. PY2016 HomeCheck Program Reported and Evaluated Impacts

Measure Category	Reported (kWh)**	Evaluated (kWh)	kWh Realization Rate
Direct install—CFL	98,211	98,211	100.0%
Direct install—LED	141,973	141,973	100.0%
Direct install—Other	101,335	101,335	100.0%
Insulation	182,736	182,736	100.0%
Thermostat	14,122	14,122	100.0%
Furnace	56,214	56,214	100.0%
Central AC	85,162	85,162	100.0%
Lighting	96,674	96,674	100.0%
Heat Pump	13,520	13,520	100.0%
Room AC	337	337	100.0%
Windows	435	435	100.0%
Clothes Washer*	4,186	4,186	100.0%
All Illinois Projects	**794,905**	**794,905**	**100.0%**

Measure Category	Reported (Peak kW)**	Evaluated (Peak kW)	Peak kW Realization Rate
Direct install—CFL	12	12	100.0%
Direct install—LED	17	17	100.0%
Direct install—Other	22	22	100.0%
Insulation	188	188	100.0%
Thermostat	16	16	100.0%
Furnace	0	0	100.0%
Central AC	113	113	100.0%
Lighting	12	12	100.0%
Heat Pump	5	5	100.0%
Room AC	0	0	100.0%
Windows	1	1	100.0%
Clothes Washer*	0	0	100.0%
All Illinois Projects	**386**	**386**	**100.0%**

Measure Category	Reported (Therms)**	Evaluated (Therms)	Therms Realization Rate
Direct install—Other	11,365	11,365	100.0%
Insulation	114,862	114,862	100.0%
Thermostat	2,674	2,674	100.0%
Furnace	33,082	32,817	99.2%
Windows	19	19	100.0%
Clothes Washer*	370	370	100.0%
All Illinois Projects	**162,372**	**162,107**	**99.8%**

Measure Category	Reported (Peak Therms)**	Evaluated (Peak Therms)	Peak Therms Realization Rate
Direct install—Other	56	56	100.0%
Insulation	1,494	1,494	100.0%
Thermostat	35	35	100.0%
Furnace	430	426	99.1%
Windows	0	0	100.0%
Clothes Washer*	1	1	100.0%
All Illinois Projects	**2,016**	**2,012**	**99.8%**

* As part of PY2016 evaluation activities, The Tetra Tech team did not evaluate clothes washers given they were discontinued on 12/31/2015. The clothes washers included here were installed in 2015 and paid in 2016, thus they are included in the reported savings.

** Reported savings shown are from PY2016 tracking data received from MidAmerican on February 2, 2017.

3.2 ENGINEERING REVIEW

The Tetra Tech team reviewed the HomeCheck program measure sheet algorithms for all measures eligible in PY2016. First, we assessed the algorithms and assumptions for reasonableness with industry standard approaches for each measure. Sources for comparison included industry studies, ENERGY STAR information, the IA TRM, and the IL TRM.[12] Next, the Tetra Tech team reviewed the measure sheet algorithms themselves to ensure there were not inadvertent errors in the algorithms and evaluated the reasonableness of assumptions used in default values or savings factors. Based on this review, we determined that MidAmerican's measure sheet algorithms, assumptions, and deemed savings were all reasonable compared to industry standards, and that there were no instances in which there was a clear error in an algorithm. In the case of deemed energy savings measures or measures with energy savings specified by ENERGY STAR, the MidAmerican measure sheet algorithms specified that peak demand savings should be calculated by an algorithm based on measure-specific load factors that were derived from MidAmerican residential load shapes. The measure-specific load factors were appropriately included in the relevant measure sheets.

As part of the overall measure-specific assessments, the Tetra Tech team reviewed baseline assumptions. For most measures affected by federal minimum standards, we found that baseline assumptions for HomeCheck program measures were informed by current federal standards. The Tetra Tech team found two exceptions—ground source heat pumps and heat pump water heaters. We have summarized the baselines for each of the measures in the PY2016 HomeCheck program below, including providing baseline consumption examples that would be seen for an assumed capacity using the measure sheet algorithms[13]:

- **Central Air Conditioners.** The measure sheet indicates a baseline efficiency equal to that of the minimum federal standard central air conditioner, SEER (Seasonal Energy Efficiency Ratio) 13. This matches the IA TRM baseline for central air conditioners and is consistent with our findings based on research. As an example, a SEER 13 central air conditioner with 30,000 BTUH (2 ½ ton) capacity would produce a baseline annual energy consumption of 1,871 kWh according to the measure sheet. The Tetra Tech team finds this reasonable for a unit of this capacity.

- **Insulation.** The stated baseline from the MidAmerican measure sheet algorithm for attic insulation is the actual existing R-value of the insulation as observed during the assessment (ranging from R-3 to R-24). The algorithm also uses savings factors (units of kWh per square foot and therms per square foot) that presumably include an assumption about heating and cooling equipment system efficiency and that contribute to baseline energy consumption. The stated baseline for wall insulation and rim/band joist insulation is that there is no insulation, but that the structural components (drywall, framing, air space, and exterior sheathing) provide an average insulation level of R-3.63. Foundation insulation uses the existing R-value along with R-4.29 to account for the insulation value of the slab. These algorithms also use savings factors. Finally, heating degree day (HDD) and cooling degree day (CDD) values specified in the measure sheets also contribute to the baseline energy consumption.

  The IA TRM uses a similar algorithm, but requires that the actual cooling and heating efficiencies be entered, and that actual R-values be entered (with a minimum of R-5 to be used

[12] Illinois Statewide Technical Reference Manual, Manual for Energy Efficiency, Version 6.0, p.86. http://ilsagfiles.org/SAG_files/Technical_Reference_Manual/Version_6/Final/IL-TRM_Effective_010118_v6.0_Vol_3_Res_020817_Final.pdf.

[13] Note that the baseline consumption will be different for different capacities, which means that essentially for every project, the baseline consumption will be different.

for uninsulated assemblies). The IA TRM also takes a different approach to HDDs, using a lower HDD base 60 value of 5,052 HDD, compared to the MidAmerican measure sheets. The MidAmerican measure sheets use HDD with a base of 65, resulting in 6,362 HDD. Finally, the IA TRM algorithm includes a framing factor to account for increased heat loss where framing is located, and an adjustment factor to account for typical engineering algorithms, consistently overstating energy savings. As a result of these factors, the IA TRM baseline energy use tends to be considerably lower than baseline energy use predicted by the MidAmerican measure sheets for similar baseline conditions. We do note, though, that it was not possible to make a direct comparison between the two savings methods because it was not clear what cooling and heating efficiencies are assumed for the measure sheet.

As an example, baseline heating energy consumption predicted by the IA TRM for uninsulated walls totaling 1,000 square feet and with assumed heating efficiency of 80 percent would be 143 therms. The baseline heating energy consumption predicted by the measure sheet for uninsulated walls totaling 1,000 square feet is predicted to be 327 therms (more than double the IA TRM baseline). However, this method is not directly comparable to the IA TRM because savings factors are currently used in the measure sheet algorithm.

Because the measure sheet lacks some measure-level documentation, the Tetra Tech team could not determine with certainty what the measure sheet baseline consumption would be due to the use of savings factors. We do, however, believe that the base 65 HDD value of 6,362 used in the measure sheet provides a better estimate of energy consumption for poorly insulated homes that would be candidates for insulation improvements than would the base 60 HDD value of 5,052 used in the IA TRM.

- **Infiltration Reduction.** The stated baseline for the measure sheet algorithm for infiltration reduction is 10 ACH50[14], but the algorithm uses heating and cooling savings factors of 0.0531 therms per square foot and 0.2017 kWh per square foot, respectively, for natural gas heated homes with central air conditioning. This means that it was not clear what assumptions were made regarding heating and cooling system efficiencies or hours of operation at baseline infiltration conditions, and thus, not possible to calculate a baseline energy consumption from the measure sheet algorithm. The IA TRM preferred approach is to use a blower door test to determine both base case and reduced infiltration case infiltration level, so the baseline energy consumption would be based on actual measured infiltration and would vary from home to home. The IA TRM secondary approach is referred to as the "Conservative Deemed Approach" and uses savings factors in similar fashion to the approach used in the measure sheets, but the IA TRM only states that these values are based on 15 percent improvement in air infiltration and does not mention what the baseline condition is.
- **Direct Installation—LEDs and CFLs Lighting.** The measure sheet states that Energy Independence and Security Act of 2007 (EISA) standard lighting is the baseline, and the value used in the baseline table is 43 Watts (assumed to be a common EISA compliant halogen bulb). The measure sheet also uses 949 annual hours of operation (based on 2.6 hours per day). The baseline annual energy consumption predicted by the measure sheet algorithm is therefore 40.8 kWh per bulb. The Tetra Tech team finds this to be a reasonable baseline currently, but recommends considering a blended baseline for the LED measure for future program years given that CFLs are becoming more prevalent. The IA TRM baseline for a 43 Watt incandescent

[14] ACH50 (air changes per hour) is the number of time the air volume in a building changes per hour at 50 pascals of pressure. It is the CFM50 * 60 minutes (to convert to hours) divided by the house's volume. While there is industry debate about its appropriateness for all buildings, ACH50 is a straightforward way to make apple-ish to apple-ish comparisons of different house's air tightness.

lumen output equivalent is listed as a blended baseline wattage of 33.9 Watts (based on 70 percent incandescent at 43 Watts, 25 percent CFL at 13.4 Watts, and 5 percent LED at 10.1 Watts). The IA TRM also uses a slightly lower annual hours assumption of 894 hours for residential interior lighting.

- **Direct Installation—Aerators and Showerheads.** The measure sheet states that the baseline for bath and kitchen aerators is a standard aerator with 2.2 gpm water use. The baseline assumption for low flow showerheads is a standard showerhead with 2.5 gpm water use. Both the aerator measure sheets and the low flow showerhead measure sheet use a deemed savings value. The IA TRM uses an algorithm that applies different daily water consumption values for bath and kitchen aerator and different household size depending on home type—baseline energy consumption for a kitchen aerator in a single family home with a natural gas water heater would be 17.7 therms, and a bath aerator would have a baseline energy consumption of 6.2 therms. Given that the measure sheet savings for bath aerators was higher overall than the savings predicted by the IA TRM (2.6 therms vs 1.4 therms), it might be inferred that the baseline consumption for the measure sheet would be in the range of 9 to 10 therms. The measure sheet savings for kitchen aerators was also 2.6 therms, so the baseline consumption could also be inferred to be 9 to 10 therms for that measure.

- **Direct Installation—Hot Water Pipe Insulation.** The measure sheet for hot water pipe insulation states that the baseline is hot water pipe with no insulation, but the measure sheet algorithm uses a savings factor and there, it was not possible to determine baseline energy consumption. The IA TRM baseline assumption is also an uninsulated hot water pipe, but the IA TRM algorithm allows calculation of a baseline energy consumption. As an example, a six-foot uninsulated pipe with a 78 percent efficient gas hot water heater would have an annual baseline consumption of 5.3 therms.

- **Direct Installation—Water Heater Blanket.** The measure sheet for water heater blanket states that the baseline is a hot water heater with no insulation blanket, but the measure sheet uses a deemed savings value and therefore, it was not possible to determine baseline energy consumption. The IA TRM baseline assumption is also a water heater with no insulation blanket, but the IA TRM algorithm allows calculation of a baseline energy consumption. As an example, a 30-gallon, 78 percent efficient gas hot water heater with assumed existing packaged insulation of R-14 would have an annual baseline consumption of 9.2 therms.

- **Direct Installation—Smart Power Strip.** The measure sheet for smart power strip states that the baseline is a standard power strip, but the measure sheet uses a deemed savings value and therefore, it was not possible to determine baseline energy consumption. The IA TRM baseline assumption is also a standard power strip, and also uses deemed savings values depending on what the power strip is used for. Baseline power consumption would be determined by standby wattage of the device controlled and estimated annual number of hours that the device is in standby mode and active wattage for the balance of the year. For example, if a device connected to a standard power strip had a standby wattage of 6 Watts and was in standby mode for 7,129 hours annually and had a wattage of 200 Watts in active mode for 1,541 hours, the baseline annual energy consumption would be 351 kWh.

- **Air-Source Heat Pumps.** The measure sheet indicates a baseline efficiency equal to that of the minimum federal standard air-source heat pump, SEER 14 and 8.2 HSPF (Heating Seasonal Performance Factor). This matches the IA TRM baseline for air-source heat pumps and is consistent with our findings based on research. As an example, a SEER 14 and 8.2 HSPF air-source heat pump of 30,000 BTUH (2 ½ ton) cooling capacity would have a cooling baseline of 1,701 kWh according to the measure sheet algorithm, and a heating baseline of 8,349 kWh. The

Tetra Tech team finds that the estimated cooling baseline consumption is appropriate in this case, but that the estimated heating baseline consumption is likely overstated, as heating capacities for air-source heat pumps are generally lower than cooling capacities due to lower output capacities at test conditions.

- **Ground Source Heat Pumps.** The MidAmerican measure sheet indicates that the assumed baseline is a less efficient ground source heat pump. The Tetra Tech team believes this is a typographical error and that MidAmerican intends an air-source heat pump to be the baseline technology. The baseline equipment specifications for heating performance align with ASHRAE 90.1 guidelines for operations at 17F, which reflect a reasonable performance specification and estimate for actual heating performance and not the federal minimum standards, which reflect heating performance at specific test conditions (47F). The MidAmerican baseline heating specifications appear reasonable. However, the heating capacity of the baseline and efficient ground source heat pump use the cooling capacity as the basis from which to calculate consumption and savings. For both air-source and ground source heat pumps, heating capacity is typically less than the cooling capacity. As such, consumption based on equivalent full load hours (EFLHs) would be overstated for the heating system (baseline or efficient condition). Both the IA TRM and MidAmerican measure sheet approaches are reasonable, with the exception of MidAmerican using cooling capacity to represent the heating capacity of the baseline and efficient technology.
- **Furnaces.** The MidAmerican measure sheet indicates a baseline efficiency equal to that of the minimum federal standard of 80 percent AFUE and <250 MBTUH. As an example, a 55,000 BTUH furnace with baseline efficiency of 80 percent would have an annual natural gas consumption of 630 therms, according to the measure sheet algorithm. The Tetra Tech team finds that this is reasonable for a unit of this capacity. The IA TRM assumes an AFUE of 85 percent, stating that this value was agreed to by the Technical Advisory Committee to account for “significant demand” above the federal standard of 80 percent, a different approach to baseline selection based on assumed market adoption rates.
- **Room Air Conditioners.** The federal standard is a Combined Energy Efficiency Ratio (CEER) ranging from 9.0 to 11.0, depending on the capacity of the equipment and whether or not the unit has louvered sides. This is consistent with the IA TRM baseline, and both the measure sheet and the IA TRM provide tables from which the baseline CEER needs to be selected. As an example, using the measure sheet algorithm, an 8,000 BTUH capacity room air conditioner without louvered sides would have a baseline efficiency of 9.6 CEER from the measure sheet baseline table, and an annual consumption of 243 kWh. The Tetra Tech team finds that this is reasonable for a unit of this capacity.
- **Refrigerators and Freezers.** The federal standard is annual kWh consumption, as specified in the ENERGY STAR database for refrigerators and freezers. Additionally, MidAmerican measure sheet baseline values appear to be consistent with the values used in the IA TRM.
- **Heat Pump Water Heaters.** The MidAmerican measure sheet baseline is based on a federal standard electric resistance water heater with an energy factor of 0.92. The baseline appears to be based on the previous federal standard of EF=0.97-(0.00132 * storage volume), as this produces an energy factor of 0.92 with a 40 gallon water heater. The IA TRM uses the new federal standard that went into effect in April 2015, which is EF=0.96-(0.0003 * storage volume). The new federal standard would produce a slightly higher baseline energy factor of 0.948 for a 40 gallon water heater.

- **Furnace Fan.**[15] A standard motor is indicated as the baseline in the MidAmerican measure sheets, but no baseline performance specifications are listed. The industry standard furnace fan would be a permanent split capacitor (PSC) induction motor with an efficiency of approximately 50 percent. A 1/3 hp (horse power) PSC motor might be expected to have an annual baseline energy consumption of over 1,900 kWh. Given that the MidAmerican savings are based on the installation of an electronically commutated motor (ECM), which can be expected to operate at a minimum of 70 percent efficiency, the measure sheet savings for an ECM furnace fan (469 kWh) are reasonable. The IA TRM assumes the same baseline technology for furnace fans—a non-brushless permanent magnet motor.
- **Programmable Thermostats.** The MidAmerican measure sheet uses a non-programmable thermostat as the baseline technology assumption. A 55,000 BTUH, 80 percent efficient standard furnace would be expected to have an annual natural gas heating baseline of 630 therms, according to the furnace measure sheet algorithm, and a 13 SEER, 30,000 BTUH central air conditioner would be expected to have an annual electric cooling baseline of 1,871 kWh. Based on the measure savings, this example would result in approximately three percent savings for heating and approximately four percent savings for cooling, reasonable savings for the measure given the implied baseline consumption. The IA TRM also states that the baseline is a non-programmable thermostat and that for an unknown location, 578 therms should be used as base heating consumption, though the thermostats are assumed to save 6.8 percent of the heating load. In the IA TRM, cooling savings are assumed to be zero for a programmable thermostat so no baseline consumption is provided.

Our review of the measure sheet energy savings algorithms revealed the following key findings for program-eligible measures:

- The measure sheet savings approaches for furnace fans, thermostats, refrigerators, and freezers are reasonable and are in-line with industry standards based on engineering calculation for single family homes and in comparison to the IA TRM.
- For SAVE heating and cooling measures, the measure sheet algorithms use a savings factor multiplied by capacity to determine quality installation savings and a separate algorithm to determine savings for the efficient equipment. A more accurate representation is a single algorithm in which the new high efficiency equipment installed by means of a quality installation is able to fully achieve, or achieve close to, its nameplate efficiency while the existing equipment being replaced is likely not able to achieve its nameplate efficiency because quality installation was not performed (represented by a de-rate factor for the standard equipment). The IA TRM calculation uses one algorithm and a de-rate factor is applied to the standard equipment.
- The heat pump water heater measure sheet algorithm applies a savings factor to default water heater energy loads to estimate energy savings, which yields reasonable savings at minimum efficiency (EF=2.0). However, at higher efficiency levels (EF=3.0 or 4.0) the measure sheet algorithm predicted energy savings that were much higher than energy savings predicted by other algorithms, such as the ones in the IA TRM and the IL TRM.

[15] The Tetra Tech team did not provide an example of estimated baseline consumption for a standard furnace fan motor, as it requires an assumption about the hp of the motor and total annual hours of operation, neither of which is provided in the measure sheet or the IA TRM.

3.2.1 Project Level Tracking Data and Documentation

The engineering analysis also included an assessment of the appropriateness of the information collected to support program QA/QC, as well as the impact evaluation activities. The Tetra Tech team received and reviewed the HomeCheck program population data queried from the EEMIS database for projects completed in PY2016. The HomeCheck program tracking data is provided at the project level. The type of data that was captured and reviewed by the evaluation for each database is further described below.

EEMIS data that was key to the evaluation effort included:

- Customer information (e.g., address, site contact information)
- Project level energy savings by fuel type
- Project number (EEMIS Project ID, EEIS Project number)
- Equipment model number (to crosscheck with application)
- Equipment size and efficiency information (to crosscheck with application)
- Dates (e.g., assessment date, install date, paid date, other date).

Key documentation captured and reviewed for each sampled project included:

- Customer participation forms
- Assessment form for quantities and types of direct install measures, square footages, and existing insulation levels (if applicable)
- Contractor invoices
- Equipment specifications
- AHRI performance data for heating and cooling equipment
- SAVE test data for quality installations.

For the sampled projects, the Tetra Tech team completed engineering desk reviews to confirm equipment specifications, quantities, and that savings reported from the EEMIS database matched the results the Tetra Tech team calculated from the filed Appendix A measure sheet algorithms. The Tetra Tech team reviewed all information and cross-checked data sources for consistency. Customer information, equipment model numbers, capacities, and efficiencies recorded on the customer participation forms were compared to the supporting equipment specifications provided, as well as with the information entered in the EEMIS database. In the event that equipment specifications were not provided with the project documents, the Tetra Tech team gathered this information through research based on the model number provided.

Specific findings from the desk reviews include the following:

- Reported furnace savings estimates used input capacities in the measure sheet algorithms rather than output capacities, resulting in savings being overstated. The measure sheet algorithm for furnace energy savings includes a calculation of furnace capacity divided by furnace AFUE. Although the measure sheet does not specify whether furnace input capacity or furnace output capacity should be used, the fact that AFUE is in the denominator of the

algorithm indicates that the furnace output capacity would be the correct capacity to use to calculate the expected consumption of natural gas.

- The savings calculations for air-source heat pumps and ground source heat pumps incorrectly use cooling capacity to determine both cooling and heating. Heat pump heating capacities are generally lower than their cooling capacities and should be differentiated for their respective space-conditioning savings.
- For SAVE heating and cooling measures, the measure sheet algorithms use a savings factor multiplied by capacity to determine quality installation savings and a separate algorithm to determine savings for the efficient equipment. A more accurate representation is a single algorithm in which the new high efficiency equipment installed by means of a quality installation is able to fully achieve, or achieve close to, its nameplate efficiency while the existing equipment being replaced is likely not able to achieve its nameplate efficiency because quality installation was not performed (represented by a de-rate factor for the standard equipment). The IA TRM calculation uses one algorithm and a de-rate factor is applied to the standard equipment.
- The measure sheet savings approaches for furnace fans and thermostats are reasonable and are in-line with industry standards based on engineering calculation for single family homes and in comparison to the IA TRM.

4.0 NET IMPACT EVALUATION

In addition to requiring gross reported savings estimates, the Illinois Commerce Commission (ICC) requires that MidAmerican provide evaluated savings estimates with NTG adjustments. To meet this requirement, the Tetra Tech team conducted primary and secondary research to recommend NTG ratios that would be appropriate to apply to MidAmerican's Illinois HomeCheck evaluated program savings data.

4.1 ESTIMATION PROCESS

From an impact perspective, NTG represents a measurement of savings attributable to program interventions. It first accounts for free-ridership, which measures the savings claimed by individuals who would have installed the same high-efficiency measure type on their own at that same time if the program had not been offered. We also accounted for participant spillover, which measures untracked and non-rebated savings resulting from program information and intervention. When free-ridership and spillover are captured, the NTG ratio is calculated.

