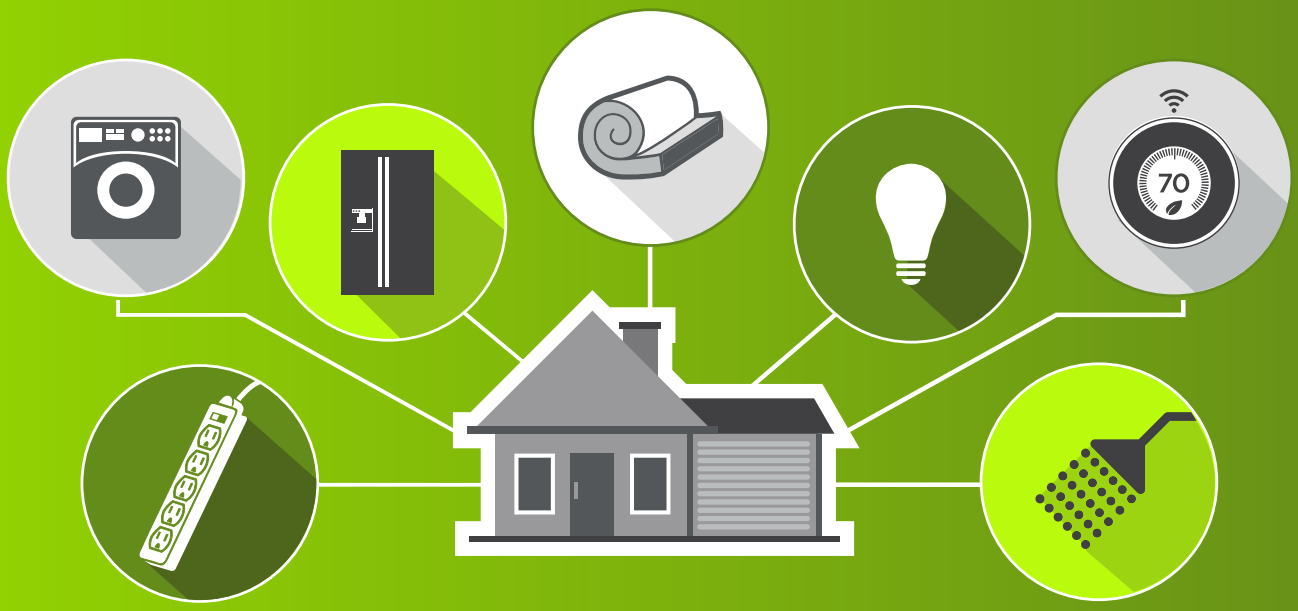


HOME ENERGY SERVICES

Process Evaluation (Res 35)
March 2018

PRODUCED IN COLLABORATION BETWEEN

NAVIGANT ILLUME cadeo bellomy research

PREPARED FOR: THE ELECTRIC AND GAS PROGRAM ADMINISTRATORS OF MASSACHUSETTS
PART OF THE RESIDENTIAL EVALUATION PROGRAM AREA

ABOUT THE HOME ENERGY SERVICES INITIATIVE

The Home Energy Services (HES) initiative is the cornerstone of the Massachusetts Program Administrators' (PA) residential energy efficiency portfolio. It is the primary mechanism non-low-income residential customers living in 1- to 4-unit homes use to partner with their PA(s) to improve their home's existing efficiency. Through the initiative's whole home energy assessment (HEA), the PAs install instant savings measures (e.g., efficient lighting, efficient showerheads and faucet aerators, advanced smart strips, and thermostats) and promote weatherization measures (e.g., air sealing, attic, wall, and basement insulation). The HEA also provides an opportunity to identify and refer customers to other residential initiatives that incentivize heating, cooling, and water heating equipment upgrades.