As the decision-making process is fundamentally different for assessments with direct install measures, and the Tetra Tech team would expect a NTG of 1.0 for that part of the program, the NTG research focused on participants who had progressed from the assessment to the purchase of equipment rebated by MidAmerican and tracked under the HomeCheck program. The Tetra Tech team conducted primary research with participating customers and trade allies, as well completed a secondary review to recommend a NTG ratio that would be most appropriate for equipment rebated through MidAmerican's HomeCheck program. The participant survey estimated free-ridership and participant spillover effects from customer self-reports following the IL TRM protocol (version 5.0). The trade ally interviews also investigated qualitative indicators of the program's influence on customer decision-making and trade ally practices. The secondary review focused on relevant studies addressing residential NTG for states or service territories with measures similar to MidAmerican's program.

The customer self-reports resulted in a calculated NTG ratio of 70 percent following the IL TRM self-report protocol (31 percent free-ridership, <1 percent spillover). Feedback from participating trade allies suggests higher program attribution for HVAC measures than indicated by the customer self-report results—trade allies we spoke with consistently reported using the program rebates in their sales processes and pricing quotes and comparisons, and that less program-qualifying high efficiency equipment would be sold if program rebates were not available to help offset the additional cost for these large investment measures. Trade allies are a primary source of program awareness, and participants commonly mentioned the influence of contractor recommendations on their decision to install their rebated equipment. Considering the trade ally-driven nature of the insulation measures, which comprise the bulk of program savings, the customer self-reports alone likely underrepresent true program attribution.

Next, we present detailed findings from the customer self-reports and trade ally interviews.

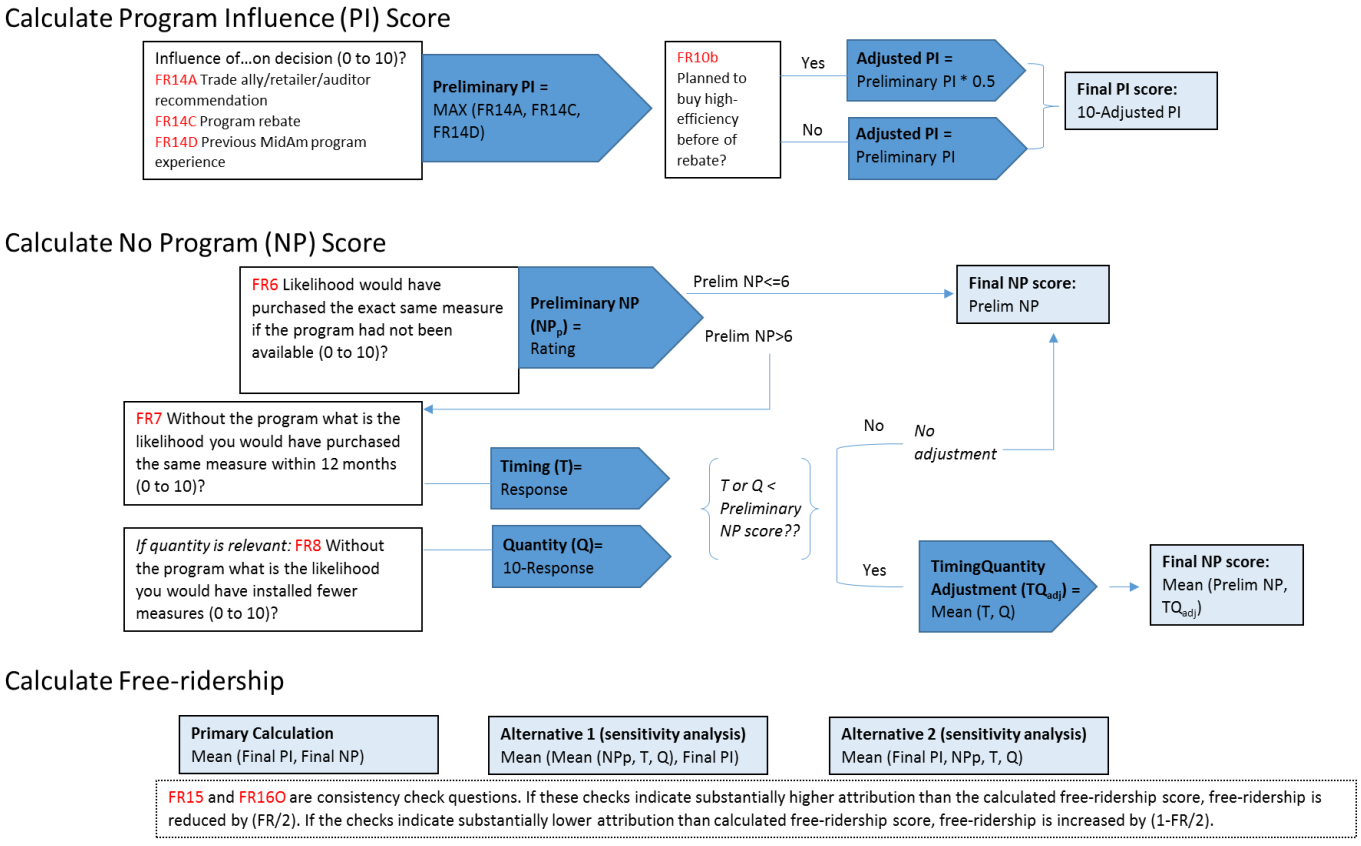
4.2 CUSTOMER SELF-REPORTS

The participant customer survey asked customers a series of highly structured questions to estimate free-ridership and spillover effects following the IL TRM self-report protocol.

4.2.1 Free-ridership

The participant survey asked decision-makers about the influence of the program on their decision to purchase qualifying equipment and actions that would have been taken in the absence of the program to assess free-ridership. A preliminary free-ridership rate was calculated for each participant, following the scoring algorithm detailed in the IL TRM, as shown in Figure 4-1. Preliminary free-ridership scores were further reviewed for consistency with additional consistency check questions included in the participant survey. In some cases, preliminary free-ridership scores were adjusted based on these consistency checks to more accurately reflect program attribution.[16] Individual free-ridership rates were then weighted to adjust for proportional sampling differences, non-response, and reported energy savings to calculate measure-category-level and program-level free-ridership rates.

Figure 4-1. Free-ridership Scoring Methodology



[16] A total of nine preliminary free-ridership scores were adjusted based on the consistency check review.

Following the IL TRM protocol, the participant customer self-reports resulted in an overall free-ridership rate of 31 percent. Free-ridership rates for insulation, which represented 80 percent of the combined reported electric and gas savings in the survey population, averaged 29 percent.

Table 4-1. Customer Self-Report Free-Ridership Results

Measure	Surveyed (n)	Population Reported Savings (MMbtu)	Free-ridership Estimate	90% CI (+/-)
Central air conditioner	13	230	39%	14%
Furnace	16	2,374	39%	13%
Heat pump	3	45	46%	15%
Insulation	91	10,406	29%	3%
Overall	**123**	**13,055**	**31%**	**3%**

Because these measures, with the exception of insulation, can be recorded under either the Residential Equipment or HomeCheck program—depending on whether or not the customer received an assessment—free-ridership rates were compared across these two programs. In almost all cases the free-ridership estimates for the customers who had received assessments were eight to 18 percent lower than for those who had only received a rebate through the Residential Equipment program. Although there is no comparison to free-ridership estimates for insulation, as insulation is only offered through the HomeCheck program, free-ridership is lowest for this particular measure. This continues to reinforce that the HomeCheck assessments are impacting decision-making processes for customers.

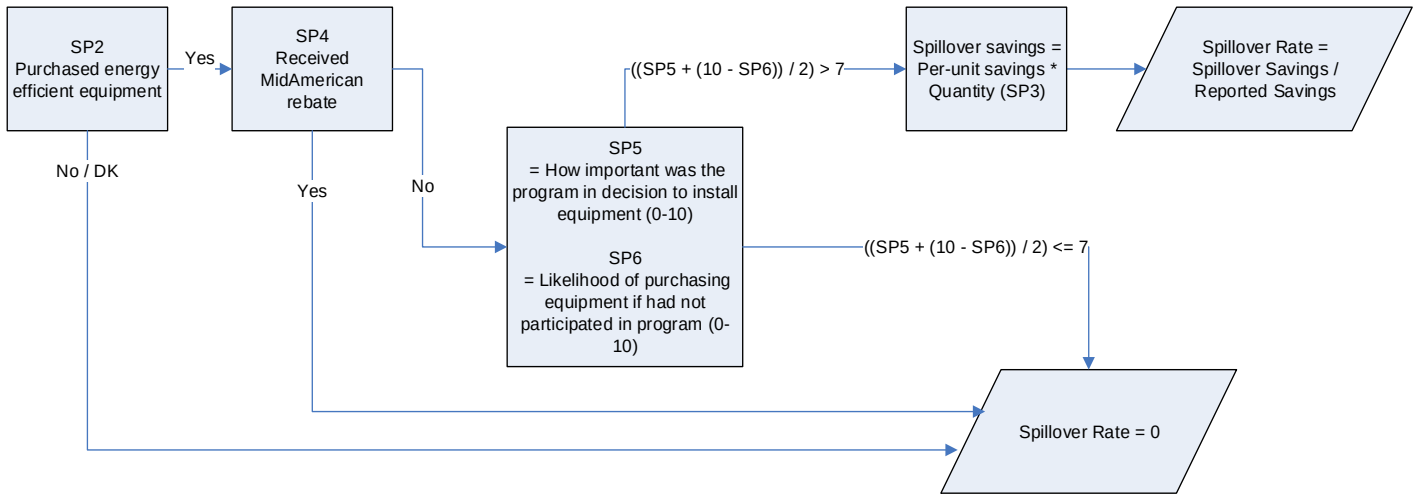
Additionally, most customers indicated the program was highly influential on their decisions to install program-qualifying equipment. On average, participants rated the influence of the rebate on the decision to install their rebate equipment at 9.1 out of 10, with 0 being “not at all influential” and 10 being “very influential.” Also, where applicable, respondents rated the influence of the information provided by the program energy assessment at an average of 8.8 out of 10. At the same time, one-quarter of respondents (25 percent) reported that they were already planning to install their rebated equipment before they learned about the rebate available through the program. Additionally, on average, respondents rated the likelihood that they would have purchased the exact same equipment if the program had not been available at 5.6 out of 10, with 0 being “not at all likely” and 10 being “completely likely.” Those who gave a rating of greater than 0 rated the likelihood of purchasing the equipment within 12 months at 5.8 of out of 10, on average, using the same scale. Finally, those purchasing multiple rebated units rated the likelihood of installing fewer units in the absence of the program at 6.7 out of 10 on average, indicating moderate program influence on the quantity of energy efficient purchases.

4.2.2 Spillover

In addition to free-ridership, the participant survey included a series of questions designed to measure spillover following the IL TRM protocols, as shown in Figure 4-2. Spillover refers to purchases of energy-efficient equipment since participation that were made *without* any financial assistance from MidAmerican as a result of the customer’s participation in the program. A participant spillover estimate is computed based on energy savings from energy efficient equipment the customer installed on their own since participating because of their experience with the program. The Tetra Tech team followed

the IL TRM protocols to estimate attributable spillover for measures where savings could be confidently estimated from MidAmerican's PY2016 tracking data or the IL TRM.[17]

Figure 4-2. Participant Spillover Methodology



The participant survey identified overall spillover rate of less than one percent. Fourteen participant respondents reported purchasing equipment resulting in quantifiable spillover savings attributable to the HomeCheck program. Reported measures resulting in attributable spillover savings included LEDs (n=10), water heaters (n=2), central air conditioners (n=1), faucet aerators (n=1), and basement insulation (n=1). In addition, while spillover savings could not be confidently estimated and therefore are not included in the spillover estimate shown below, two additional respondents reported installing windows and doors, respectively, as a result of their participation in the program.

Table 4-2. Self-Report Participant Spillover Results

Program	Respondents (n)	Spillover Estimate	90% CI (+/-)
Residential Assessment	273	<1%	3%

4.3 TRADE ALLY VIEWS

One potential issue with assessing free-ridership through customer self-reports for trade ally-influenced equipment is that programmatic influences on trade ally sales practices and recommendations are likely not fully captured in customer self-reports. The program relies heavily on trade allies for customer outreach and marketing, especially for HVAC measures. Results from the participant survey show that trade allies are a leading source of program awareness for customers and contractors' recommendations are highly influential customers' decision-making processes. Recognizing this,

[17] For measures where PY2016 MidAmerican program tracking data were available, average per-unit reported savings from the tracking data were used to calculate spillover savings. For measures not represented in MidAmerican's PY2016 tracking data, per-unit spillover savings were estimated using the IL TRM and pertinent household characteristics available from the participant survey. Spillover savings were not quantified for measures not included in the IL TRM, or where savings could not be confidently estimated based on the respondent data available.

interviews with participating trade allies investigated the program's influence on sales practices, recommendations, and market trends to support the NTG assessment.

Feedback from participating HVAC trade allies suggests that the program influences trade ally sales processes and customer decision-making. Participating trade allies we spoke with consistently reported using the rebates as part of their sales process, including incorporating rebates into pricing quotes and comparisons. The consensus among interviewees was that the program has increased customer interest and demand for high efficiency HVAC equipment. A few respondents specifically mentioned the influence of program rebates in driving down the incremental costs of program-qualifying equipment, making customer's decision to upgrade to more efficient equipment easier. Trade allies also reported that their recommendations, or customers' interest, in high efficiency equipment would be affected if MidAmerican's program was not available.

Feedback from participating insulation trade allies supports the low free-ridership rate reported by 2016 participants (31 percent). Trade allies refer customers to the HomeCheck program so customers will be eligible for rebates and the HomeCheck program educates participants on insulation needs as well as which contractors they can contact for estimates and service.

5.0 PROCESS EVALUATION FINDINGS

This section details the findings from the process evaluation activities. The process evaluation was designed around the key researchable questions identified in the methodology section 2.2.1. Process evaluation activities involved interviews with participating customers, nonparticipating customers, and market actors. The key process-related findings are detailed in the subsections below.

The participating customer survey was used to understand the perspectives of program participants; questions explored consumers' awareness, familiarity with program procedures, and satisfaction with the HomeCheck program. The participating market actor interviews investigated trade ally awareness, experiences, and satisfaction with the program and collected feedback from energy experts conducting the assessments to understand outreach, assessment processes, and potential improvements. In addition, training, education, and outreach[18] were further explored with market actors, as well as the program's impact on increasing the interest and demand for energy efficient products. Both the participant survey and the trade ally interviews included questions that were included in NTG analysis.

5.1 INTERVIEWED PARTICIPANT AND MARKET ACTOR CHARACTERISTICS

The Tetra Tech team interviewed four energy experts, 12 trade allies, and 274 program participants to inform the process findings.

5.1.1 Energy Expert Characteristics

The implementer provided contact information for four of their staff who conduct in-home assessments. The energy experts were interviewed to provide more detail on the assessment process to use as a comparison with feedback received from participating households. The energy experts interviewed were experienced staff, each with at least five years of experience with MidAmerican's HomeCheck program. Two served Des Moines and the surrounding communities, one conducted assessments in northern Iowa, and one served eastern Iowa and MidAmerican's territory in Illinois.

5.1.2 Trade Ally Characteristics

The Tetra Tech team interviewed a total of 12 participating trade allies across MidAmerican's Iowa and Illinois territories. Interviewed trade allies included contractors who sold equipment or installed insulation rebated through the HomeCheck program since 2014. Several trade allies interviewed served residential customers in both Iowa and Illinois. Considering the similarities in markets and implementation across the two territories, we present trade ally findings in aggregate.

The trade allies interviewed provided a mix of equipment including insulation (n=5), HVAC (n=6), and appliances (1), and only three were new to the program in the past three years. Five of the companies interviewed had fewer than six employees and another five had 20 to 35 employees each. The amount of time these companies have been in business varied widely. Two had been in business more than 80 years (n=2), another five had been in business approximately 40 years, one had been operating for 25 years, and the last four had been in business between eight and 14 years. Just over half of the trade allies had experience with other utility programs, mostly Alliant Energy.

[18] Training, education, and outreach findings will be summarized as part of the Education program report.

When asked about the proportion of their work that is rebated through the program, five thought the rebated work represented 75 percent or more of their work, three trade allies reported it represented from 30 to 70 percent, and the other four thought it was less than 25 percent of their projects. While most of the trade allies (n=9) think that the proportion of work rebated will likely remain the same in 2017, one HVAC trade ally thinks the rebated work will increase for them in 2017, and two trade allies (one HVAC, one appliance retailer) feel that the rebated work will be a smaller proportion in 2017.

5.1.3 Participant Characteristics

The table below summarizes the number of PY2016 participants surveyed and the number of participants in the survey population by rebated measure end use. For evaluation purposes, the participant survey population included PY2016 program participants who installed rebated equipment between January 1, 2016 and October 31, 2016.[19]

Table 5-1. Summary of PY2016 Illinois Participants Surveyed (January–October 2016)

Measure End Use	Surveyed Participants	All Participants
Appliance	0	0
Audit Only	1	19
Central Air Conditioner	13	101
Direct Install	129	740
Direct Install - CFL	2	378
Direct Install - LED	19	668
Furnace	16	88
Heat Pump	3	7
Insulation	91	325
Room Air Conditioner	0	8
Thermostat[20]	0	82
Window	0	1
Total	**274**	**2,419**

[19] In an attempt to improve customer recall, the Tetra Tech team sampled from a partial years' participant data so that we could field the telephone surveys early in 2017. Due to the measure types tracked in this program, the Tetra Tech team believes there was no sampling bias introduced based on this methodology.

[20] Thermostats were usually bundled with furnace installations and are part of the 16 furnace completes.

As shown in the table below, most participants surveyed lived in single family detached homes and owned their residence.[21] In addition, 41 percent of program participants lived in homes between 1,000 and 1,500 square feet.

Table 5-2. Survey Respondent Home Characteristics

House Characteristic		Percent / Mean
Own/Rent	Own/ buying	97%
	Rent	3%
	Respondents (n)	**274**
Type of Home	Single-family detached house	91%
	Single-family attached house	7%
	Apartment building with 2-4 units	1%
	Apartment building with 5+ units	1%
	Mobile home or house trailer	0%
	Other	0%
	Respondents (n)	**274**
Year Home Built	1930s or earlier	19%
	1940s	8%
	1950s	19%
	1960s	24%
	1970s	18%
	1980s	4%
	1990s	4%
	2000s	5%
	2010s	<1%
	Respondents (n)	**269**
Years Lived in Home	Average number of years	13.8
	Respondents (n)	**273**
Square Footage	Less than 1,000 square feet	13%
	1,000 to 1,500 square feet	41%
	1,501 to 2,000 square feet	25%
	2,001 to 3,000 square feet	18%
	More than 3,000 square feet	3%
	Respondents (n)	**256**

[21] Note that these results are reported in aggregate across all customers interviewed, are unweighted and representative of the survey sample only.

More than 90 percent of Illinois participants used natural gas for space heating and water heating. In addition, over 90 percent of participants surveyed reported having central air conditioning in their home.

Table 5-3. Survey Respondent Energy Use Characteristics

Energy Use Characteristic		Percent / Mean
Has Central Air Conditioning	Yes	91%
	No	9%
	Respondents (n)	**274**
Space Heating Fuel	Electricity	4%
	Natural Gas	95%
	Other	1%
	Respondents (n)	**270**
Water Heating Fuel	Electricity	6%
	Natural Gas	94%
	Other	<1%
	Respondents (n)	**262**

As shown in the table below, there was a reasonable distribution of participants across age and income categories.

Table 5-4. Survey Respondent Demographics

Respondent Demographics		Percent / Mean
Household Size	Average number of people in home	2.4
	Respondents (n)	**272**
	Average number of people under 19 years old in home	0.6
	Respondents (n)	**224**
	Average number of people over 65 years old in home	0.5
	Respondents (n)	**224**
Respondent Age	18-24	2%
	25-34	16%
	35-44	13%
	45-54	14%
	55-64	24%
	65 or older	31%
	Respondents (n)	**271**
Household Income	Less than $24,000	5%
	$24,000 to less than $50,000	29%
	$50,000 to less than $75,000	25%
	$75,000 to less than $100,000	22%
	$100,000 or greater	20%
	Respondents (n)	**215**
Respondent Gender	Male	62%
	Female	38%
	Respondents (n)	**270**

5.2 PROGRAM DESIGN

5.2.1 Motivations for Participation and Barriers to Implementation

While assessment participants surveyed were most commonly motivated by financial factors, a variety of non-financial factors also motivated their participation in the HomeCheck program. When asked why they decided to participate in the HomeCheck program, respondents most often mentioned the desire to save money on their energy bills (45 percent) and the financial incentive (29 percent). However, participants mentioned a variety of other factors that also motivated them to have a HomeCheck assessment conducted. About 18 percent were interested in improving the comfort of their home. Another 10 percent wanted to be more energy efficient, and 10 percent wanted to learn more about their home's performance. Energy experts also mentioned an increase in interest from customers moving into larger homes who wanted to better understand the larger utility bills they received. The

requirement for an assessment in order to receive insulation rebates also resulted in contractors referring customers to the HomeCheck program.

Table 5-5. Participant Reasons for Participating in HomeCheck

Category	Percent
Saving money on my energy bills	44.5%
The financial incentive or free equipment	29.3%
Improving the comfort of my home	17.6%
To be more energy efficient	10.3%
Curious about home's performance / general education	9.6%
To do something good for the environment	9.6%
To be eligible for the insulation rebates	5.9%
To improve our home or equipment	3.7%
Increasing the value of my home	3.3%
Moving into a new home or remodeling	3.3%
Someone I know had a positive experience with the program	2.6%
The program was recommended to me by a contractor	0.7%
Landlord recommendation	0.7%
The program was recommended to me by MidAmerican	0.7%
Other	9.9%
Respondents (n)	**272**

Source: Question PP1.
Don't know responses are excluded.
Multiple responses allowed.

Trade ally feedback supported general customer responses that costs were a key barrier to implementing energy saving actions. Trade allies include rebates when possible with project bids to minimize the upfront cost of the equipment or installation. Five of the interviewed trade allies reported that method helps about 90 percent of their customers choose energy efficient option and another three trade allies thought about half of their customers were motivated by the rebate information on bids.

5.2.2 Bonus Incentive Uptake

The HomeCheck program was designed to provide no-cost residential energy assessments, direct installation of low-cost efficiency measures, and efficiency improvement recommendations to eligible MidAmerican customers. One objective of assessment programs in general is to drive customers to make changes to save energy. In an effort to increase the number of customers following through with assessment recommendations, MidAmerican added to the 2014-2018 plan a $200 bonus rebate for HomeCheck participants who act on three or more energy efficiency improvements within 12 months of their assessment.

Marketing of the bonus rebate occurred at various touchpoints with customers. Energy experts mentioned the bonus at the time of the assessment when they communicated the opportunity to HomeCheck participants who had three or more recommendations, MidAmerican followed up about

twice a year with assessment participants to remind them of rebate opportunities, and a few trade allies that were aware of the bonus rebate mentioned it to customers. With the tracking system that has been in place in PY2016, there has been no automated way to follow up with HomeCheck participants. MidAmerican plans on exploring opportunities with their new tracking system for establishing an automatic process that considers recommendations to participants, schedules periodic reminders to complete projects, and sends bonus payments when three projects are completed.

The participant survey found that 37 percent of the HomeCheck participants were aware of the bonus rebate opportunity. In addition, the few participants who had taken advantage of the bonus rebate found it very easy to complete the required work, with a mean rating of 4.7 on a scale of 1 to 5 where 1 was ”very difficult” and 5 was ”very easy.” For those participants who were aware of the bonus, but had not yet received one, there was moderate likelihood of completing three improvements in 12 months to be eligible for the bonus, with a mean rating of 2.6 on a scale of 1 to 5 where 1 was ”not at all likely” and 5 was ”very likely.”

Energy expert feedback explained some of the low participant likelihood ratings. Although energy experts conducting the assessments were well-educated on the availability of the bonus rebate and shared the option with customers, they reported that not all customers they worked with were eligible for the bonus as there could be fewer than three improvements recommended. For those customers who received three or more recommendations, the energy experts would often prioritize recommendations to increase the likelihood the customer would work toward the bonus rebate. The number of participants who received a bonus has increased every year since it was launched. It started in 2014 with 106 bonuses paid, almost tripled in 2015 to 280, and continued to increase in 2016 with 373 bonuses paid.[22]

Trade ally feedback on the bonus rebate was mixed. At least half of the trade allies interviewed were aware of the bonus rebate, but only a couple felt that it was effective in motivating participants to act on assessment recommendations, partially due to the low number of recommendations provided as well as the cost barrier to some customers. MidAmerican continues to educate trade allies on the existence and purpose of the bonus so they can support the bonus communication from energy experts.

5.2.3 Financing

In PY2016, the program discontinued their financing incentive option due to the loss of the financial partner and low adoption. One of the researchable questions for this evaluation was assessing customer interest in financing options for energy efficiency improvements as well as financing approaches used by other utility programs. Both the participant survey and the nonparticipant survey included a series of questions to better understand how customers finance major improvement projects and the potential for financing options to help customers overcome first cost barriers.

Respondents who own their home said they used financing to a limited extent—of those who said they made a major home equipment purchase in the past five years (defined as over $2,000), 20 percent of participant survey respondents (n=119) took advantage of financing options. Most (69 percent) said they paid for the purchase out of their own account via cash, check, or debit card. Another 32 percent said they put the purchase on a credit card.[23]

We asked all home-owning respondents in both the participant and nonparticipant survey to indicate the extent to which four different financing options would affect their decisions, on a scale of 1 to 5,

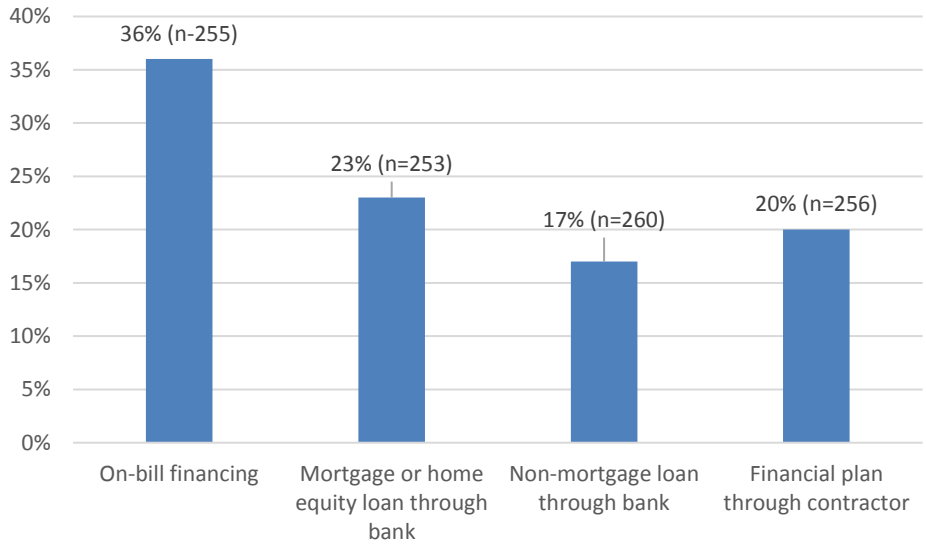
[22] Numbers reported are bonuses paid across territories.
[23] Respondents could have reported multiple methods of payment.

where 1 was “does not increase likelihood at all” and 5 was “increases likelihood a great deal.” Respondents rated the following four specific financing options:

- Mortgage or home equity loan through a bank or financial institution, specifically offered for qualifying energy efficiency upgrades
- On-bill financing
- Non-mortgage loan through a local bank or financial institution
- A payment plan or financing through the contractor.

The survey results indicated that there may be some limited opportunity to increase adoption of efficient equipment solely based on financing. On-bill financing generally elicited the greatest level of interest—36 percent of participants rated this option a 4 or 5. Non-mortgage loans and financing plans through a contractor generally received the lowest level of interest. For all financing options, over 35 percent of respondents said the availability of financing would not increase the likelihood of installing energy efficient equipment at all (gave a rating of 1).

Figure 5-1. Percentage of Homeowners Where Finance Option Would Increase Likelihood of Installing Energy Efficient Equipment (rated 4 or 5)



Source: Questions FN3A–FN3D; don’t know and refused responses are excluded.

Despite the relatively limited level of interest in financing shown in the customer survey results, several other utilities in nearby territories do continue to offer financing assistance as part of their residential portfolio. In Illinois, Alliant Energy offers a financing option through a third-party, similar to MidAmerican’s prior offering. In Illinois, on-bill financing is available to customers of Ameren, ComEd, Nicor, North Shore Gas, and Peoples Gas through the Energy Efficiency Loan Program. While these financing options are offered, the evaluation did not investigate the level of customer interest or uptake in these utility-sponsored financing options. Additionally, it is often the case that customers must choose between either the rebate or finance option[24]. While not specifically addressed in our research, residential customers tend to prefer rebates over financing.

[24] IPL’s program in Illinois requires that customers must choose between receiving the incentive or the low-interest loan.

5.2.4 Overlapping Measure Offerings

Many of the measures rebated through the HomeCheck program would have been eligible for the Residential Equipment program. As a result, there is considerable overlap across participating trade allies and target markets.

MidAmerican has established internal processes to manage how overlapping measures are tracked and reported. For example, any rebated measures identified through the HomeCheck program assessment are tracked under the HomeCheck program, even if they would also qualify under the Residential Equipment program. These processes ensure that projects are tracked consistently without duplication across programs. It is important to note that these processes were established after the 2014-2018 filing, and therefore were not considered in filed program-specific savings goals for PY2016.

Externally, MidAmerican's marketing materials and program website generally organize residential rebates by equipment or end-use category, opposed to internal program delineations. For example, central heating and cooling equipment rebates are presented under "Heating, Cooling, and Water Heating" rebates, while refrigerators and freezers are presented under "Appliance" rebates.

Across the PY2016 evaluations for the Residential Equipment, Residential HomeCheck, and Residential HVAC Tune-Up programs, we interviewed a number of contractors who completed projects through multiple different programs. None of the contractors we interviewed raised any concerns or confusion associated with measures that may qualify for multiple different programs.

5.2.5 Trade Ally Outreach and Support

MidAmerican communicates key program changes via annual trade ally meetings, the Trade Ally Central website, and email alerts. All contractors reported getting responses from MidAmerican or an implementer when they had specific questions.

> *"When I call they are great. Rep comes out once a year to talk one-on-one."*
>
> *"I have reached out when I come to a different conclusion from the auditor. They were reasonable, considered my change, they adjusted the audit findings and called me to let me know."*
>
> *"They are most responsive and easy to work with when I contact them. Very good on the phone."*

While communication methods are all leveraged by trade allies, seven of the 12 interviewed trade allies (two partners and fin non-partners) said they were not currently receiving as much program information as they would like. Many of them would like to receive more regular communication and more timely notification of program changes.

> *"I would like a walk-through of the new changes, someone to come out and sit down with me."*
>
> *"I usually receive the annual meeting notification but did not receive this year."*
>
> *"MidAmerican talks about the changes but they don't let you know when the changes actually take place. E-mail communication would be good trying to keep up."*
>
> *"I called MidAmerican weeks before the end of the year to get incentive levels to discuss with customers that would do project in 2017 and they did not know what the levels would be."*
>
> *"No one has contacted me and I have no contact person for MidAmerican."*

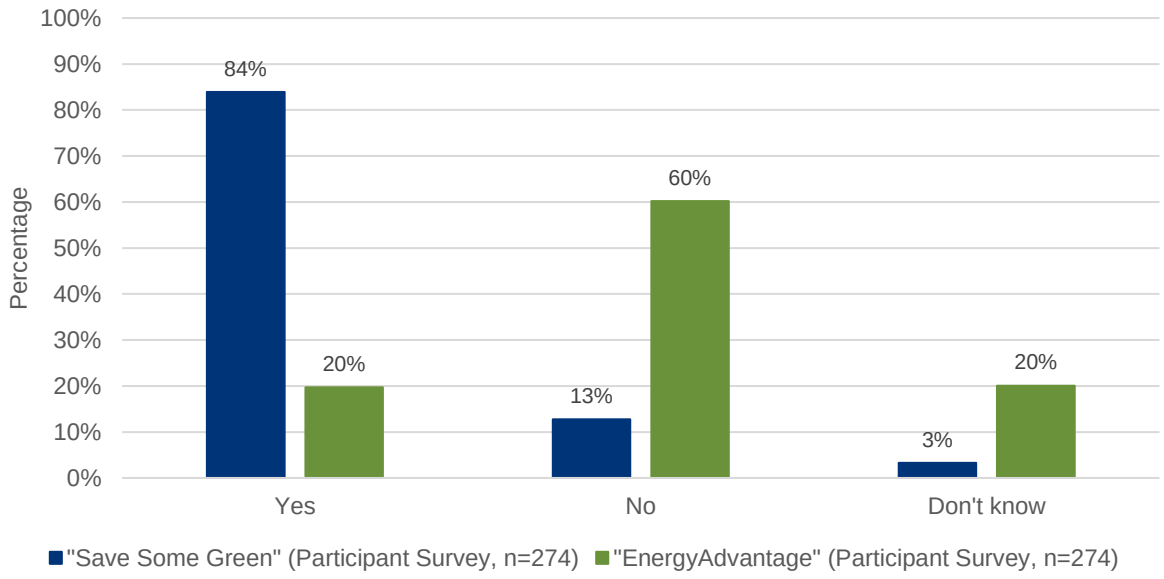
5.3 CUSTOMER EDUCATION, OUTREACH, AND MARKETING

5.3.1 Portfolio-level Marketing

The participant survey asked customers if they had seen MidAmerican's "Save Some Green" messaging. The vast majority of participants recognized "Save Some Green." Among those who were familiar with "Save Some Green," survey respondents most commonly reported seeing the messaging in a MidAmerican utility bill insert or mailing (78 percent), through radio or television advertisement (24 percent), as well as the MidAmerican website (12 percent), and newspaper advertising (9 percent).

In addition to "Save Some Green" messaging, the participant survey also asked customers if they had seen "EnergyAdvantage" messaging or materials. As shown in the figure below, far fewer participants were familiar with "EnergyAdvantage" materials, with only about one-fifth of respondents reporting they had seen the messaging. Among these respondents, respondents most commonly reported seeing the messaging in a MidAmerican utility bill insert or mailing (56 percent), followed by a retail store or contractor (17 percent), radio or television advertisement (10 percent), and the newspaper (9 percent).

Figure 5-2. Has Seen "Save Some Green" and/or "EnergyAdvantage" Messaging



Source: Questions P2, P4.

5.3.2 Program Marketing

MidAmerican has been responsible for marketing the program. A-TEC compiled the packets the energy experts left with the assessment participants and canvased areas with door hangers when they were in neighborhoods, but all materials were produced by MidAmerican. Trade allies were also a key driver of program referrals for customers interested in insulation projects.

Trade allies reported that many customers were aware of the availability of rebates in general, but felt the awareness of HomeCheck specifically could be higher. Energy experts reported mass media sources (e.g. newspaper, television, radio, billboards) were more effective in more densely populated areas and that door hangers seemed to spark immediate response.

Feedback from the participant survey shows that participants were most likely to learn about the program through word-of-mouth from family or friends, or a utility bill insert. Area trade allies were also communicating benefits of the program to customers, especially when an assessment was required for insulation rebates. In addition, landlords, home inspectors, realtors, and financial institutions increased awareness as customers moved and found new homes.

Table 5-6. Source of Program Awareness

Category	Percent
Friend/family member/other business	39.8%
MidAmerican utility bill insert	32.5%
Television	10.2%
Contractor	9.9%
MidAmerican website	9.1%
MidAmerican call center representative	5.8%
MidAmerican brochure	4.4%
Newspaper	2.6%
Retail store	0.7%
Billboard	0.7%
Radio	0.4%
Home show/conference/trade show	0.0%
Door hangers	0.0%
Other[25]	16.4%
Don't know	6.9%
Respondents (n)	**274**

Source: Question P1.
Refused responses are excluded.
Multiple responses allowed.

Trade allies used the program differently depending on the type of product they offered and where the customer was in their project process. The insulation contractors all referred customers to the HomeCheck program prior to providing insulation services to increase the opportunities for rebates. Trade allies working with customers after an assessment typically discussed assessment findings with them and included rebate information in their proposals. One trade ally makes it a point to include not only the rebate amounts, but also the added price for the SAVE testing. A couple of the trade allies knew that customers contacted them as a result of finding their company on the contractor list provided as part of the assessment information.

Trade allies felt that both customers and contractors could be better informed about the program. When asked if they used MidAmerican's Trade Ally Central, four of the 12 contractors could definitively say they were using the site. Another four thought they were but were less sure, and the rest were not.

[25] Included sources such as landlords, previous experience, realtor, financial institution, home inspector, mail and email, and energy audit (for those who also installed equipment).

Those trade allies who were using the website were not sure what was available on the site or what benefits it provided, other than getting them on the list of contractors that was distributed to customers.

5.3.3 Understanding of Assessment Benefits

As noted earlier, HomeCheck participants surveyed reported finding the assessments thorough and educational. The assessments have met various customer needs regarding how to save energy, make their homes more efficient and comfortable, reduce their energy bills, and understand how their homes use energy.

The HomeCheck participants surveyed reported high levels of influence from information provided by the energy expert who conducted their assessment, with an average influence rating of 4.5 on a scale of 1 to 5 where 1 was “not at all influential” and 5 was “very influential,” and 69 percent of participants reporting it was very influential in their decision to take further action.

Table 5-7. Influence of Information from Energy Expert

Rating Scale	Percent
1 Not at all influential	3.6%
2	1.2%
3	7.2%
4	19.3%
5 Very influential	68.7%
Respondents (n)	**83**
Mean Influence Rating	**4.5**

Source: Question A15.
Don't know and refused responses are excluded.

The free nature of the HomeCheck assessment and direct install measures were also important to participants. When asked if they would have participated in the program if the cost of the assessment had been $25.00, at least 30 percent reported they would have been unlikely to do so.

Table 5-8. Likelihood of Participating if Audit Cost was $25

Rating Scale	Percent
1 Not at all likely	17.9%
2	12.7%
3	26.5%
4	18.7%
5 Very likely	24.3%
Respondents (n)	**268**
Mean Influence Rating	**3.2**

Source: Question A18.
Don't know and refused responses are excluded.

5.4 PROGRAM ADMINISTRATION, PROCESSES, AND RESOURCES

5.4.1 Program Staff Roles and Internal Processes

The HomeCheck program has been administered through a team of MidAmerican and A-TEC implementation staff, including energy experts. Staff roles and responsibilities were clearly delineated and understood by all team members, and program and implementation staff report strong working relationships. In addition, program processes were clearly defined and documented in the program operations manual.

After the 2014-2018 program plan was filed, the program tracking procedures were changed to track all follow up participation after the HomeCheck within the HomeCheck program. A consideration for staff now is how long the follow up projects should be tracked within the HomeCheck program after a customer has an assessment. Program staff can monitor the typical span of time between the assessment and projects to determine how long activity persists from assessment recommendations to decide how long to track within the HomeCheck program.

5.4.2 Assessment Process

The primary responsibilities of the energy expert are to inspect the home for energy-saving opportunities and educate customers on what steps they can take to save energy. The table below provides the top 10 responses from participants about what they remember the energy expert doing during the assessment visit.

Table 5-9. Energy Expert Actions and Installations

Category	Percent
Inspected the home	80.1%
Received a power strip	67.3%
Installed LED bulbs	63.5%
Installed faucet aerators/ bath aerators	34.2%
Installed compact fluorescent lightbulbs (CFLs)	28.6%
Recommended insulation measures to install to save energy	22.9%
Installed low-flow showerhead	22.2%
Discussed ways to save energy in my home	12.8%
Provided a written report	7.9%
Recommended other equipment to install to save energy	6.4%
Respondents (n)	**266**

Source: Question A2, A3_1, A3_3, A4, A5, A19, A20.
Don't know and refused responses are excluded; Multiple responses allowed.

Feedback from participant survey respondents indicated that items that were directly installed by the energy experts tended to remain installed. In Illinois, all equipment that had been installed was reported as still installed. In addition, the assessments were successful in motivating customers to take energy efficient actions in their homes. Based on responses to the participant survey, the conversion rate was highest for some of the behavioral recommendations, as intended by the design of the program.

Lighting and HVAC system replacements were also common. Furthermore, there are still a number of participant who plan to act on assessment recommendations within the next year.

Table 5-10. Energy Expert Recommendations, Actions and Planned Actions

Action	Reported as Recommended	Percent Adopting Recommendation	Percent Planning to Adopt
Add insulation	223	41.3%	13.9%
Replace incandescent lights with CFLs or LEDs	81	72.8%	7.4%
Replace heating system	37	43.2%	21.6%
Replace air conditioning system	25	52.0%	28.0%
Replace windows	22	50.0%	27.3%
Perform air sealing (includes caulking, weather-stripping, duct sealing)	17	52.9%	17.6%
Change thermostat in winter/summer	12	33.3%	8.3%
Replace appliances and/or recycle appliances	11	36.4%	27.3%
Unplug items when not in use/Using power strips	11	63.6%	0.0%
Replace water heater	10	30.0%	30.0%
Add a programmable thermostat	9	66.7%	11.1%
Turn off lights when not in use	9	55.6%	0.0%
Reduce water heater temperature	2	100.0%	0.0%
Other[26]	12	33.3%	0.0%
Respondents (n)	**256**	**154**	**80**

Source: Question A7C01-A7C14, A8C01-A8C14, A9C01-A9C14.
Don't know responses are excluded; Multiple responses allowed.

5.4.3 Program Administrative Requirements

A key administrative requirement of the HomeCheck program was the assessment form. Energy experts reported that they appreciated the concise, two-page format of the current form, and that the form collects the most critical information, although most would like to have an electronic option. While energy experts reported the paper form is easy to use, it may take more than one try for an energy expert to get a correctly completed form that is readable for the customer. Electronic forms benefit from the ability to correct and print easy-to-read versions. Additionally, feedback from a few participants surveyed suggests that customers are beginning to request electronic versions of the form that are easier to read and store electronically for future reference.

[26] The "Other" category included responses such as cleaned furnace filter, measures were directly installed (unspecified), provided contractor lists, general tips, minor sealing suggestions, specific maintenance equipment recommendations.

Some of the mistakes made on assessment forms were caused by the varying layouts energy experts deal with when moving from one home to another served by different utilities. As opportunities allow for form revisions, MidAmerican could continue to collaborate with other utilities on form design.

Feedback from the insulation trade allies indicated that program requirements were not burdensome for them and the application forms were easy to complete. The only administrative suggestion offered by trade allies was to consider the option for the customer to sign over the rebate to the contractor; an option that has been available on the application since 2015. The trade allies believe that this option could increase the likelihood that contractors can sell jobs, as the customer then has to come up with less funds to cover the project. It also enables contractors to offer financing options if they know the rebate will come back to them to cover a portion of the cost.

5.4.4 SAVE Requirements

Only six of the trade allies interviewed conducted SAVE installations, as the others were insulation contractors or appliance vendors. Most of these trade allies interviewed supported the SAVE initiative and felt that it was improving installation quality in the state and contributed to customer peace-of-mind. They also felt that the requirements were clear and reasonable. However, at least three of the six found that entering the SAVE data into the system was confusing and difficult and that the paperwork, including the level of detail, was beginning to ask for more than what they believe necessary. One felt that this may cause contractors to provide inaccurate information just to get the forms completed.

MidAmerican has established rigorous QA/QC protocols for SAVE rebate applications. In addition to paper verification on a census of SAVE projects, A-TEC's policy in PY2016 was to conduct field verification on the first three applications for each participating trade ally (Tier 1), followed by 1 in 10 installations (Tier 2), then 1 in 30 installations (Tier 3). Program implementation staff noted that SAVE test scores have improved over time with additional contractor training and experience; however, the program's SAVE verification protocols are costly to implement. None of the participating SAVE contractors interviewed for the evaluation mentioned any concerns or complaints with the program's QA/QC requirements.

5.5 MARKET RESPONSE

At least seven of the interviewed contractors thought that MidAmerican residential energy efficiency programs were influencing the services they provide to customers by increasing customer awareness, incorporating rebates, and selling more energy efficient options.

> *"The program helped to sell more insulation".*
>
> *"Rebates are a big driver for customers".*
>
> *"The level of rebate effects sales and installations."*

Two interviewed trade allies felt the programs were creating a significant increase in the interest and demand for energy efficient equipment, and three others thought they were creating some interest, mostly due to increased customer awareness and their desire to save money. Just one of the six trade allies that had an opinion thought it was having no effect on customers.

Trade allies interviewed felt that it was fairly easy to sell the customers on energy efficient equipment once they explained the energy savings and the MidAmerican rebate. Although six of the trade allies did not see a change or could not explain the change in their business as a result of MidAmerican's

programs, other trade allies have seen a marked improvement in their sales and interest from customers, or experienced decreases as rebates have been discontinued.

> *"Increased quite a bit with the inclusion of insulation."*
>
> *"Rebates have helped with our sale of furnaces."*
>
> *"Sales are definitely up. It has helped with marketing."*
>
> *"Sales drastically down since they stopped providing incentives for dish washers."*
>
> *"When the rebates went down by 30 percent work has not been quite as active. Variable peak 2-stage furnaces increased a lot as a result."*

5.6 PROGRAM SATISFACTION

Respondents to the participant survey generally expressed high satisfaction with the program overall as well as individual aspects of their participation experience. More than 90 percent of respondents said they were either "extremely satisfied" or "very satisfied" with the program overall. Participants overwhelmingly characterized the assessments as "thorough," "professional," and "educational." Ninety-one percent of participants surveyed could think of no suggested improvements to the program. The few suggested improvements focused on providing a more detailed review and paperwork, the availability of window rebates, and more follow-up after the assessment.

Of the individual aspects of the program asked in the survey, on average participants reported the highest satisfaction ratings with the interaction with the energy expert. The amount of the program rebate, the length of time it took to receive their rebate (if applicable), and the information provided through the assessment all receive similar satisfaction ratings on average.

Table 5-11. Participant Satisfaction

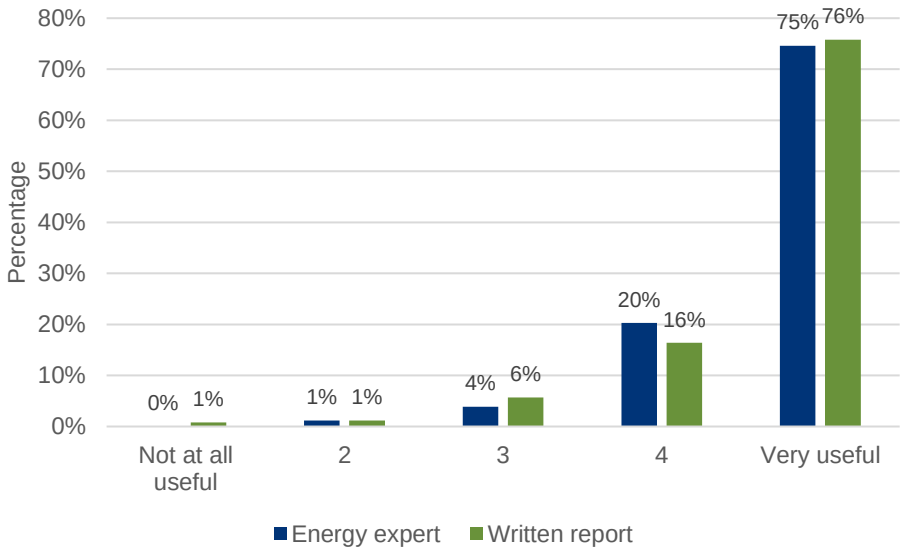
Program Aspect	Respondents (n)	Extremely Satisfied	Very Satisfied	Somewhat Satisfied	Not at All Satisfied
The program overall	**273**	46.2%	45.8%	7.7%	0.4%
The length of time it took to receive the rebate	**119**	36.1%	52.9%	9.2%	1.7%
Your interactions with the energy expert	**270**	43.0%	48.5%	7.8%	0.7%
The amount of the rebate received through the program	**122**	36.1%	54.9%	9.0%	0.0%
The information provided through the assessment	**272**	37.5%	53.7%	8.5%	0.4%

Source: Questions SAT1A—SAT1E, SAT4; don't know and refused responses are excluded.

Reinforcing the high satisfaction ratings, at least 75 percent of respondents reported having recommended the HomeCheck program to others. The overwhelming majority of participants who said they have not recommended the program to others explained that they simply have not had the opportunity or generally do not make recommendations relating to purchases of energy-using equipment.

HomeCheck participants were asked to rate the usefulness of the assessment information from the energy expert and the written report they received. As shown in the figure below, approximately 75 percent of participants found both forms of information to be very useful.

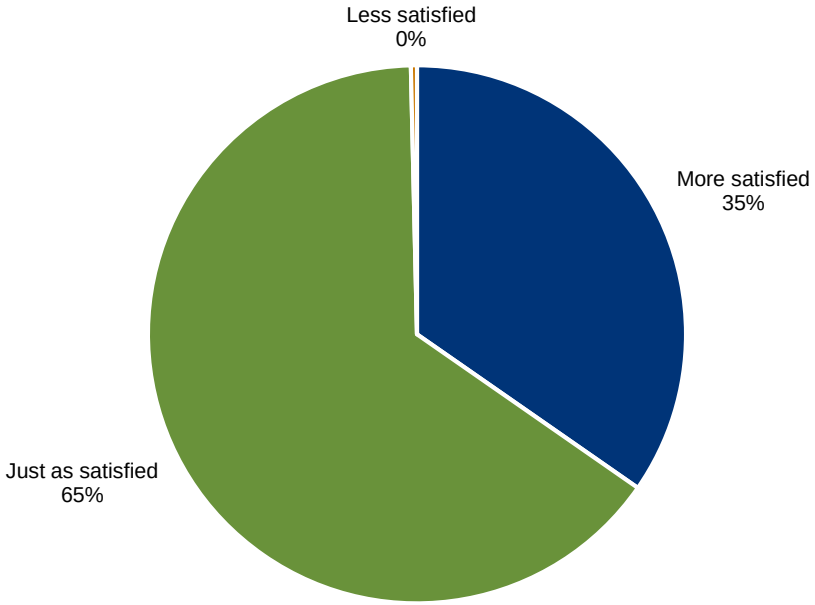
Figure 5-3. Usefulness of Assessment Information from Energy Expert and Written Report



Source: Question A13B; don't know and refused responses are excluded.

Over a third of participants surveyed (35 percent) said they were more satisfied with the quality of service provided by MidAmerican since their participation in the HomeCheck program, compared to less than one percent who were less satisfied. These results further reflect high program satisfaction.

Figure 5-4. Satisfaction with Service Provided By MidAmerican since Participation (n=274)



Source: Question SAT7.

The Tetra Tech team also asked energy experts and trade allies about their satisfaction with the program. Both were satisfied with the program processes. Energy experts felt that the leave-behind informational packets were some of the best they had seen and full of good information. Trade allies provided the following ratings:

- Technical support—seven of 10 rated this a 4 or 5 on a scale of 1 to 5 where 1 was ”not at all satisfied” and 5 was ”very satisfied”
- The program overall—eight of 12 rated this a 4 or 5 on a scale of 1 to 5 where 1 was ”not at all satisfied” and 5 was ”very satisfied”
- Program administrative requirements—eight of 12 rated this a 1 or 2 on a scale of 1 to 5 where 1 was “not at all difficult” and 5 was “very difficult,” although there was mention of extra application requirements.

Trade allies had a few more suggestions than customers did on program improvements. Three trade allies mentioned increasing rebates back to previous levels or revising rebates for insulation, a couple would like more information on or better communication of program changes, a couple thought the SAVE class costs were too high or testing requirements should be reduced, one thought the paperwork could be easier, and one felt there could be more marketing of the program.

6.0 KEY FINDINGS AND RECOMMENDATIONS

Overall, the program exceeded its savings goals for kWh savings, peak kW, natural gas savings, and peak natural gas savings for PY2016. The following table reflects the impact results of the HomeCheck program. The overall realization rates for Illinois were 100.0 percent for kWh, 100.0 percent for peak kW, 99.8 percent for natural gas therms savings, and 99.8 percent for natural gas peak therms. In this section we outline the key takeaways of the evaluation, and propose related recommendations.

Table 6-1. Illinois Savings Goals and Impacts for PY2016

Impact	Goal	Reported Gross Savings*	Evaluated Gross Savings	Evaluated Realization Rate*
kWh	459,453	794,905	794,905	100.0%
Peak kW	168	386	368	100.0%
Therms	96,096	162,372	162,107	99.8%
Peak Therms	1,071	2,016	2,012	99.8%

* Reported savings shown are from PY2016 tracking data received from MidAmerican on February 2, 2017.

**The realization rate is the ratio of evaluated gross savings to reported gross savings.

Based on the evaluation findings, the Tetra Tech team offers the recommendations for MidAmerican's consideration in Table 6-2.

Table 6-2. HomeCheck Program Recommendations

Program Recommendations
Recommendation #1: Review the hours of use assumptions and base case assumptions used in the measure sheet and consider including cooling benefit and heating penalty as part of the measure sheet algorithm.
Recommendation #2: Discuss with the IA TRM Advisory Group whether HDD60 is appropriate to use for homes that have need for additional insulation.
Recommendation #3: If MidAmerican plans to continue with the current HomeCheck program design, where a blower door test is not required for infiltration, MidAmerican should work with the IA TRM Advisory Group to determine the source of the IA TRM savings factors and whether or not they should be updated.
Recommendation #4: Consider consolidating the standard installation algorithm and quality installation algorithm into one and utilize a de-rate factor for base equipment, similar to the approach taken by the IA TRM.
Recommendation #5: Use cooling capacity for the portion of the algorithm that calculates cooling energy savings and heating capacity for the portion of the algorithm that calculates heating energy savings.
Recommendation #6: Specify the use of furnace output capacity in the furnace measure sheet algorithm, or modify the furnace measure sheet algorithm so that furnace input capacity is the correct input for the algorithm.
Recommendation #7: We recommend no changes to the current measure sheets for refrigerators, freezers, furnace fans, and thermostats.
Recommendation #8: Consider suggesting a revised Equivalent Full Load Hour heating value for the IA TRM high efficiency furnace measure, perhaps even based on actual furnace energy use data and furnace capacity data for Illinois.

Program Recommendations
Recommendation #9: Continue to look for opportunities to promote the HomeCheck program using new messages, the online assessment, trade allies, and the assessment implementer. In addition, keep trade allies updated on program opportunities and changes so they have the correct information to present to customers.
Recommendation #10: Continue to focus resources on follow up communication with HomeCheck participants, including tracking activity against recommendations and opportunities with the new tracking system to schedule and automate reminders.
Recommendation #11: Continue to provide high-quality on-site assessments for residential customers with the goal of transitioning to an electronic assessment form as this provides a more professional, readable, and storable form for customers. In addition, continue to investigate opportunities to standardize forms across utilities for a more consistent form that will help alleviate errors.

The following section represents the key takeaways from the evaluation and associated recommendations.

Finding #1: The CFL and LED direct install measure sheet savings appeared to be reasonable, though slightly higher per bulb than predicted by the IA TRM approach.

The measure sheets used what appears to be a reasonable 2.6 hours per day (949 hours per year) usage for CFLs and LEDs, whereas the IA TRM uses 894 hours per year based on an average, based on four Midwest metering studies. The IA TRM also appears to use a slightly lower base wattage assumption than the measure sheets for both CFLs and LEDs. The result is that CFL measure sheet savings were 9.8 percent higher than savings predicted by the IA TRM and LED measure sheet savings were 6.8 percent higher than savings predicted by the IA TRM. In addition, the IA TRM includes a cooling benefit and heating penalty as part of the algorithm and the measure sheet does not. The cooling and heating effects are based on REMRate modeling and efficiency levels of existing heating and cooling equipment, which the Tetra Tech team feels is a reasonable approach.

> *Recommendation #1: Review the hours of use assumptions and base case assumptions used in the measure sheet and consider including cooling benefit and heating penalty as part of the measure sheet algorithm.*

Finding #2: Attic insulation and wall insulation measure sheet algorithms do not account for the heat loss impact of structural framing.

Structural framing is a conduit for heat loss that should be taken into account when determining the savings associated with attic or wall insulation improvements. The IA TRM savings algorithm takes framing into account, but the measure sheet savings algorithm do not. In addition, savings factors are used in the measure sheet algorithms, but it was not clear what assumptions were used to develop those savings factors, though based on our industry knowledge they appear reasonable. The Tetra Tech team also noted that there was only a small difference between the CDD value used in the measure sheets and the IA TRM, but a large difference between the HDD value used in the measure sheets and the IA TRM (6,362 HDD and 5,052 HDD, respectively). This is because the measure sheets use a base 65 HDD and the IA TRM uses a base 60 HDD. We believe that although base 60 HDD may be appropriate for determining energy consumption for the general housing stock, base 65 HDD may provide a better estimate of energy consumption in poorly insulated houses that would be candidates for insulation improvements.

> *Recommendation #2: Discuss with the IA TRM Advisory Group whether HDD60 is appropriate to use for homes that have need for additional insulation.*

Finding #3: Infiltration reduction savings factors differed considerably between the measure sheet algorithm and the IA TRM non-blower door approach.

The measure sheet algorithm for infiltration reduction savings used a savings factor that was multiplied by square footage to determine electricity cooling and natural gas heating savings. The IA TRM recommends a blower door testing approach as the preferred approach, but does offer a second method that also uses savings factors (referred to as the Conservative Deemed Approach). The IA TRM savings factors for this method are significantly lower than the savings factors used in the measure sheets (0.05 kWh per square foot compared with 0.2017 kWh per square foot for cooling savings and 0.013 therms per square foot compared with 0.0531 therms per square foot for heating). The resulting savings were therefore much higher using the measure sheet algorithm.

> *Recommendation #3: If MidAmerican plans to continue with the current HomeCheck program design, where a blower door test is not required for infiltration, MidAmerican should work with the IA TRM Advisory Group to determine the source of the IA TRM savings factors and whether or not they should be updated.*

Finding #4: The measure sheets treated the residential HVAC mechanical equipment measures and their quality installation as two separate savings algorithms, which was a less accurate approach to calculating savings than combining the measures.

Efficient HVAC equipment and its quality installation has a combined effect—while the equipment itself is more efficient than the baseline, the quality installation improves the operation of that equipment. Thus, a more accurate representation of the entire system would be for the new high efficiency equipment to be installed and include a SAVE quality installation in order to achieve the equipment's nameplate efficiency. Absent quality installation, the measure would likely not achieve its nameplate efficiency. To account for this, the IA TRM provides de-rate factors for equipment that is installed using a standard installation whereas the measure sheet algorithms use a savings factor multiplied by capacity to determine quality installation savings and a separate algorithm to determine savings for the efficient equipment. While the Tetra Tech team finds the de-rate factors in the IA TRM to be reasonable, performing both a SAVE test-in and test-out for quality installation retrofits could inform more appropriate de-rate assumptions. Alternatively, a metering study could help inform the most appropriate de-rate assumptions for the baseline condition by measuring how existing systems are functioning as compared to their stated efficiencies. However, that metering study could be costly to complete and not offer information equal in value.

> *Recommendation #4: Consider consolidating the standard installation algorithm and quality installation algorithm into one and utilize a de-rate factor for base equipment, similar to the approach taken by the IA TRM.*

Finding #5: The current measure sheet algorithms for air-source heat pumps and ground source heat pumps incorrectly used cooling capacity to determine both cooling and heating.

Heat pump heating capacities are generally lower than their cooling capacities. In addition, air-source heat pumps in particular have substantially lower heating capacities at lower temperatures. Using heat pump cooling capacity in both the heating and cooling portion of the savings calculation tends to overstate heating-mode energy savings.

> *Recommendation #5: Use cooling capacity for the portion of the algorithm that calculates cooling energy savings and heating capacity for the portion of the algorithm that calculates heating energy savings.*

Finding #6: Reported furnace savings estimates used input capacities in the measure sheet algorithms rather than output capacities, resulting in savings being overstated.

The measure sheet algorithm for furnace energy savings included a calculation of furnace capacity divided by furnace AFUE. Although the measure sheet does not specify whether furnace input capacity or furnace output capacity should be used, the fact that AFUE is in the denominator of the algorithm indicates that the furnace output capacity would be the correct capacity to use. The lack of specification in the measure sheet may have caused confusion, as in almost all cases the input capacity was used in the savings calculation even though output capacity was listed on the application as the capacity of the furnace.

> *Recommendation #6: Specify the use of furnace output capacity in the furnace measure sheet algorithm, or modify the furnace measure sheet algorithm so that furnace input capacity is the correct input for the algorithm.*

Finding #7: Measure sheet savings approaches for furnace fans, thermostats, refrigerators, and freezers were reasonable.

The furnace fan measure sheet used a deemed savings value of 469 kWh. This is similar to the value used in the IA TRM for single family homes in Des Moines (553 kWh), and perhaps even slightly conservative. Thermostat savings appeared to be reasonable, but the measure sheet did not include documentation of assumptions beyond referencing the 2014-2023 Iowa Statewide Assessment of Energy Efficiency Potential. Refrigerator and freezer savings are to be determined from the ENERGY STAR database based on model number energy use in comparison to standard refrigerator energy use. The Tetra Tech team was able to replicate savings for all of these measures.

> *Recommendation #7: We recommend no changes to the current measure sheets for refrigerators, freezers, furnace fans, and thermostats.*

Finding #8: The IA TRM savings algorithms and input assumptions appear reasonable, with the exception of Equivalent Full Load Hours (EFLH) for furnaces.

The Equivalent Full Load Hours (EFLH) heating value listed in the IA TRM for the high efficiency furnaces is 612 EFLH, which seems unreasonably low. This estimate is considerably lower than EFLH assumptions referenced in TRMs in nearby territories with similar climates, include Illinois and Missouri. In addition, despite being a predominantly heating climate, the heating EFLH estimate is lower than the EFLH cooling value specified in the IA TRM for Des Moines (811 EFLH cooling). The Tetra Tech team reviewed the equivalent full load hour heating values specified for Rockford, IL in the IL TRM (1,969 EFLH heating), as well as the approach described for calculating this value. Based on these reviews and our own independent calculations, we determined that a more reasonable estimate for EFLH heating value for Des Moines may be 1,830 EFLH heating.

> *Recommendation #8: Consider suggesting a revised Equivalent Full Load Hour heating value for the IA TRM high efficiency furnace measure, perhaps even based on actual furnace energy use data and furnace capacity data for Iowa.*

Finding #9: Program marketing and outreach efforts have been successful in raising general customer awareness of MidAmerican rebates—word of mouth, bill inserts, and trade allies have been most successful in driving participation.

The vast majority of participants surveyed recognized MidAmerican's "Save Some Green" messaging (84 percent). MidAmerican utility bill inserts or mailings, the MidAmerican website, and radio or television advertisement were the most commonly mentioned sources of awareness of "Save Some Green" messages.

Most participating trade allies thought that customers were generally aware of the availability of MidAmerican rebates, although trade allies indicated customers were less knowledgeable about specifics on eligibility criteria or rebate amounts. This feedback underscores the importance of leveraging trade allies to help educate customers on program specifics.

Participants surveyed most commonly reported learning about the HomeCheck program through word of mouth (40 percent) or MidAmerican bill inserts (33 percent). Television ads and trade allies contributed another 10 percent each toawareness, mostly from insulation contractors. Although energy experts reported the door hangers they leave in neighborhoods create spikes in interest, participants did not specify them as a source of awareness, although they may be included in word of mouth as a neighbor would have received an assessment. In addition, energy experts indicate that mass media sources (e.g., newspaper, television, radio, billboards) have been effective in promoting the program in larger markets.

> *Recommendation #9: Continue to look for opportunities to promote the HomeCheck program using new messages, the online assessment, trade allies, and the assessment implementer. In addition, keep trade allies updated on program opportunities and changes so they have the correct information to present to customers.*

Finding #10: The on-site assessment, energy expert thoroughness, and bonus rebates are motivating participants to follow through with energy saving projects rebated by MidAmerican.

Participant feedback indicated that they felt the HomeCheck energy experts were professional, thorough, and provided valuable education on how their homes were performing. The goal after an assessment is to motivate customers to engage in energy efficient projects. To that end, the program provides two follow-up communications with participants as well as a $200 bonus rebate for those who upgrade three qualifying recommended items within 12 months of their assessment. Thirty-seven percent of HomeCheck participants were aware of the bonus rebate. While participants reported a modest likelihood (2.6 rating)[27] of completing three projects in 12 months to be eligible for bonus, energy experts report that is often due to the number of recommendations that would qualify for rebates, not a participant's unwillingness to take action. And those participants who have received the bonus found it easy to complete three projects in 12 months (4.7 average rating).[28]

> *Recommendation #10: Continue to focus resources on follow up communication with HomeCheck participants, including tracking activity against recommendations and opportunities with the new tracking system to schedule and automate reminders.*

Finding #11: There is high program satisfaction among participating customers and energy experts, although a few minor suggestions for improvements were shared by energy experts.

Participating surveyed customers generally expressed high satisfaction with the program overall as well as individual aspects of their participation experience. More than 90 percent of survey respondents said they were either "extremely satisfied" or "very satisfied" with the program overall. Seventy-five percent of participants found the information from both the energy expert and written reports to be very useful. Participants also characterized the assessment as thorough, professional, and educational. Reinforcing the high satisfaction ratings, at least 75 percent of all participant respondents reported having recommended the HomeCheck program to others.

Energy experts felt that the assessment leave-behind informational packets were some of the best they had seen and full of good information. Energy experts report that they appreciated the concise, two-

[27] Using a 1 to 5 scale where 1 was "not at all likely" and 5 was "very likely."
[28] Using a 1 to 5 scale where 1 was "very difficult" and 5 was "very easy."

page format of the current assessment form, and that the form collects the most critical information, although most would like to have an electronic option. While the paper form is easy to use, it differs significantly from forms the energy experts use for other utilities and it may take more than one try for an energy expert to get a correctly completed form that is readable for the customer. Electronic forms benefit from the ability to correct and print easy-to-read versions. Additionally, feedback from a few survey participants suggests that customers are beginning to request electronic versions of the form that are easier to read and store electronically for future reference.

> *Recommendation #11: Continue to provide high-quality on-site assessments for residential customers with the goal of transitioning to an electronic assessment form as this provides a more professional, readable, and storable form for customers. In addition, continue to investigate opportunities to standardize forms across utilities for a more consistent form that will help alleviate errors.*

APPENDIX A: PROJECT REVIEW RESULTS

As noted earlier, the PY2016 HomeCheck program impact evaluation efforts included an engineering analysis for a sample of 17 participating Illinois projects. The Tetra Tech team made no adjustments to calculated savings for electric projects, but it was necessary to adjust natural gas savings for furnace quality installation projects because of an error involving use of the incorrect capacity in the measure sheet algorithm. The Tetra Tech evaluation team made savings adjustments to one electricity savings projects and three natural gas savings projects. The table below provides project level realization rates for the three HomeCheck projects where adjustments were made. A detailed description of the adjustments follow the table.

Table A-1. Project Level Reported and Evaluated Gross Energy Savings

Project ID	Electric Savings (kWh)		Demand Savings (Peak kW)		Gas Savings (Therms)		Gas Savings (Peak Therms)		Realization Rate			
	Reported	Evaluated	Reported	Evaluated	Reported	Evaluated	Reported	Evaluated	kWh	kW	Therms	Peak Therms
Illinois Projects												
5001A	-	-	-	-	116.43	115.77	1.51	1.50	-	-	0.994	0.993
5001B	-	-	-	-	35.53	35.33	0.462	0.459	-	-	0.994	0.994
5002A	-	-	-	-	111.72	110.74	1.4527	1.44	-	-	0.991	0.991
5002B	-	-	-	-	32.298	32.016	0.42	0.416	-	-	0.991	0.990
5003A	-	-	-	-	111.72	110.74	1.4527	1.44	-	-	0.991	0.991
5003B	-	-	-	-	32.298	32.016	0.42	0.416	-	-	0.991	0.990

Details of the project-based savings adjustments are provided below by Project ID:

- **Project ID 5001-5003:** The evaluation identified that furnace input capacity was incorrectly used instead of output capacity in the measure sheet algorithm, causing savings for the furnace replacement (A), and quality installation (B) to be somewhat overstated.

APPENDIX B: PARTICIPANT SURVEY

NOTE:

- Variable names are in bold type, all caps, and are in the same order as the dataset. Variables that are not in bold type indicate questions that were dropped from the dataset, but included in the survey.
- Questions were asked of all respondents unless indicated otherwise.
- A code of (-1) means that the question wasn't asked because the respondent stopped the survey before completion.
- A code of (-4) means the question wasn't asked due to an interviewer mistake.
- A code of (-6) means programmed skip (i.e., a skip that was purposely programmed based on skip patterns).
- A code of (-7) means not applicable.
- A code of (-8) means don't know.
- A code of (-9) means refused.

SURVEY FILES

Data file: MidAmerican Res Assessment - Final Data—20Mar2017.sav

SAMPLE VARIABLES

CASEID Unique case identifier

TERRITORY Territory where measure was implemented
1 Illinois
2 Illinois

PROGRAM HomeCheck® program

MEAS_SUM Number of measures

DATE Date of participation

REBATE Received a rebate through the program.
0 Did not receive rebate (either direct install or assessment only)
1 Received rebate

REBAMT Rebate dollar amount per measure

QTY Quantity of sampled measure installed

BENDESC Description of benefit

1 a rebate for SAVE, which was a quality installation of your *[EE_MEAS]*, that you received an additional rebate for
2 an assessment and no-cost/ low-cost energy-saving equipment
3 an assessment and a rebate for *[EE_MEAS]*
4 an assessment

AUDIT Audit received

0 No audit
1 Audit

EE_TYP Equipment description

1 Purchased and installed
2 Received

MEASURE_TYPE Generic product description

0 Direct Install
2 Central Air Conditioner
3 Clothes Washer
4 Dishwasher
5 Freezer
6 Furnace
7 Furnace Fan
9 Heat Pump
10 Refrigerator
11 Room Air Conditioner
12 Thermostat
13 Water Heater
14 Insulation

MEASURE Sampled survey measure

EE_MEAS Specific high efficiency equipment implemented or service performed.

DI_EQUIP Flag indicating if case had DI measures

0 Did not have DI measures
1 Did have DI measures

DI_LIGHT Sampled Direct Install Lighting measure—CFL or LED

0 None
1 CFL
2 LED

SAVE Participated in the SAVE program option

0 None
1 SAVE installation included

EQUIPMENT Received equipment

0 No equipment received
1 Equipment received

SERVICE Received service (tune-up, duct sealing)
0 Did not receive service
1 Service received

CFL_FLG Had CFLs installed
0 Did not have CFLs installed
1 Had CFLs installed

LED_FLG Had LEDs installed
0 Did not have LEDs installed
1 Had LEDs installed

INSULATION Had insulation installed
0 None
1 Rebated for insulation (w/o pipe or blanket)
2 Rebated for insulation (including pipe or blanket)

REFRIG_FZR Had refrigerator or freezer installed
0 None
1 Rebated for refrigerator/freezer

CAC Had central air conditioning installed
0 None
1 Rebated for central air conditioning

HEATPUMP Had heat pump installed
0 None
1 Rebated for heat pump

FURNACE Had furnace installed
0 None
1 Rebated for furnace

THERM Had thermostat installed
0 None
1 Rebated for thermostat

SIDEWALL Had sidewall insulation installed
0 None
1 Rebated for sidewall insulation

ATTIC Had attic insulation installed
0 None
1 Rebated for attic insulation

OUT_AIR_SEAL Had outside air sealing installed
0 None
1 Rebated for air sealing

OTHERINS Had other insulation installed
0 None
1 Rebated for other insulation

BONUS Received a bonus rebate for multiple equipment installed
0 No Bonus listed
1 Received Bonus rebate

ADDRESS Address where measure implemented

CONTACT Contact listed in participant files

BILL_ACCOUNT Billing account number

UPREMISE_ID Utility premise identification number

EXTPROJECTID Project identification number

INTRODUCTION

INTRO *[INTERVIEWER INSTRUCTION:* Please dial the phone number *[TELEPHONE]* and enter the call result.*]*

1	Connected	[PROCEED]
2	Did not connect	[DISPO CASE OUT]

INT01 Hello, my name is _____ calling from Tetra Tech on behalf of MidAmerican Energy. We are conducting a study about MidAmerican's *[PROGRAM]*. This is not a sales call, and responses will be used to inform MidAmerican about your experience with the program.

Our records show that your household received a rebate for purchasing *[EE_MEAS]* through MidAmerican's *[PROGRAM]*. May I speak to the person in your household that is most familiar with your participation in the program?

1	Yes	
2	No, R not knowledgeable	[SKIP TO SCREEN1]
3	No, R is not currently available	[SCHEDULE CALLBACK]
4	Did not connect	[DISPO CASE OUT]

PREAMBLE I'm with Tetra Tech, an independent research firm. I am calling to learn about your experiences with MidAmerican's *[PROGRAM]*.

I'm not selling anything; I'd just like to ask your opinion about this program. Let me assure you that your responses will be kept confidential and your individual responses will not be revealed to anyone unless you grant permission.

This survey will only take about 20 minutes of your time. Before we start, I would like to inform you that for quality control purposes, this call will be recorded and monitored.

1	Continue	*[SKIP TO CELL1]*

FAQ *[THE FOLLOWING IS AVAILABLE ONLY IF NEEDED:*

Who is doing this study: MidAmerican Energy has hired our firm to evaluate this program. As part of the evaluation, we're talking with customers that participated in the program to understand their experiences with the program.

Why are you conducting this study: Studies like this help MidAmerican Energy better understand customers' need for energy efficiency programs and services.

Timing: This survey should only take about 20 minutes of your time. Is this a good time for us to speak with you? *[IF NOT, SET UP CALLBACK APPOINTMENT OR OFFER TO LET THEM CALL US BACK AT 1-800-454-5070.]*

Sales concern: I am not selling anything; we would simply like to learn about your experience with the program. Your responses will be kept confidential and not revealed to anyone unless you grant permission. If you would like to talk with someone from MidAmerican Energy about this study, feel free to call MidAmerican Energy's call center at (888) 427-5632.*]*

SCREEN1 Is there someone else in your household that is knowledgeable about your household's participation in the *[PROGRAM]*?

1	Yes, there's somebody else	
2	No	[THANK & TERMINATE]
-6	Programmed skip	
-8	Don't know	[THANK & TERMINATE]
-9	Refused / Prefer not to answer	[THANK & TERMINATE]

SCREEN2 May I please speak with that person?

1	Yes	[RETURN TO INT01]
2	Yes, but R is not currently available	[SCHEDULE CALLBACK]
3	No	[THANK AND TERMINATE]
-6	Programmed skip	
-9	Refused	[THANK AND TERMINATE]

PHONE SCREENING QUESTIONS

CELL1 Are you currently talking to me on a regular landline phone or a cell phone? *[CHECK ONE]*

1 Landline phone
2 Cell phone
-8 Don't know
-9 Refused

CELL2 *[SKIP IF CELL1 = 1]* Are you currently driving a motorized vehicle? *[CHECK ONE]*

1 Yes [SCHEDULE CALLBACK]
2 No
-6 Programmed skip
-8 Don't know [SCHEDULE CALLBACK]
-9 Refused *[SCHEDULE CALLBACK]*

I3 First, I'd like to ask you a few questions about your household.

Are you, or is anyone in your household, a current or former employee of MidAmerican? *[CHECK ONE]*

1 Yes [THANK & TERMINATE]
2 No
-8 Don't know [THANK & TERMINATE]
-9 Refused *[THANK & TERMINATE]*

I4 Are you over 18 years old? *[CHECK ONE]*

1 Yes [Continue]
2 No [Schedule call back with other knowledgeable person]
-9 Refused *[THANK & TERMINATE]*

D2 Do you own your home or are you renting? *[CHECK ONE]*

1 Own/ buying
2 Rent
-8 Don't know
-9 Refused

6.1.1 **AWARENESS SOURCE**

[ASK OF ALL]

P2 MidAmerican Energy offers rebates and services to customers to help them save energy. You may have seen MidAmerican's "Save Some Green" messages. Before today, had you heard or seen these messages? *[CHECK ONE]*

1	Yes	
2	No	[SKIP TO P4]
-8	Don't know	[SKIP TO P4]
-9	Refused	[SKIP *TO P4]*

P3 Please tell where you have noticed information about Save Some Green.

[DO NOT READ LIST; CHECK ALL THAT APPLY]

For P3C01 through P3C99

0	Not mentioned
1	Mentioned
-6	Programmed skip

P3C01 MidAmerican utility bill insert or other mailing

P3C02 MidAmerican website

P3C03 Retail store or contractor

P3C04 Radio or television advertisement

P3C05 Billboard

P3C06 Signage at local event such as school or sporting event

P3C07 Anywhere else? *[SPECIFY]*

P3C88 Don't know

P3C99 Refused

P3C07O *[ASK IF P3C07=1]* Other place where noticed information about Save Some Green.

P4 Have you seen any energy efficiency materials or messaging that included "EnergyAdvantage?" *[CHECK ONE]*

1	Yes	
2	No	[SKIP TO P1]
-8	Don't know	[SKIP TO P1]
-9	Refused	[SKIP *TO P1]*

P5 Please tell where you have noticed the "EnergyAdvantage" materials or messaging. *[DO NOT READ LIST; CHECK ALL THAT APPLY]*

For P5C01 through P5C99

0	Not mentioned
1	Mentioned
-6	Programmed skip

P5C01 MidAmerican utility bill insert or other mailing

P5C02 MidAmerican website

P5C03 Retail store or contractor

P5C04 Radio or television advertisement

P5C05 Billboard

P5C06 Signage at local event such as school or sporting event

P5C07 Anywhere else? *[SPECIFY]*

P5C88 Don't know

P5C99 Refused

P5C07O *[ASK IF P5C07=1]* Other place noticed "EnergyAdvantage" materials or messaging.

Now I would like to ask you about your experience with the *[PROGRAM]*.

P1 How did you learn about the *[PROGRAM]*?

[DO NOT READ; CHECK ALL THAT APPLY]

For P1C01 through P1C99
0 Not mentioned
1 Mentioned

P1C01 MidAmerican utility bill insert

P1C02 MidAmerican website

P1C03 MidAmerican brochure

P1C04 MidAmerican call center representative

P1C05 Retail store

P1C06 Contractor

P1C07 Home show/conference/trade show

P1C08 Newspaper

P1C09 Radio

P1C10 Television

P1C11 Billboard

P1C12 Friend/family member/other business

P1C13 Door hangers

P1C14 Other *[SPECIFY]*

P1C88 Don't know

P1C99 Refused

P1C14O *[ASK IF P1C14=1]* Other way learned about the program.

PROCESS QUESTIONS

[ASK OF ALL]

A2 What did the program representative, also called an energy expert, do while at your home? [DO NOT READ; RECORD ALL THAT APPLY]

For A2C01 through A2C88
0 Not mentioned
1 Mentioned

A2C01 Installed equipment (in general/ can't remember all that was installed)

A2C02 Installed compact fluorescent lightbulbs (CFLs)

A2C03 Installed LED bulbs

A2C04 Installed water heater wrap / blanket

A2C05 Installed low-flow showerhead

A2C06 Installed faucet aerators/ bath aerators

A2C07 Installed a programmable thermostat

A2C08 Installed a power strip

A2C09 Discussed ways to save energy in my home

A2C10 Provided a written report

A2C11 Recommended insulation measures to install to save energy

A2C12 Recommended other equipment to install to save energy

A2C13 Inspected the home

A2C14 Installed pipe wrap

A2C15 Other *[SPECIFY]*

A2C16 Performed tests *[ADDED 2/24]*

A2C17 Performed air sealing (includes caulking, weather-stripping, duct sealing) *[ADDED 2/24]*

A2C88 Don't know

A2C15O *[ASK IF A2C15=1]* Other thing energy expert did while at home.

A6_INT Next, I would like to understand what the energy expert discussed with you during the visit.

A6_1 *[ASK IF A2C09<>1]* Did the energy expert discuss with you ways you could save energy in your home?

1 Yes
2 No
-6 Programmed skip
-8 Don't know

A6_2 *[ASK IF A2C10<>1]* Did the energy expert provide a written report documenting recommendations for energy saving improvements?

1 Yes
2 No
-6 Programmed skip
-8 Don't know

A7 *[ASK IF A6_1=1 OR A6_2=1 OR A2C09=1 OR A2C10=1]* Specifically, what recommendations did the energy expert provide during the visit, either through the walk-through assessment or written report? *[DO NOT READ; RECORD ALL THAT APPLY]*

For A7C01 through A7C88
0 Not mentioned
1 Mentioned
-6 Programmed skip

A7C01 Change thermostat in winter/summer

A7C02 Use drapes or shades to stay cool in summer/warm in winter

A7C03 Close off rooms when not in use

A7C04 Turn off lights when not in use

A7C05 Clean furnace filter regularly

A7C06 Replace incandescent lights with CFLs or LEDs

A7C07 Replace heating system

A7C08 Replace air conditioning system

A7C09 Replace water heater

A7C10 Add insulation

A7C11 Replace windows

A7C12 Nothing

A7C13 Other *[SPECIFY]*

A7C14 Perform air sealing (includes caulking, weather-stripping, duct sealing) *[ADDED 2/24]*

A7C88 Don't know

A7C13O *[ASK IF A7C13=1]* Other recommendation made by energy expert during the visit.

NUM_REC *[COMPUTE SUM A7 (1 TO 11, 13, 14)—IF A7C12=1 OR A7C88=1, NUM_REC=0]*

[ASK A8 THROUGH A10 IF NUM_REC >1, ELSE SKIP TO A11]

A8 *[ASK IF NUM_REC >1]* Which of these recommendations have you adopted since the visit? *[DO NOT READ; RECORD ALL THAT APPLY]*

For A8C01 through A8C88
0 Not mentioned
1 Mentioned
-4 Interviewer mistake
-6 Programmed skip

A8C01 Change thermostat in winter/summer

A8C02 Use drapes or shades to stay cool in summer/warm in winter

A8C03 Close off rooms when not in use

A8C04 Turn off lights when not in use

A8C05 Clean furnace filter regularly

A8C06 Replace incandescent lights with CFLs or LEDs

A8C07 Replace heating system

A8C08 Replace air conditioning system

A8C09 Replace water heater

A8C10 Add insulation

A8C11 Replace windows

A8C12 None

A8C13 Other *[SPECIFY]*

A8C14 Perform air sealing (includes caulking, weather-stripping, duct sealing, etc.) *[ADDED 2/24]*

A8C 88 Don't know

A8C13O *[ASK IF A8C13=1]* Other recommendation adopted since visit.

NUM_IMP *[COMPUTE SUM A8 (1 TO 11, 13, 14)—IF A8C12=1 OR A8C88=1 NUM_IMP=0]*

A9 *[ASK IF (NUM_REC >NUM_IMP) ELSE SKIP TO A13]* Which recommendations do you think you will adopt in the next year? *[DO NOT READ; RECORD ALL THAT APPLY]*

For A9C01 through A9C88
0 Not mentioned
1 Mentioned
-4 Interviewer mistake
-6 Programmed skip

A9C01 Change thermostat in winter/summer

A9C02 Use drapes or shades to stay cool in summer/warm in winter

A9C03 Close off rooms when not in use

A9C04 Turn off lights when not in use

A9C05 Clean furnace filter regularly

A9C06 Replace incandescent lights with CFLs or LEDs

A9C07 Replace heating system

A9C08 Replace air conditioning system

A9C09 Replace water heater

A9C10 Add insulation

A9C11 Replace windows

A9C12 None

A9C13 Other *[SPECIFY]*

A9C14 Perform air sealing (includes caulking, weather-stripping, duct sealing, etc.) *[ADDED 2/24]*

A9C88 Don't know

A9C13O *[ASK IF A9C13=1]* Other recommendations plan to adopt in the next year.

NUM_FUTURE *[COMPUTE SUM A9 (1 TO 11, 13)—IF A9C12=1 OR A9C88=1, NUM_FUTURE=0]*

A10O *[ASK IF NUM_REC> (NUM_IMP+NUM_FUTURE)]* Why don't you think you'll adopt *[IF A9=12 AND A8=12:* "any of the"; *IF A9<>12 or A8<>12:* "some of the"*]* recommendations?

[RECORD VERBATIM]

[ASK A11 THROUGH A12_2 IF NUM_REC=1, ELSE SKIP TO A13]

A11 *[ASK IF NUM_REC=1]* Have you adopted this recommendation since the visit?

1 Yes
2 No
-6 Programmed skip
-8 Don't know

A12_1 *[ASK IF NUM_REC=1 AND A11=2 OR -8]* Do you plan to adopt this recommendation in the next year?

1 Yes
2 No
-6 Programmed skip
-8 Don't know

A12_2O *[ASK IF A12_1=2]* Why don't you think you will adopt this recommendation?

[RECORD VERBATIM]

A13 *[ASK IF (A6_1=1 OR A2C09=1) OR (A6_2=1 OR A2C10=1)]* Using a 1 to 5 scale, where 1 is "not at all useful" and 5 is "very useful," how useful did you find…

For A13A through A13B

_____ *[RECORD USEFULNESS RATING (1-5)]*
-6 Programmed skip
-8 Don't know
-9 Refused

A13A *[ASK IF A6_1=1 or A2C09=1]* The type of information provided by the energy expert during the visit?

A13B *[ASK IF A6_2=1 or A2C10=1]* The type of information provided in the written report?

A15 *[ASK IF ANY INDICATED IN A9 (NUM_FUTURE>=1) OR A12_1=1]* Using a 1 to 5 scale, where 1 is "not at all influential" and 5 is "very influential," how influential will the information provided by the energy expert be in your decision to make any of the future changes we discussed?

_____ *[RECORD INFLUENCE RATING (1-5)]*
-6 Programmed skip
-8 Don't know
-9 Refused

A16O *[ASK IF (A6_1=1 OR A2C09=1) OR (A6_2=1 OR A2C10=1)]* What did you like best about the information provided through the in-person visit and/or written report?

[RECORD VERBATIM]

A17O *[ASK IF (A6_1=1 OR A2C09=1) OR (A6_2=1 OR A2C10=1)]* How could the information provided through the in-person visit or written report be improved?

[RECORD VERBATIM]

A18 On a scale of 1 to 5, with 1 being "not at all likely" and 5 being "very likely," how likely is it that you would have participated in the *[PROGRAM]* if the in-home energy audit cost was $25? *[PROBE IF NEEDED:* instead of it being free*]*

_____ *[RECORD LIKELIHOOD RATING (1-5)]*
-8 Don't know
-9 Refused

PROCESS FOR DIRECT INSTALL MEASURES

[ASK OF ALL WITH A DIRECT INSTALL MEASURE (DI_EQUIP=1)]

[SAMPLE ONE DI LIGHTING MEASURE—DI_LIGHT=CFL OR LED (SKIP TO A4 IF DI_LIGHT=0)]

A3_1 *[ASK IF A2C02<>1 AND DI_LIGHT=1 - CFL]* Did the energy expert install or provide you with compact fluorescent lights, or CFLs?

1 Yes
2 No [SKIP TO A4]
-6 Programmed skip
-8 Don't know *[SKIP TO A4]*

A3_2 *[(IF A3_1=1 OR A2C02=1) AND DI_LIGHT=1 - CFL]* How many CFLs were received or installed through the program?

____ *[RECORD NUMBER OF CFLs]*
-6 Programmed skip
-8 Don't know

A3_3 *[ASK IF A2C03<>1 AND DI_LIGHT= 2 - LED]* Did the energy expert install or provide you with LED bulbs?

1 Yes
2 No [SKIP TO A4]
-6 Programmed skip
-8 Don't know *[SKIP TO A4]*

A3_4 *[ASK IF (A3_3=1 OR A2C03=1) AND DI_LIGHT = 2 - LED]* How many LEDs were received or installed through the program?

____ *[RECORD NUMBER OF LEDs]*
-6 Programmed skip
-8 Don't know

L2 Did you install the *[DI_LIGHT]*(s) yourself, did the energy expert install them, or did someone else install the *[DI_LIGHT]*(s) in your home?

1	Installed themselves	
2	Energy expert installed	
3	Someone else installed the [DI_LIGHT](s) [SPECIFY: Who installed them?]	
4	Combination of self-install someone else [SPECIFY: Who installed them?]	
5	Did not receive [DI_LIGHT](s)	[SKIP TO A4]
6	None of the [DI_LIGHT](s) are installed	[SKIP TO C_A3_DK_SKIP]
7	Other [SPECIFY]	
-6	Programmed skip	
-8	Don't know	

L20304O *[ASK IF L2=3 OR L2=4]* Other person who installed lights.

L2O *[ASK IF L2=7]* Other description of who installed lights.

L3 How many of the *[IF DI_LIGHT=1 - CFL, SHOW: A3_2; IF DI_LIGHT=2 - LED, SHOW: A3_4, IF A3_2 OR A3_4= -8, LEAVE BLANK] [DI_LIGHT]*(s) you received through the program are currently installed inside or outside of your home?

_____	*[RECORD NUMBER OF [DI_LIGHT](s) INSTALLED]*
-6	Programmed skip
-8	Don't know

L4 How many of the *[IF DI_LIGHT=1 - CFL, SHOW: A3_2; IF DI_LIGHT=2 - LED, SHOW: A3_4, IF A3_2 OR A3_4= -8, LEAVE BLANK] [DI_LIGHT]*(s) you received through the program are currently being stored at your home?

_____	*[RECORD NUMBER OF [DI_LIGHT](s) STORED]*
-6	Programmed skip
-8	Don't know

C_A3_DK_SKIP *[SKIP TO L8 IF A3_2 OR A3_4 = -8]*

C_L2_C6_SKIP *[SKIP TO L5b IF L2=6]*

L5A *[ASK IF (L3 AND L4<> -8) AND (L3+L4)<>(A3_2 OR A3_4)]* You mentioned that *[L3]* of the *[DI_LIGHT]*(s) you received through the program are currently installed, and *[L4]* are currently being stored. What did you do with the other *[A3_2/A3_4—(L3+L4)] [DI_LIGHT]*(s) you received through the program?

[RECORD QUANTITY OF [DI_LIGHT](s) *FOR EACH RESPONSE]*

For L5AA through L5AJ

_____ *[RECORD NUMBER OF BULBS]*
-4 Interviewer mistake
-6 Programmed skip
-8 Don't know

L5AA They burned out

L5AB Using them in another home

L5AC Storing them in another home

L5AD Storing them in office/work/other nonresidential location

L5AE Gave them away

L5AF Misplaced them

L5AG They broke

L5AH Returned them to the store

L5AI Installed them but later removed

L5AJ Other *[SPECIFY]*

L5AJO *[ASK IF L5AJ>0]* Other thing that was done with the other *[DI_LIGHT]*(s) that were received through the program.

[SKIP TO L6]

L5B *[ASK IF L3 OR L2 = -8 OR L2=6]* What did you do with the *[QTY] [DI_LIGHT]*(s) you received through the program?

[ALLOW RESPONDENT TO ANSWER; THEN PROBE FOR AMOUNT; ENTER "0" FOR CATEGORIES NOT MENTIONED]

For L5BA through L5BJ

_____ *[RECORD NUMBER OF [DI_LIGHT]*(s)*]*
-6 Programmed skip
-8 Don't know

L5BA They burned out

L5BK *[HIDE IF L2=6]* Installed them in home

L5BB Using them in another home

L5BC Storing them in another home

L5BD Storing them in office/work/other nonresidential location

L5BE Gave them away

L5BF Misplaced them

L5BG They broke

L5BH Returned them to the store

L5BI Installed them but later removed

L5BJ Other *[SPECIFY]*

L5BJO *[ASK IF L5BJ>0]* Other thing that was done with the other *[DI_LIGHT]*(s) that were received through the program.

L6 *[ASK IF L5AI OR L5BI <> 0, -8]* You said *[L5AI/L5BI] [DI_LIGHT]*(s) were installed but have since been removed. Why were the bulbs removed?

[DO NOT READ LIST, RECORD ALL THAT APPLY]

For L6C01 through L6C011
0 Not mentioned
1 Mentioned
-6 Programmed skip

L6C01 Didn't like the color

L6C02 It took too long to start up

L6C03 It wasn't bright enough

L6C04 Didn't like the way it looked

L6C05 It didn't fit

L6C06 It made noise / buzzed

L6C07 It didn't work in a dimmer switch

L6C08 It wasn't available in 3-way

L6C09 Other *[SPECIFY]*

L6C88 Don’t know

L6C99 Refused

L6C09O *[ASK IF L6C09=1]* Other reason bulbs were removed.

L8 Did the *[DI_LIGHT]*(s) you installed replace existing bulbs? *[CHECK ONE]*

1 Yes, all
2 Yes, some
3 No, none [SKIP TO A4]
-6 Programmed skip
-8 Don’t know *[SKIP TO A4]*

L9 *[ASK IF L8=1 OR 2]* What type of bulb did the *[DI_LIGHT]*(s) replace? *[CHECK ALL THAT APPLY]*

For L9C01 through L9C88

0 Not mentioned
1 Mentioned
-6 Programmed skip

L9C01 Incandescent bulb

L9C02 CFL bulb

L9C03 LED bulb

L9C04 Halogen bulb

L9C05 Other *[SPECIFY]*

L9C88 Don't know

L9C05O *[ASK IF L9C05=1]* Other type of bulb that the *[DI_LIGHT]*(s) replaced.

A4 *[ASK IF A2C14<>1]* Did the energy expert install pipe wrap on some or all of your water pipes?

1 Yes
2 No
-6 Programmed skip
-8 Don’t know

A4A *[ASK IF A4=1 OR A2C14=1]* Is the pipe wrap provided by your energy expert still installed in your home?

1 Yes
2 No
-6 Programmed skip
-8 Don’t know

A5 *[ASK IF A2C05<>1]* Did the energy expert install any low-flow showerheads?

1 Yes
2 No
-6 Programmed skip
-8 Don't know

A5A *[ASK IF A5=1 OR A2C05=1]* Are the low-flow showerheads provided by your energy expert still installed in your home?

1 Yes
2 No
-6 Programmed skip
-8 Don't know

A19 *[ASK IF A2C06<>1]* The energy expert may have offered to install bath or kitchen faucet aerators. Did you agree to have the bath or kitchen faucet aerators installed, decline to have them installed, or did the energy expert not offer to install them?

1 Agreed to installation
2 Declined installation
3 Energy expert did not offer
-6 Programmed skip
-8 Don't know

A19A *[ASK IF A19=1 OR A2C06=1]* Are the/these bath and/or kitchen faucet aerators still installed in your home?

1 Yes
2 No
-6 Programmed skip
-8 Don't know

A19BO *[ASK IF A19=2]* Why did you decline the bath and/or kitchen faucet aerators installation?

[RECORD VERBATIM]

A20 *[ASK IF A2C08<>1]* Did the energy expert install or provide you with a power strip?

1 Yes
2 No
-6 Programmed skip
-8 Don't know

A21 *[ASK IF A2C07<>1]* Is the thermostat installed by your energy expert currently installed in your home?

1 Yes
2 No [SKIP TO NEXT SECTION]
-6 Programmed skip

A21A *[ASK IF A21=1]* Is your thermostat programmed to automatically change the temperature settings at different times of the day or days of the week, or are you manually changing the temperature as needed?

1 Programmed
2 Manually setting
3 Both
-6 Programmed skip
-8 Don't know
-9 Refused

INSULATION REBATE AWARENESS

[ASK IF INSULATION=0]

B7 The *[PROGRAM]* provides a rebate to install recommended insulation. How influential would this rebate be in your consideration of insulation upgrades? Please rate on a 1 to 5 scale where 1 is "not at all influential" and 5 is "highly influential."

____ *[RECORD INFLUENCE RATING (1-5)]*
-6 Programmed skip
-8 Don't know
-9 Refused

INSULATION MEASURES

[ASK SECTION IF INSULATION MEASURE SAMPLED (MEASURE_TYPE=14)—NOT INCLUDING PIPE INSULATION OR WATER HEATER BLANKET]

IN1 Now I'm going to ask you some questions about the insulation you purchased through the program. Is this insulation currently installed in your home?

1 Yes [CONTINUE]
2 No [SPECIFY: Why isn't this equipment installed?] [SKIP TO NEXT SECTION]
-6 Programmed skip

IN02O *[ASK IF IN1=2]* Reason insulation is not installed in home.

IN2 *[ASK IF SIDEWALL=1]* Our records indicate you added insulation to the walls. Is that correct?

1 Yes
2 No
-6 Programmed skip
-8 Don't know

IN4 *[ASK IF IN2=1]* And how many walls did you insulate?

____ *[RECORD NUMBER OF WALLS INSULATED]*
-6 Programmed skip
-8 Don't know

IN5 *[ASK IF ATTIC=1]* Our records indicate you added insulation to the attic or ceiling. Is that correct?

1 Yes
2 No
-6 Programmed skip
-8 Don't know

IN6 *[ASK IF IN5=1]* Did you have insulation in the attic or ceilings before adding this insulation?

1 Yes
2 No
-6 Programmed skip
-8 Don't know

IN7 *[ASK IF IN6=1]* About how many inches of attic insulation did you have in your attic before you added more through the program?

____ *[RECORD INCHES OF INSULATION]*
-6 Programmed skip
-8 Don't know

IN8 *[ASK IF IN5=1]* And what percent of your attic is now insulated?

____ *[RECORD PERCENT OF ATTIC INSULATED (1-100)]*
-6 Programmed skip
-8 Don't know
-9 Refused

IN9 *[ASK IF OTHERINS=1]* Our records indicate you added insulation to areas other than your walls, attic, or ceiling. Is that correct?

1 Yes
2 No
-6 Programmed skip
-8 Don't know

IN10 *[ASK IF OUT_AIR_SEAL=1]* Our records indicate you air sealed the exterior of your home. Is that correct?

1 Yes
2 No
-6 Programmed skip
-8 Don't know

IN11 Did you install any of the insulation yourself, use a contractor, or some combination?

1 Installed him/herself
2 Used a contractor
3 Combination
4 Other [SPECIFY]
-8 Don't know
-6 Programmed skip

IN11O *[ASK IF IN11=4]* Other description of who installed the insulation.

IN12 Did the program provide you with a list of recommended contractors?

1 Yes
2 No
-6 Programmed skip
-8 Don't know

IN13 *[ASK IF IN11=2 OR 3 AND IN12=1]* Did you select the contractor you hired from the list of recommended contractors?

1 Yes
2 No
-6 Programmed skip
-8 Don't know

REFRIGERATOR OR FREEZER

[ASK SECTION IF REFRIGERATOR/FREEZER MEASURE SAMPLED (MEASURE_TYPE=5, 10)]

RF1 Now I'm going to ask you some questions about the *[MEASURE]* you purchased through the program. Is this *[MEASURE]* currently installed in your home?

1 Yes [CONTINUE]
2 No [SPECIFY: Why isn't this equipment installed?] [SKIP TO NEXT SECTION]
-6 Programmed skip

RF102O *[ASK IF RF1=2]* Reason new refrigerator/freezer is not installed.

RF3 *[ASK IF MEASURE=10 REFRIGERATOR]* Does your new refrigerator have an ice dispenser, water dispenser, both, or neither?

1 Ice dispenser only
2 Water dispenser only
3 Both
4 Neither
-6 Programmed skip
-8 Don't know
-9 Refused

RF2a *[ASK IF MEASURE=5 FREEZER]* Is the freezer attached to a refrigerator or a standalone unit?

1 Attached to refrigerator
2 Standalone unit
-6 Programmed skip
-8 Don't know [SKIP TO RF6]
-9 Refused *[SKIP TO RF6]*

RF2 *[ASK IF MEASURE=5 FREEZER and RF2a=1]* Where is the freezer located or mounted on your refrigerator?

1 Freezer is on the bottom of the refrigerator
2 Freezer is on the top of the refrigerator
3 Freezer is on the side of the refrigerator
4 Refrigerator does not have an attached freezer
-6 Programmed skip
-8 Don't know
-9 Refused

RF4 *[ASK IF MEASURE=5 FREEZER and RF2a=2]* Is the freezer you installed through the program a chest freezer or a stand-up unit?

1 Chest
2 Standup
3 Other [SPECIFY]
-6 Programmed skip
-8 Don't know
-9 Refused

RF4O *[ASK IF RF4=3]* Other type of freezer installed through the program.

RF6 Is the *[MEASURE]* you installed through the program being used as your main *[MEASURE]*, or is it a secondary or spare unit?

1 Main
2 Secondary or Spare
-6 Programmed skip
-8 Don't know
-9 Refused

RF7 Where is it located?

1 Kitchen
2 Garage
3 Porch/Patio
4 Basement
5 Other [SPECIFY]
-6 Programmed skip
-8 Don't know
-9 Refused

RF7O *[ASK IF RF7=5]* Other place refrigerator/freezer is located.

RF9 Did the *[MEASURE]* you purchased replace an existing *[MEASURE]*?

1 Yes
2 No [SPECIFY: Why did you decide to purchase this new appliance?] [SKIP TO NEXT SECTION]
-6 Programmed skip
-9 Don't know *[SKIP TO NEXT SECTION]*

RF9O *[ASK IF RF9=2]* Reason for purchasing a refrigerator/freezer.

RF8 *[ASK IF RF9=1]* Did you get rid of your old *[MEASURE]* through a utility recycling program?

1 Yes
2 No
-6 Programmed skip
-8 Don't know
-9 Refused

RF10 *[ASK IF RF9=1]* Was the old *[MEASURE]* you replaced a high efficiency model?

1 Yes
2 No [SKIP TO RF12]
-6 Programmed skip
-8 Don't know *[SKIP TO RF12]*

RF11O *[ASK IF RF10=1]* How do you know that your old *[MEASURE]* was high efficiency?

[RECORD VERBATIM]

RF12 *[ASK IF RF9=1]* Was the old *[MEASURE]* in good, fair, poor, or non-working condition?

1 Good
2 Fair
3 Poor
4 Non-working
-6 Programmed skip
-8 Don't know

CENTRAL AIR CONDITIONER

[ASK IF CENTRAL AIR CONDITIONER MEASURE SAMPLED (MEASURE_TYPE=2)]

CAC1 Now I'm going to ask you some questions about the central air conditioner you purchased through the program. Is this central air conditioner currently installed in your home?

1 Yes [CONTINUE]
2 No [SPECIFY: Why isn't this equipment installed?] [SKIP TO NEXT SECTION]
-6 Programmed skip
-7 Not applicable *[ADDED 2/21]*

CAC102O *[ASK IF CAC1=2]* Reason new central air conditioner is not installed.

CAC2 Prior to participating in the program, what type of air conditioning system, if any, did you use in your home?

1 Did not have air conditioning [SPECIFY: Why did you decide to purchase this new air conditioner?] [SKIP TO CAC10]
2 Central air conditioner
3 Room/wall air conditioner [SPECIFY: How many?] [SKIP TO CAC10]
4 Fans [SKIP TO CAC10]
5 Evaporative cooler or swamp cooler
6 Geothermal (ground-source) heat pump
7 Air-to-air (air-source) heat pump
8 Add-on heat pump
9 Other [SPECIFY]
-6 Programmed skip
-7 Not applicable—new home [SKIP TO CAC10]
-8 Don't know
-9 Refused

CAC201O *[ASK IF CAC2=1]* Reason for purchasing new air conditioner.

CAC203 *[ASK IF CAC2=3]* Number of room/wall air conditioners previously used in home.

CAC2O *[ASK IF CAC2=9]* Other type of air conditioning system used in home.

CAC3 *[ASK IF CAC2=2, 5, 6, 7 OR 8]* How old was this air conditioning unit when it was replaced?

____ *[RECORD AGE IN YEARS]*
-6 Programmed skip
-8 Don't know
-9 Refused

CAC4 Which statement best describes the way your household used the old air conditioning unit during the summer: not used at all, turned on only a few days or nights when really needed, turned on quite a bit, turned on just about all summer, or something else?

1 Not used at all
2 Tuned on only a few days or nights when really needed
3 Turned on quite a bit
4 Turned on just about all summer
5 Something else [SPECIFY]
-6 Programmed skip
-8 Don't know
-9 Refused

CAC4O *[ASK IF CAC4=5]* Other description of the way household used the old air conditioning unit.

CAC13 *[ASK IF CAC3<=5 AND CAC2=2, 5, 6, 7 OR 8]* Was the old air conditioner you replaced a high efficiency model?

1 Yes
2 No [SKIP TO CAC15]
-6 Programmed skip
-8 Don't know *[SKIP TO CAC15]*

CAC14O *[ASK IF CAC13=1]* How do you know that your old air conditioner was high efficiency?

[RECORD VERBATIM]

CAC15 *[ASK IF CAC2=2, 5, 6, 7 OR 8]* Was the old air conditioner in good, fair, poor, or non-working condition?

1 Good
2 Fair
3 Poor
4 Non-working
-6 Programmed skip
-8 Don't know

CAC10 Have you used the new air conditioner though a cooling season yet?

1 Yes
2 No [SKIP TO NEXT SECTION]
-6 Programmed skip
-8 Don't know [SKIP TO NEXT SECTION]
-9 Refused *[SKIP TO NEXT SECTION]*

CAC11 *[ASK IF CAC10=1]* Which statement best describes the way your household uses the new air conditioning unit during the summer: not used at all, turned on only a few days or nights when really needed, turned on quite a bit, turned on just about all summer or something else?

1 Not used at all
2 Tuned on only a few days or nights when really needed
3 Turned on quite a bit
4 Turned on just about all summer
5 Other [SPECIFY]
-6 Programmed skip
-8 Don't know
-9 Refused

CAC11O *[ASK IF CAC11=5]* Other description of the way household uses the new air conditioning unit

HEAT PUMP

[ASK IF HEAT PUMP MEASURE SAMPLED (MEASURE_TYPE=9)]

HP1 Now I'm going to ask you some questions about the heat pump you purchased through the program. Is this heat pump currently installed in your home?

1 Yes [CONTINUE]
2 No [SPECIFY: Why isn't this equipment installed?] [SKIP TO NEXT SECTION]
-6 Programmed skip

HP102O *[ASK IF HP1=2]* Reason new heat pump is not installed.

HP2 Is your heat pump system used to heat your home, cool your home, or both heat and cool your home?

1 Only heat
2 Only cool
3 Both
-6 Programmed skip
-8 Don't know

[COMPUTE SYSTEM: IF HP2=1, SYSTEM="heating system"; *IF HP2=2, SYSTEM=*"cooling system"; *IF HP2=3, SYSTEM=*"heating and cooling system"; *IF HP2=-8, SYSTEM=*"heating or cooling system"*]*

HP3 *[ASK IF HP2=1 OR 3]* Prior to participating in the program, what type of equipment did you use to heat your home?

1 Natural gas furnace
2 Electric furnace
3 Electric space heater
4 Geothermal (ground-source) heat pump
5 Air-to-air (air-source) heat pump
6 Add-on heat pump
7 Other [SPECIFY]
-6 Programmed skip
-7 Not applicable—new home [SKIP TO NEXT SECTION]
-8 Don't know

HP3O *[ASK IF HP3=7]* Other type of equipment used to heat home.

HP4 *[ASK IF HP2=2 OR 3]* Prior to participating in the program, what type of equipment did you use to cool your home?

1 Nothing
2 Central air conditioner
3 Room air conditioner
4 Fans
5 Evaporative cooler or swamp cooler
6 Geothermal (ground-source) heat pump
7 Air-to-air (air-source) heat pump
8 Add-on heat pump
9 Other [SPECIFY]
-6 Programmed skip
-8 Don't know

HP4O *[ASK IF HP4=9]* Other type of equipment used to cool home.

HP5 How old was the *[SYSTEM]* when you replaced it?

____ *[RECORD AGE IN YEARS]*
-6 Programmed skip
-8 Don't know
-9 Refused

HP6 *[ASK IF HP5 <=5]* Was the old *[SYSTEM]* you replaced a high efficiency model?

1 Yes
2 No [SKIP TO HP8]
-6 Programmed skip
-8 Don't know *[SKIP TO HP8]*

HP7O *[ASK IF HP6=1]* How did you know that your old *[SYSTEM]* was high efficiency?

[RECORD VERBATIM]

HP8 Was the old *[SYSTEM]* in good, fair, poor, or non-working condition?

1 Good
2 Fair
3 Poor
4 Non-working
-6 Programmed skip
-8 Don't know

FURNACE

[ASK IF FURNACE MEASURE SAMPLED (MEASURE_TYPE=6)]

FUR1 Now I'm going to ask you some questions about the furnace you purchased through the program. Is this furnace currently installed in your home?

1 Yes [CONTINUE]
2 No [SPECIFY: Why isn't this equipment installed?] [SKIP TO NEXT SECTION]
-6 Programmed skip

FUR102O *[ASK IF FUR1=2]* Reason new furnace is no longer installed.

FUR2 Before participating in the program, what type of heating system did you use in your home?

1 Natural gas furnace
2 Electric furnace
3 Electric space heater
4 Geothermal (ground-source) heat pump
5 Air-to-air (air-source) heat pump
6 Add-on heat pump
7 Other [SPECIFY]
-6 Programmed skip
-7 Not applicable—new home [SKIP TO NEXT SECTION]
-8 Don't know

FUR2O *[ASK IF FUR2=7]* Other type of heating system used in home before participating in program.

FUR3 How old was your heating unit when you replaced it?

____ *[RECORD AGE IN YEARS]*
-6 Programmed skip
-8 Don't know
-9 Refused

FUR5 *[ASK IF FUR3 <=5]* Was the old heating system you replaced a high efficiency model?

1 Yes
2 No [SKIP TO FUR7]
-6 Programmed skip
-8 Don't know *[SKIP TO FUR7]*

FUR6O *[ASK IF FUR5 = 1]* How do you know that your old heating system was high efficiency?

[RECORD VERBATIM]

FUR7 Was the old heating system in good, fair, poor, or non-working condition?

1 Good
2 Fair
3 Poor
4 Non-working
-6 Programmed skip
-8 Don't know

THERMOSTAT & HEATING/ COOLING TEMPERATURES

[ASK SECTION IF THERM=1]

T1 Now I'm going to ask you some questions about the thermostat(s) you purchased through the program. Is this thermostat currently installed in your home?

1 Yes [CONTINUE]
2 No [SPECIFY: Why isn't this equipment installed?] [SKIP TO NEXT SECTION]
-6 Programmed skip

T102O *[ASK IF T1=2]* Reason new thermostat is not installed.

T1A Did you install the thermostat yourself or did someone else install the thermostat in your home?

1 Installed themselves
2 Contractor installed the thermostat
3 Someone else installed [SPECIFY]
-6 Programmed skip
-8 Don't know

T1AO *[ASK IF T1A=3]* Other person who installed thermostat in home.

T3 Is your thermostat programmed to automatically change the temperature settings at different times of the day or days of the week, or are you manually changing the temperature as needed?

1 Programmed
2 Manually setting
3 Both
-6 Programmed skip
-8 Don't know
-9 Refused

T4 What type of thermostat did your new programmable thermostat replace?

1 Manual thermostat
2 Programmable thermostat
3 Smart/WiFi thermostat
4 Other [SPECIFY]
-6 Programmed skip
-8 Don't know

T4O *[ASK IF T4=4]* Other type of thermostat replaced by new programmable thermostat.

FREE-RIDERSHIP

[ONLY ONE MEASURE SAMPLED PER PARTICIPANT; SAME MEASURE AS VERIFICATION SECTION]

[ASKING ONLY FOR REBATED MEASURES (NO DI MEASURES)]

[ASK IF IN1=1 OR RF1=1 OR CAC1=1 OR HP1=1 OR FUR1=1 OR T1=1]

INTROFa Now, I'd like to ask you about your decision to install the *[EE_MEAS]* through the *[PROGRAM]*.

RR5 Please think back to the time when you decided to purchase the equipment you installed through the program, perhaps recalling things that occurred in your household shortly before and after *[DATE]*. What factors motivated you to purchase this equipment? *[DO NOT READ; CHECK ALL THAT APPLY; ONCE THEY RESPONDENT HAS FINISHED, PROBE:* Are there any other factors?*]*

For RR5C01 through RR5C99
0 Not mentioned
1 Mentioned
-6 Programmed skip

RR5C01 Old equipment didn't work

RR5C02 Old equipment working poorly

RR5C03 The program and/or audit recommendation

RR5C04 The program and/or audit technical assistance

RR5C05 Wanted to save energy

RR5C06 Wanted to reduce energy costs

RR5C07 The information provided by the auditor

RR5C08 Because of past experience with another utility program

RR5C09 Recommendation from other utility program *[SPECIFY:* What program?*]*

RR5C10 Recommendation of someone else *[SPECIFY:* Who?*]*

RR5C11 Advertisement in newspaper *[SPECIFY:* For what program?*]*

RR5C12 Radio advertisement *[SPECIFY:* For what program?*]*

RR5C13 Environmental concerns

RR5C14 Global warming

RR5C15 Part of a remodeling project

RR5C16 Other *[SPECIFY]*

RR5C88 Don't know

RR5C99 Refused

RR509O *[ASK IF RR5C09=1]* Utility program that recommendation came from.

RR510O *[ASK IF RR5C10=1]* Other person who recommended purchasing equipment.

RR511O *[ASK IF RR5C11=1]* Program(s) advertised in newspaper.

RR512O *[ASK IF RR5C12=1]* Program(s) advertised on radio.

RR5C16O *[ASK IF RR5C16=1]* Other factor that motivated to purchase equipment.

FR1 Who, if anyone, recommended you purchase and install the *[EE_MEAS]* rebated through the *[PROGRAM]*? *[CHECK ONE]*

1 Trade ally / contractor
2 Retailer
3 Auditor or Energy expert
4 Family/friends/neighbor
5 No one
6 Other person [SPECIFY]
-6 Programmed skip
-8 Don't know
-9 Refused

FR1O *[ASK IF FR1=6]* Other person who recommended purchase and installation of *[EE_MEAS]*.

FR14 I'm going to ask you to rate how various factors might have influenced your decision to install the *[EE_MEAS]*. Please rate the influence of each of the following using a scale of 0 to 10, where 0 is "not at all influential" and 10 is "very influential." How influential was… *[ROTATE OPTIONS]*

For FR14A through FR14E

__ *[RECORD INFLUENCE (0-10)]*
-6 Programmed skip
-7 Not applicable
-8 Don't know
-9 Refused

FR14A *[ASK IF FR1=1, 2, 3, 4, OR 6]* The *[FR1]* recommendation on your decision to *[IF EQUIPMENT:* install*; IF SERVICE:* receive*]* the *[EE_MEAS]*

FR14B *[ASK IF MEASURE_TYPE <> 14 INSULATION]* The age or condition of the old equipment?

FR14C *[ASK IF EE_TYP=1]* The availability of the program rebate?

FR14D Previous experience with a MidAmerican energy efficiency program?

FR14E *[ASK IF AUDIT=1]* The information provided by the audit?

FR6 According to our records, the *[PROGRAM]* provided to you a rebate of *[REBAMT]* dollars for the *[EE_MEAS]*. If the program had not been available, what is the likelihood you would have purchased the exact same *[MEASURE]*? Please rate on a 0 to 10 scale, where 0 is "not at all likely" and 10 is "completely likely."

[INTERNAL NOTE: BY EXACT SAME MEASURE WE'RE INCLUDING EXACT SAME EFFICIENCY]

__ *[RECORD LIKELIHOOD (0-10)]*
-6 Programmed skip
-8 Don't know
-9 Refused

FR7 *[ASK IF FR6 <>0]* Without the program, what is the likelihood you would have purchased the same *[EE_MEAS]* within 12 months? Please rate on a 0 to 10 scale, where 0 is "not at all likely" and 10 is "completely likely."

__ *[RECORD LIKELIHOOD (0-10)]*
-6 Programmed skip
-8 Don't know
-9 Refused

FR8 *[ASK IF FR6 <>0 AND (QTY >1 OR INSULATION=1)]* Without the program, what is the likelihood you would have purchased fewer *[EE_MEAS]*?
Again, please use a 0 to 10 scale, where 0 is "not at all likely" and 10 is "completely likely."

__ *[RECORD LIKELIHOOD (0-10)]*
-6 Programmed skip
-8 Don't know
-9 Refused

FR10b Had you already been planning to install the same *[EE_MEAS]* before you learned about the rebate available through the *[PROGRAM]*?

1 Yes
2 No
-6 Programmed skip
-8 Don't know
-9 Refused

FR15 Now I want to focus on what it would have cost your household to install this equipment on your own without the program.

On a scale of 0 to 10, with 0 being "not at all likely" and 10 being "very likely," how likely is it that you would have paid the additional *[REBAMT]* dollars on top of the amount you already paid, to implement *[IF QTY>1:* "the same quantity and efficiency"; *IF QTY=1:* "the same efficiency"] of *[MEASURE TYPE]* at the same time as when you participated in the program?

__ *[RECORD LIKELIHOOD (0-10)]*
-6 Programmed skip
-8 Don't know
-9 Refused

FR16O Could you please tell me, in your own words, what influence, if any, the *[PROGRAM]* had in your decision to install the *[EE_MEAS] [IF NOT FURNACE FAN, SHOW:* instead of the standard efficiency*]*?

[RECORD VERBATIM]

SPILLOVER

[ASK OF ALL]

SP1 Did your participation in MidAmerican Energy's program influence you to purchase any other type of energy efficient or ENERGY STAR equipment?

1	Yes	
2	No	[SKIP TO NEXT SECTION]
-8	Don't know	*[SKIP TO NEXT SECTION]*

SP2 What energy efficient equipment have you purchased? *[DO NOT READ; CHECK ALL THAT APPLY]*

For SP2C01 through SP2C99
0 Not mentioned
1 Mentioned
-6 Programmed skip

SP2C01 CFLs

SP2C02 LEDs

SP2C03 Lighting other than CFLs and LEDs

SP2C04 ENERGY STAR electronics

SP2C05 Refrigerator

SP2C06 Water heater

SP2C07 Freezer

SP2C08 Room air conditioner

SP2C09 Central air conditioner

SP2C10 Clothes washer

SP2C11 Furnace

SP2C12 Heat pump

SP2C13 Low flow showerhead

SP2C14 Faucet aerator

SP2C15 Programmable thermostat

SP2C16 Insulation

SP2C17 Windows

SP2C18 Doors

SP2C19 Other *[SPECIFY:* What kind of equipment?*]*

SP2C88 Don't know *[SKIP TO NEXT SECTION]*

SP2C99 Refused *[SKIP TO NEXT SECTION]*

SP2C03O *[ASK IF SP2C03=1]* Can you describe what type of lighting other than CFLs and LEDs?

SP2C04O *[ASK IF SP2C04=1]* Can you describe what type of ENERGY STAR electronics?

SP2C19O *[ASK IF SP2C19=1]* Other kind of energy efficient equipment purchased.

SPD1 *[ASK IF SP2C06=1]* What type of high efficiency water heater was installed? Was it… *[READ CATEGORIES]*

1 Gas Storage
2 Electric Storage
3 Gas Tankless
4 Electric Tankless
5 Heat Pump Water Heater
6 Other [SPECIFY]
-6 Programmed skip
-8 Don't know

SPD1O *[ASK IF SPD1=6]* Other type of high efficiency water heater installed.

SPD3 *[ASK IF SP2C12=1]* What type of equipment did the new energy efficient heat pump replace?

1 Existing Heat Pump
2 Central Air Conditioner w/ Gas Heating
3 Central Air Conditioner w/ Electric Heating
4 Other [SPECIFY]
-6 Programmed skip
-8 Don't know

SPD3O *[ASK IF SPD3=4]* Other type of equipment that the new heat pump replaced.

SPD4 *[ASK IF SP2C13=1]* How many total showers are in your home? Please include the total quantity of showers with a showerhead. Please do not include bathtubs without a showerhead.

__ *[RECORD NUMBER OF SHOWERS (0-25)]*
-6 Programmed skip
-8 Don't know
-9 Refused

SPD5 *[ASK IF SP2C14=1]* How many total faucets are in your home? *[IF NEEDED:* Please count the total number of sinks in your home. If you have dual sinks that would count as two faucets*]*

__ *[RECORD NUMBER OF FAUCETS (0-25)]*
-6 Programmed skip
-8 Don't know
-9 Refused

SPD6 *[ASK IF SP2C16=1]* Where was insulation installed? *[CHECK ALL THAT APPLY]*

For SPD6C01 through SPD6C99
0 Not mentioned
1 Mentioned
-6 Programmed skip

SPD6C01 Attic Insulation

SPD6C02 Wall Insulation

SPD6C03 Floor Insulation

SPD6C04 Basement Insulation

SPD6C05 Crawlspace Insulation

SPD6C06 Rim Joist Insulation

SPD6C07 Some other place *[SPECIFY]*

SPD6C88 Don't know

SPD6C07O *[ASK IF SPD6C07=1]* Other place insulation was installed.

SPD7 *[ASK FOR EACH RESPONSE TO SPD6] [ASK IF SP2C16=1] [ASK OF EACH SPD6 SELECT]* What was the total area of installed *[RESPONSES FROM SPD6]*?

For SPD7_1 through SPD7_7

____ *[RECORD TOTAL AREA IN SQUARE FEET (0-7500)]*
-6 Programmed skip
-8 Don't know
-9 Refused

SPD7_1 Total area of installed Attic insulation

SPD7_2 Total area of installed Wall insulation

SPD7_3 Total area of installed Floor insulation

SPD7_4 Total area of installed Basement insulation

SPD7_5 Total area of installed Crawlspace insulation

SPD7_6 Total area of installed Rim Joist insulation

SPD7_7 Total area of installed Other insulation

[ROSTER SP4 to SP6 FOR EACH MENTIONED IN SP2 EXCEPT 19]

SP4 *[SKIP IF SP2C01, SP2C02, SP2C13, SP2C14, OR SP2C15=1]* Did you receive a MidAmerican Energy rebate for the *[SP2 EQUIPMENT]*?

For SP4R1 through SP4R18

1 Yes *[*SKIP TO END OF LOOP]
2 No [Note: those who received rebates, but only NON-MidAmerican rebates, go here]
3 No rebate received
-6 Programmed skip
-8 Don't know

SP4R1 CFLs
SP4R2 LEDs
SP4R3 Lighting other than CFLs and LEDs
SP4R4 ENERGY STAR electronics
SP4R5 Refrigerator
SP4R6 Water heater
SP4R7 Freezer
SP4R8 Room air conditioner
SP4R9 Central air conditioner
SP4R10 Clothes washer
SP4R11 Furnace
SP4R12 Heat pump
SP4R13 Low flow showerhead
SP4R14 Faucet aerator
SP4R15 Programmable thermostat
SP4R16 Insulation
SP4R17 Windows
SP4R18 Doors

SP3 *[SKIP IF SPC16=1; INSULATION]* How many *[SP2 EQUIPMENT]* did you purchase?

For SP3R1 through SP3R18
__ *[RECORD AMOUNT PURCHASED]*
-6 Programmed skip
-8 Don't know
-9 Refused

SP3R1 CFLs
SP3R2 LEDs
SP3R3 Lighting other than CFLs and LEDs
SP3R4 ENERGY STAR electronics
SP3R5 Refrigerator
SP3R6 Water heater
SP3R7 Freezer
SP3R8 Room air conditioner
SP3R9 Central air conditioner
SP3R10 Clothes washer
SP3R11 Furnace
SP3R12 Heat pump
SP3R13 Low flow showerhead
SP3R14 Faucet aerator
SP3R15 Programmable thermostat
SP3R16 Insulation
SP3R17 Windows
SP3R18 Doors

SP3a *[SKIP IF SP2C01, SP2C02, SP2C14, OR SP2C15=1]* How do you know the *[SP2 EQUIPMENT]* is energy efficient? *[PROBE:* Is it ENERGY STAR rated? Do you know the SEER level?*]*

For SP3AR1O through SP3AR18O

[RECORD RESPONSE VERBATIM]

SP3AR1O CFLs

SP3AR2O LEDs

SP3AR3O Lighting other than CFLs and LEDs

SP3AR4O ENERGY STAR electronics

SP3AR5O Refrigerator

SP3AR6O Water heater

SP3AR7O Freezer

SP3AR8O Room air conditioner

SP3AR9O Central air conditioner

SP3AR10O Clothes washer

SP3AR11O Furnace

SP3AR12O Heat pump

SP3AR13O Low flow showerhead

SP3AR14O Faucet aerator

SP3AR15O Programmable thermostat

SP3AR16O Insulation

SP3AR17O Windows

SP3AR18O Doors

SP5 On a scale of 0 to 10, with 0 being “not at all important” and 10 being “extremely important,” how important was your participation in the MidAmerican *[PROGRAM]* on your decision to purchase *[SP2 Equipment]* on your own?

For SP5R1 through SP5R18

__ *[RECORD IMPORTANCE (1-10)]*
-6 Programmed skip
-8 Don’t know
-9 Refused

SP5R1 CFLs

SP5R2 LEDs

SP5R3 Lighting other than CFLs and LEDs

SP5R4 ENERGY STAR electronics

SP5R5 Refrigerator

SP5R6 Water heater

SP5R7 Freezer

SP5R8 Room air conditioner

SP5R9 Central air conditioner

SP5R10 Clothes washer

SP5R11 Furnace

SP5R12 Heat pump

SP5R13 Low flow showerhead

SP5R14 Faucet aerator

SP5R15 Programmable thermostat

SP5R16 Insulation

SP5R17 Windows

SP5R18 Doors

SP6 If you had not participated in MidAmerican's program, how likely is it you would have still purchased *[SP2 Equipment]*, using a 0 to 10 scale, where 0 is you "definitely WOULD NOT have purchased" and 10 means you "definitely WOULD have purchased?"

For SP6R1 through SP6R18

__ *[RECORD LIKELIHOOD (1-10)]*
-6 Programmed skip
-8 Don't know
-9 Refused

SP6R1 CFLs

SP6R2 LEDs

SP6R3 Lighting other than CFLs and LEDs

SP6R4 ENERGY STAR electronics

SP6R5 Refrigerator

SP6R6 Water heater

SP6R7 Freezer

SP6R8 Room air conditioner

SP6R9 Central air conditioner

SP6R10 Clothes washer

SP6R11 Furnace

SP6R12 Heat pump

SP6R13 Low flow showerhead

SP6R14 Faucet aerator

SP6R15 Programmable thermostat

SP6R16 Insulation

SP6R17 Windows

SP6R18 Doors

[END ROSTER; SKIP TO NEXT SECTION]

FINANCING

[IF D2=2, -8, -9, SKIP TO SAT1]

FN_INT Some households could save money over the long run by upgrading their home or equipment to be more energy efficient. I have some questions about financing options that could increase your ability to install energy efficient equipment.

FN1 First, have you made any major home equipment purchases over the past five years? This would include equipment or appliances over $2,000 such as heating, cooling, water heating, and insulation purchases. *[CHECK ONE]*

1	Yes	
2	No	[SKIP TO FN3]
-6	Programmed skip	
-8	Don't know	[SKIP TO FN3]
-9	Refused	*[SKIP TO FN3]*

FN2 I'd like to understand how you funded these purchases. Did you…

[SELECT ALL THAT APPLY]

For FN2C01 through FN2C99

0	Not mentioned
1	Mentioned
-6	Programmed skip

FN2C01 Pay cash / debit card / check

FN2C02 Put the purchase on a credit card

FN2C03 Finance the project, either through the bank, store, or contractor you purchased from

FN2C04 Other *[SPECIFY]*

FN2C88 Don't know

FN2C99 Refused

FN2C04O *[ASK IF FN2C04=1]* Other method of funding purchases.

FN3 Using a scale of 1 to 5 where 1 means “does not increase at all” and 5 means “increases a great deal,” please indicate how much the following financing options would increase your likelihood of installing energy efficient equipment.
[IF NEEDED: Energy efficient equipment includes insulation or high-efficiency heaters, air conditioners, hot water heaters or appliances.*]*

How much would…

[READ LIST; ROTATE STATEMENTS]

For FN3A through FN3D

__ *[RECORD LIKELIHOOD (1-5)]*
-6 Programmed skip
-8 Don’t know
-9 Refused

FN3A On-bill financing increase your likelihood of installing energy efficient equipment
[READ IF NEEDED: On-bill financing is a loan that MidAmerican would offer to you to pay for energy efficiency improvements. The loan repayments are collected on the utility bill until the loan is repaid. This is not something MidAmerican currently offers as an option, they are just trying to assess interest.*]*

FN3B A mortgage or home equity loan through a bank or financial institution specifically offered for qualifying energy efficiency upgrades increase your likelihood of installing energy efficient equipment
[READ IF NEEDED: Energy Efficiency mortgages help homebuyers or homeowners finance the cost of energy efficiency features as part of their home purchase or refinancing mortgage.*]*

FN3C A non-mortgage loan through a local bank or financial institution increase your likelihood of installing energy efficient equipment

FN3D A payment plan or financing through your contractor increase your likelihood of installing energy efficient equipment

SATISFACTION

[ASK OF ALL]

SAT1 How satisfied are you with the following aspects of the *[PROGRAM]*? Please indicate if you are not at all satisfied, somewhat satisfied, very satisfied, or extremely satisfied? *[ROTATE CHOICES]*

For SAT1A through SAT1E
1 Not at all satisfied
2 Somewhat satisfied
3 Very satisfied
4 Extremely satisfied
-6 Programmed skip
-8 Don't know

SAT1A *[SKIP IF REBATE=0]* The length of time it took to receive the rebate

SAT1B Your interactions with the energy expert?

SAT1C The information provided through the assessment

SAT1E *[SKIP IF REBATE=0]* The amount of the rebate received through the program

SAT3 Have you recommended the *[PROGRAM]* to others?

1 Yes
2 No [SPECIFY: What is main reason you have not recommend the program to anyone?]
-8 Don't know

SAT3O *[ASK IF SAT3=2]* Main reason for not recommending the program to anyone.

SAT4 Overall, how satisfied are you with the *[PROGRAM]*? Would you say not at all satisfied, somewhat satisfied, very satisfied, or extremely satisfied?

1 Not at all satisfied
2 Somewhat satisfied
3 Very satisfied
4 Extremely satisfied
-8 Don't know

SAT5O *[ASK IF SAT4 <3]* Why did you rate your satisfaction with the program that way?

[RECORD VERBATIM]

S1B The next questions ask about your experience with MidAmerican in general as your energy provider, not just with the *[PROGRAM]*. How would you rate the service provided by MidAmerican? Would you say not at all satisfied, somewhat satisfied, very satisfied, or extremely satisfied?

1 Not at all satisfied
2 Somewhat satisfied
3 Very satisfied
4 Extremely satisfied
-8 Don't know

S1AO *[ASK IF S1b=1,2,3,4]* Why did you rate your satisfaction with MidAmerican Energy as *[FILL RATING FROM S1]*?

[RECORD VERBATIM]

SAT7 Would you say you are more satisfied, just as satisfied, or less satisfied with the quality of service provided by MidAmerican since your participation in the *[PROGRAM]*?

1 More satisfied
2 Just as satisfied
3 Less satisfied

SAT8O *[ASK IF SAT7=1 OR 3]* Why do you say that?

[RECORD VERBATIM]

FINAL PROCESS

[ASK OF ALL]

PP1 People participate in energy efficiency programs for different reasons.

Why did you decide to participate in this program? *[DO NOT READ; CHECK ALL THAT APPLY]*

For PP1C01 through PP1C99

0 Not mentioned
1 Mentioned

PP1C01 Saving money on my energy bills

PP1C02 The financial incentive (rebate, payment for participating)

PP1C03 The program was recommended to me by MidAmerican

PP1C04 Someone I know had a positive experience with the program

PP1C05 The program was a way for me to do something good for the environment

PP1C06 Improving the comfort of my home

PP1C07 Increasing the value of my home

PP1C08 The program was recommended to me by a contractor

PP1C09 Other *[SPECIFY]*

PP1C88 Don't know

PP1C99 Refused

PP1C09O *[ASK IF PP1C09=1]* Other reason for participating in the program.

BEN2O What could MidAmerican Energy do to help your home become more energy efficient?

[RECORD VERBATIM]

[SKIP CHANGED 3/2]

BR1 *[ASK IF BONUS=0 AND STATE<>SD]* Are you aware of the $200 bonus rebate available from MidAmerican Energy for completing three recommended upgrades within 12 months of receiving your on-site assessment?

1 Yes
2 No
-6 Programmed skip
-8 Don't know

BR2 *[ASK IF BR1=1]* What is the likelihood that you will complete three recommended upgrades within 12 months of your assessment to be eligible for the bonus rebate? Please use a scale of 1 to 5 where 1 is "not at all likely" and 5 is "very likely."

____ *[RECORD LIKELIHOOD (1-5)]*
-6 Programmed skip
-7 NA—already completed 3 upgrades
-8 Don't know
-9 Refused

BR3O *[ASK IF BR2=1, 2]* Why are you unlikely to complete three recommended upgrades in the next 12 months?

[RECORD VERBATIM]

BR4 *[ASK IF BONUS=1]* How easy was it to complete three recommended upgrades within 12 months of your assessment to be eligible for the bonus rebate? Please use a scale of 1 to 5 where 1 is "very difficult" and 5 is "very easy."

____ *[RECORD EASE (1-5)]*
-6 Programmed skip
-8 Don't know

BR5O *[ASK IF BR4=1, 2]* What was difficult about completing three upgrades to receive the bonus rebate?

[RECORD VERBATIM]

DEMOGRAPHICS

[ASK OF ALL]

We are almost done; I just have a few final questions.

D1 What type of home do you live in? Is it a… *[READ CATEGORIES; CHECK ONE]*

1 Single-family detached house
2 Single-family attached house (townhouse, row house, or duplex)
3 Apartment building with 2-4 units
4 Apartment building with 5 or more units
5 Mobile home or house trailer
6 Other [SPECIFY]
-8 Don't know
-9 Refused

D1O *[ASK IF D1=6]* Other type of home lived in.

D3 In approximately what year was your home built?

__ *[RECORD YEAR]*
-8 Don't know

D3a *[ASK IF D3=-8]* In what decade was your home built? *[READ LIST; CHECK ONE]*

1 1930s or earlier
2 1940s
3 1950s
4 1960s
5 1970s
6 1980s
7 1990s
8 2000s
9 2010s
-6 Programmed skip
-8 Don't know
-9 Refused

D5 How many years have you lived in your home? *[ENTER 0 IF LESS THAN ONE FULL YEAR]*

__ *[RECORD YEARS]*
-8 Don't know
-9 Refused

D6 Not including unfinished basements or crawlspaces, which of the following best describes the square footage of your home? Is it… *[READ LIST; CHECK ONE]*

1 Less than 1,000 square feet
2 1,000 to 1,500 square feet
3 1,501 to 2,000 square feet
4 2,001 to 3,000 square feet
5 More than 3,000 square feet
-8 Don't know
-9 Refused

D4 *[SKIP IF CAC1=1]* Does your home have central air conditioning?

1 Yes
2 No
-6 Programmed skip
-8 Don't know
-9 Refused

D7 What fuel do you use to heat your home?

1 Electricity
2 Gas
3 Other [SPECIFY]
-8 Don't know

D7O *[ASK IF D7=3]* Other type of fuel used to heat home.

D8 What is the fuel type used for your home's water heating?

1 Electricity
2 Gas
3 Other [SPECIFY]
-8 Don't know

D8O *[ASK IF D8=3]* Other type of fuel used for home's water heating.

D9 Counting yourself, how many people normally live in this household on a full time basis?

__ *[RECORD RESPONSE (0-20)]*
-8 Don't know
-9 Refused

D10 *[ASK IF D9 >1]* How many household members are children under 19 years old?

__ *[RECORD RESPONSE (0-20)]*
-6 Programmed skip
-8 Don't know
-9 Refused

D11 *[ASK IF D9 >1]* How many household members are 65 years old or older?

__ *[RECORD RESPONSE (0-20)]*
-6 Programmed skip
-8 Don't know
-9 Refused

D12 How old were you on your last birthday? Were you… *[READ CATEGORIES; CHECK ONE]*

1 18-24
2 25-34
3 35-44
4 45-54
5 55-64
6 65 or older
-8 Don't know
-9 Refused

D13 Including wages, salaries, pensions, Social Security and other sources of income for all members of your household, what was your total household income before taxes in 2016? Please select from the following categories. Was it…
[CHECK ONE]

1 Less than $24,000
2 $24,000 to less than $50,000
3 $50,000 to less than $75,000
4 $75,000 to less than $100,000
5 $100,000 or greater
-8 Don't know
-9 Refused

D14 And finally, I'm required to ask this question. What is your gender?

1 Male
2 Female
-9 Refused

CONCLUSION

E1 As part of our evaluation, we may need to follow-up on some of this information. Would it be all right if someone called you if needed?

1 Yes
2 No

E2 Thank you for taking the time to complete this survey. Do you have any additional comments or questions?

1 Yes [record comment]
2 No

E2O *[ASK IF E2=1]* Additional comments/questions.

INT99 *[END CALL]*

[INTERVIEWER: RECORD ANY NOTES ON DIFFICULTY OF R IN RESPONDING TO QUESTIONS, IMPRESSION OF PROGRAM INFLUENCE, ETC.]

APPENDIX C: ENERGY EXPERT INTERVIEW GUIDE

C.1 BACKGROUND

This guide will be used to understand the perspectives of energy specialist responsible for energy assessments for the MidAmerican Energy Residential HomeCheck during 2016.

The Residential HomeCheck (Assessment) program is the primary entry point for residential customers seeking assistance through MidAmerican's energy efficiency programs. The program provides free residential energy assessments, direct installation of low-cost efficiency measures, and efficiency improvement recommendations to MidAmerican customers. The program consists of an on-site energy assessment implemented by A-TEC Energy (A-TEC) and an online energy assessment implemented by OPower Inc. Post inspection quality assurance/quality control (QA/QC) is performed by A-TEC on one percent of insulation projects for each approved contractor, 25 percent of self-installed upgrades over $500, and 10 percent of sites installed by non-program contractors. Additionally, A-TEC performs follow up after the HomeCheck® on-site with a random sampling of customers for each of their assessors.

The on-site assessment provides residential customers with multiple benefits including a whole-house assessment from trained assessors, immediate savings through direct installation of low-cost measures, recommendations on insulation and applicable rebates, and an introduction to other available rebates. Upon completion of the assessment, the energy expert provides a report to the homeowner of the home's insulation, heating, cooling, water heating equipment, and window efficiency. The report can be used to inform future energy efficiency improvements at the home. Added in 2014 for both the Illinois and Illinois territories, customers who complete three recommended upgrades within 12 months of receiving an on-site assessment will receive a $200 bonus incentive.

Rebate information
https://www.midamericanenergy.com/ia-res-forms.aspx

In-depth interviews will be conducted by senior Tetra Tech staff via telephone. The interviews will be semi-structured. Therefore, the following interview protocol is only a guide to ensure certain topics are covered, but evaluators will follow the flow of the interview and modify questions as needed to fit the interviewee's circumstance and flow of conversation.

We expect the interviews to take approximately 30 minutes. We will attempt to schedule interviews with respondents in advance to accommodate each specialist's schedule.

C.2 INTRODUCTION

Hello, may I speak to [_____]? My name is _____, and I'm calling from Tetra Tech on behalf of MidAmerican Energy. We would like to ask you some questions about the assessments you conduct as part of the HomeCheck program to help provide insight back to MidAmerican Energy about your experience with the program, what has worked well, or improvements you might recommend. Additionally we have questions about the program's effect on the market for energy efficiency going forward.

To confirm, do you conduct energy assessments for the MidAmerican HomeCheck program?

1 Yes [Continue]

2 No -> Can you tell me who I should speak with? [End call if no one is familiar]

Is this a convenient time for you to talk, or would you prefer to schedule another time?
[Proceed or schedule appointment as appropriate.]

The interview should last about 30 minutes. The information you provide will be treated as confidential and will help MidAmerican Energy improve their residential rebate programs in the future.

[If needed: Offer the contact name from below as the person to contact with any questions about the validity of this research.]

Name	Phone #
Erin Rasmussen	563.333.8873

With your permission, I would like to record the interview. Do I have your permission to do so? [IF NEEDED: We will use the recording to help us compile the results, in order to make sure we accurately represent your responses. No one but Tetra Tech staff will listen to the recording.]

C.3 BUSINESS SCOPE

I'd like to start with some general information.

1) To get us started, could you briefly tell me a little bit about your position?

- How long have you been in conducting residential assessments?
- How long have you been in conducting residential assessments for MidAmerican?
- About how many assessments do you conduct in Illinois?
- About how many assessments do you conduct in Illinois?

C.4 PROGRAM DESIGN

1) What are the primary reasons you hear from customers that motivate them to have an energy assessment? Is the energy assessment able to meet their needs?

2) How receptive have customers been to LEDs being installed as part of the energy assessment, compared to CFLs?

3) What about the other direct install measures (e.g. include pipe insulation, faucet aerators, low-flow showerheads, water heater blankets (NOTE: these had low participation and were removed in 2017), programmable thermostats, compact fluorescent lamps (CFLs), light emitting diodes (LEDs), and smart strips)—how do customers respond to having this equipment installed?

4) For homes that qualify for HomeCheck, what do you think prevents customers from having an energy assessment conducted in their home?

5) Do you think the program has been effective at addressing these barriers?

C.5 EDUCATION, OUTREACH, AND MARKETING

1) Who do you get most of your program information from? By program information, I mean updates on program requirements, rebate levels, for example.

2) Do you feel adequately informed of program changes?

   1 Yes
   2 No -> How would you like to be better informed of program changes?

3) Are you aware of other utility energy efficiency programs?

   1 Yes -> Which ones? Do you have any involvement with these programs—why or why not?
   2 No

4) What do customers understand to be the benefits of the HomeCheck program prior to working with you? What do customers understand the benefits of the energy assessment to be?

5) How do you present the MidAmerican program rebates to customers?
(Probe: discussion, website information, brochure, fact sheets, etc)

   - Which methods do you think are most effective or informative for customers?

6) Do you think MidAmerican's marketing strategies have been successful in educating customers and generating program-related activity? How could they be improved? What additional tools or support could MidAmerican provide you with to better motivate participation by customers?

C.6 PROGRAM PROCESS AND SATISFACTION

1) Could you describe a typical assessment to me? (NOTE: Probe about interactions with customers, typical direct install measures, tests completed, education provided to customers, recommendations made to customers, follow-up)

2) How does the scheduling process work? How is the wide-spread service territory taken into account when assessments are scheduled?

3) How long are assessments? Does this give you enough time to cover the items required? Does it allow for enough discussion with the customer?

4) Is the assessment form well laid out and easy to use? Does it have areas to record all relevant information? Is it missing anything?

5) Is there any additional automation that could take place with the assessment form or the process?

6). What are the typical or most common recommendations that result from an assessment? How do customers typically respond to the recommendations?

7) What QA/QC issues have you identified when completing post insulation inspections, or when reviewing other contractor work? Are there things that contractors need to address with their installation practices or that MidAmerican Energy should be aware of?

8) How could the program be more effective at getting customers to install energy efficiency measures after the assessment? Has the addition of the $200 bonus incentive moved more customers to install additional energy efficiency measures? Do you think offering a financing option would help?

C.7 MARKET RESPONSE

1) Are there markets that you feel MidAmerican's residential energy efficiency programs are reaching well? Are there markets that you feel the program is not reaching well?

   - Can you identify approaches that might expand the reach of the program into markets that may be underserved by the program?

2) To what degree do you see the program increasing the interest and demand for energy efficient equipment? [PROBE: comparable degrees of increased interest and demand (e.g., no increase, some increase, significant increase)] Why is that?

3) What issue(s) may affect future program participation? [PROBE: example issues are changes to building codes and standards promoted in the Midwest and program incentive levels].

C.8 OVERALL PROGRAM

Now I'd like to wrap up with a few final questions.

1) Using a five-point scale where 1 means "not at all satisfied," and 5 means "very satisfied," overall, how satisfied are you with MidAmerican's HomeCheck program?

2) In case we would like to clarify anything we discussed, would it be alright if I contacted you again?

   If YES, get best phone number and email address

Those are all the questions I have today. If you think of anything you would like to add, please feel free to contact us. Thank you very much for your time.

APPENDIX D: MARKET ACTOR INTERVIEW GUIDE

D.1 BACKGROUND

This guide will be used to understand the perspectives of participating market actors involved with the MidAmerican Energy Residential HomeCheck during 2016. Most interviews will be conducted with contractors who interact with both MidAmerican Energy and the program implementer.

The Residential HomeCheck (Assessment) program is the primary entry point for residential customers seeking assistance through MidAmerican's energy efficiency programs. The program provides free residential energy assessments, direct installation of low-cost efficiency measures, and efficiency improvement recommendations to MidAmerican customers. The program consists of an on-site energy assessment implemented by A-TEC Energy (A-TEC) and an online energy assessment implemented by Opower Inc. Post inspection quality assurance/quality control (QA/QC) is performed by A-TEC on one percent of insulation projects for each approved contractor, 25 percent of self-installed upgrades over $500, and 10 percent of sites installed by non-program contractors. Additionally, A-TEC performs follow up after the HomeCheck® on-site with a random sampling of customers for each of their assessors.

The on-site assessment provides residential customers with multiple benefits including a whole-house assessment from trained auditors, immediate savings through direct installation of low-cost measures, recommendations on insulation and applicable rebates, and an introduction to other available rebates. Upon completion of the assessment, the energy expert provides a report to the homeowner of the home's insulation, heating, cooling, water heating equipment, and window efficiency. The report can be used to inform future energy efficiency improvements at the home. Added in 2014 for both the Illinois and Illinois territories, customers who complete three recommended upgrades within 12 months of receiving an on-site assessment will receive a $200 bonus incentive.

Rebate information
https://www.midamericanenergy.com/ia-res-forms.aspx
Some equipment is listed separately for applications—Appliances, Heating, Cooling, and Water Heating. Insulation is part of HomeCheck—instructions below.

6.1.2 Rebate requirements and how to apply

Refer to the rebate application included in the HomeCheck® folder for all rebate requirements.

Professionally Installed	Self Installed
Have your dealer send a completed rebate application and itemized invoices for materials and labor to MidAmerican Energy by March 31, 2018.	Complete the appropriate rebate application, attach a copy of the itemized, dated receipt and send them to MidAmerican Energy by March 31, 2018. You may not charge labor for self-installations.

http://tradeallycentral.com/
Trade Ally site for contractors—log in or request marketing materials

https://partner.tradeallycentral.com/tradeally/public/find.do

Trade Ally search tool on MidAm website

NOTE TO INTERVIEWER: Check the sample information and website for each contractor prior to calling.

In-depth interviews will be conducted by senior Tetra Tech staff via telephone. The interviews will be semi-structured. Therefore, the following interview protocol is only a guide to ensure certain topics are covered, but evaluators will follow the flow of the interview and modify questions as needed to fit the interviewee's circumstance and flow of conversation.

We expect the interviews to take approximately 30 minutes. We will attempt to schedule interviews with respondents in advance to accommodate each contractor's schedule.

D.2 INTRODUCTION

Hello, may I speak to [_____]? My name is _____, and I'm calling from Tetra Tech on behalf of MidAmerican Energy. We are conducting interviews with firms that sell or install equipment or provide services rebated through MidAmerican's Residential energy efficiency programs.

We would like to ask you some questions about your participation in the program to help provide insight back to MidAmerican Energy about your experience with the program, what worked well, or improvements you might recommend. Additionally we have questions about the program's effect on the market for energy efficiency going forward.

Are you the best person at [COMPANY] to talk to about [COMPANY]'s experience with the MidAmerican Residential rebate programs?

1 Yes [Continue]
2 No -> Can you tell me who I should speak with? [End call if no one is familiar]

Is this a convenient time for you to talk, or would you prefer to schedule another time?
[Proceed or schedule appointment as appropriate.]

The interview should last about 30 minutes. The information you provide will be treated as confidential and will help MidAmerican Energy improve their residential rebate programs in the future.

[If needed: Offer the contact name from below as the person to contact with any questions about the validity of this research.]

Name	Phone #
Erin Rasmussen	563.333.8873

With your permission, I would like to record the interview. Do I have your permission to do so? [IF NEEDED: We will use the recording to help us compile the results, in order to make sure we accurately represent your responses. No one but Tetra Tech staff will listen to the recording.]

D.3 BUSINESS SCOPE

I'd like to start with some general information about you and your company.

NOTE TO INTERVIEWER: Overview and verify what you found through website search. Then start as needed with questions below.

1) To get us started, could you briefly tell me a little bit about your business and position?

- How long have you been in business?
- What type(s) of services do you provide?
- Do you provide services in Illinois?
- Do you provide services in Illinois?
- How many employees (full-time equivalents) does your company employ?

2) What proportion (or percent) of your total projects in 2016 did the rebated projects represent <for each measure>?

3) For 2017, do you expect this percentage to be higher, lower, or about the same?

1 Higher -> Why do you think it will be higher?
2 Lower -> What could MidAmerican do to change that?
3 About the same -> Why do you think it will be about the same?

D.4 PROGRAM AWARENESS, MARKETING, AND RECRUITMENT

1) When did you first get involved with MidAmerican's energy efficiency programs?

- How did you first hear about them?

2) Who do you get most of your program information from? By program information, I mean updates on program requirements, rebate levels, trainings being offered, for example. (Probe if through MidAmerican staff or website, a state or national energy organization, program implementation staff at A-TEC, etc.)

3) Do you feel adequately informed of program changes?

1 Yes
2 No -> How would you like to be better informed of program changes?

4) Are you aware of other utility energy efficiency programs?

1 Yes -> Which ones? Do you have any involvement with these programs—why or why not?
2 No

5) Are customers already aware of the MidAmerican rebates prior to working with you?

1 Yes
2 No

6) How do you present the MidAmerican program rebates to your customers? (Probe: discussion, website information, brochure, fact sheets, etc)

- Which methods do you think are most effective or informative for customers?

D.5 EDUCATION AND OUTREACH

1) Have you received enough support from A-TEC and/or MidAmerican when you needed it?

- IF NO: What support would you like to see added or expanded (and from which entity)?

2) What type of program-specific training was made available to you and your staff? Would you like to see more trainings or outreach activities offered by MidAmerican to support the Residential energy efficiency programs?

- IF YES: What sort of trainings or outreach would you like to see added or expanded?

3) Do you think MidAmerican's marketing strategies have been successful in generating program-related activity for you? How could they be improved to better serve you? What additional tools or support could MidAmerican provide you with to better motivate participation by your customers?

4) Are there markets that you feel MidAmerican's residential energy efficiency programs are reaching well? Are there markets that you feel the program is not reaching well?

- Can you identify approaches that might expand the reach of the program into markets that may be underserved by the program?

5) Are you registered on MidAmerican's Trade Ally Central?

1 Yes → What does that resource provide for you? How valuable do you find those resources? (Probe on program information and updates, marketing materials, applications, etc).

2 No → Are you aware that MidAmerican has a webpage devoted to trade allies? Have you ever visited that site? Why are you not registered?

D.6 PARTICIPATION PROCESS AND SUPPORT

Now I'd like to ask you about the process of working with the MidAmerican rebate programs.

1) What is the process for completing work through the program? Please *briefly* walk me through from initial contact with the customer through the rebate process.

- What is the easiest part of the process?
- What would you like to see improved?

2) [ASK IF CONTRACTOR INSTALLS HVAC EQUIPMENT] Do you install equipment according to SAVE guidelines?

1 Yes → Ask the following:

- How does the proportion of SAVE installations through a MidAmerican program compare with SAVE installations outside of the program?
- What is your general impression of the SAVE quality installation requirements to qualify for MidAmerican incentives? Are the requirements clear? Are the requirements reasonable?
- What do you feel are the primary challenges with SAVE installations?
- What do you feel are the primary benefits of SAVE installations?
- What influence, if any, has MidAmerican's program had on your standard HVAC installation practices?
- How do you leverage the SAVE certification to promote your business? What affect has it had on your business?

2 No → Why not?

3) Are you aware that MidAmerican offers an additional incentive to encourage customers to complete multiple installations?

1 Yes → Using a scale of 1 to 5 where 1 is 'not at all effective' and 5 is 'very effective,' how effective do you think the additional incentive has been?
2 No

5) Using a scale of 1 to 5 where 1 is 'not at all satisfied' and 5 is 'very satisfied' how satisfied are you with the program's technical support?

- [IF RESPONDENT RATES A 1 OR 2, ASK] What could be done to improve the program's technical support?

6) On a scale of 1 to 5 where 1 is 'not at all difficult' and 5 is 'very difficult', how would you rate the program's administrative requirements (e.g., paperwork) for you?

- [IF RESPONDENT RATES A 4 OR 5, ASK] What could be done to lessen the administrative burden?

7) How have your sales changed as a result of the program? Which types of equipment have seen the greatest change?

8) On a scale of 1 to 5 where 1 is 'not at all difficult' and 5 is 'very difficult,' how difficult do you find it to motivate customers to purchase efficient equipment eligible for program rebates?

- Why is energy efficient equipment (easy / difficult) to sell to customers?
- What are the primary reasons why customers typically want to install efficient equipment?
- What are the primary reasons why customers typically do not want to install efficient equipment?

9) What percent of the customers who you initially provide a quote to follow-up and complete the job with you?

- What can be done to increase the number of participating projects in the program?

D.7 MARKET RESPONSE

1) For your projects, how much do you see MidAmerican's residential energy efficiency programs influencing the services you provide and/or the equipment you offer?

3) To what degree do you see the program increasing the interest and demand for energy efficient equipment? [PROBE: comparable degrees of increased interest and demand (e.g., no increase, some increase, significant increase)] Why is that?

4) What issue(s) may affect future program participation? [PROBE: example issues (e.g., changes to building codes and standards promoted in the Midwest, program incentive levels)].

D.8 OVERALL PROGRAM

Now I'd like to wrap up with a few final questions.

1) Using a five-point scale where 1 means "not at all satisfied," and 5 means "very satisfied," overall, how satisfied are you with MidAmerican's residential energy efficiency programs?

2) If you were to recommend anything to MidAmerican regarding the program design or operations, what would it be?

3) Is there anything else you'd like to share with us about MidAmerican's residential energy efficiency programs?

4) In case we would like to clarify anything we discussed, would it be alright if I contacted you again?

   If YES, get best phone number and email address

That is all the questions I have today. If you think of anything you would like to add, please feel free to contact us. Thank you very much for your time.