The PAs deliver HES through two complementary channels:

Lead vendors (LVs). The PAs work with one of the following LVs to implement HES on their behalf: CLEAResult, RISE Engineering (RISE), and the Center for EcoTechnology (CET). LVs complete HEAs for customers that enter HES through traditional channels, such as the MassSave statewide phone number or MassSave.com. LVs are responsible for managing an extensive network of independent installation contractors (IICs) that air seal and insulate homes following HEAs, including providing quality assurance and quality control (QA/QC) services. The LVs and PAs collaborate through a statewide HES Working Group. While the LVs offer relatively consistent services statewide, some differences exist between LVs. Most notably, CET and CLEAResult use one energy specialist to complete each HEA, whereas RISE employs two. Under RISE's model, one energy specialist is primarily responsible for communicating with the customer while the other completes the physical assessment of the home.

Home performance contractors (HPCs). In 2011, the PAs created a second participation channel. HPCs independently market and recruit customers for HEAs. HPCs differ from the LV and IIC delivery approach, as they provide end-to-end services to customers. HPCs complete the assessment and install any energy efficiency improvements customers decide to complete. These improvements can include weatherization measures incentivized through HES, as well as measures through other PA initiatives (e.g., HVAC equipment installation).

In addition to the QA/QC provided by the LVs, the PAs also contract with CMC Energy Services (CMC, previously Competitive Resources, Inc. [CRI]) to complete independent, third-party QA/QC of the HEAs themselves, as well as the HPCs and IICs' weatherization work. In total, CMC completes some form of QA/QC services for one out of ten HES customers. National Grid also contracts with Abode Energy Management for QA/QC services. Abode is charged with overseeing HPCs for National Grid only, including training, contracting, inspections, and reporting.

TARGETED OFFERS

Also, under the HES initiative, the PAs target services and enhanced incentives to two harder to reach customer segments: moderate-income customers and renters and/or landlords. The PAs launched these offers statewide in April 2016, only a few months before the start of this evaluation.

- **Moderate-income offer.** Provides enhanced incentives to income-qualified HES customers (customers with incomes between 61% and 80% of the state median income [SMI]) for weatherization and select appliance improvements. The offer increased since the initial launch with all PAs now offering insulation to qualified customers at no cost (versus standard offer of 75% of the total cost). The PAs and EEAC consultants created a set of 13 key performance indicators (KPIs) to track the performance of the offer.

- **Renter and landlord offer.** Provides enhanced incentives to customers in rental properties and landlords when they successfully work with multiple tenants to weatherize a property. Like the moderate-income offer, the PAs identified a set of KPIs to track, starting at the outset of the new offer.

In just the last three and a half years, the PAs have completed more than 300,000 HEAs.

EVALUATION OBJECTIVES

In September 2016, the PAs collaborated with Navigant, Cadeo, and ILLUME Advising (known as the "evaluation team" throughout this document) to develop an evaluation plan (RES 35) focused on key aspects of HES to prepare for the next 3-year (2019-2021) implementation plan. Specifically, the PAs and the Energy Efficiency Advisory Council (EEAC) consultants organized evaluation objectives within four primary research areas:

1. Performance of the moderate-income and renter-landlord offers
2. Effectiveness of HEAs
3. QA/QC
4. Overall performance

STUDY CONTEXT

TAs noted above, the PAs are continuing to undergo intensive planning efforts supporting the impending statewide 2019-2021 implementation plan. While the specifics are still being worked out, the PAs have indicated that they anticipate meaningful changes to HES' current delivery.

The impetus for considering more meaningful changes, versus further refinement of the current process, are many. Some stem from the PA's understanding that the current design, which has grown in scope and complexity over the years in response to the interests of many stakeholders, may now require more time and expertise than some energy specialists, HPCs, and customer can provide. While the PAs came to this understanding on their own, evidence supporting their conclusion can be found throughout this report. Some of the motivation for larger programmatic change is external to the initiative: increasing federal lighting standards mean that the savings generated by direct install lighting measures, which has historically buoyed total HES savings and offset the non-trivial cost of completing in-person, comprehensive energy assessments, are declining. The lessened future role of direct install lighting savings affords the PA's the opportunity to revisit – in a more fundamental way – the way they currently deliver HES and, potentially, reorient the initiative toward other technologies and/or adopt alternative delivery models.

The PAs are proposing changes to HES delivery as part of the next three-year energy efficiency plan, which has been under development concurrently with this evaluation and will be finalized in October 2018. The evaluation team, PAs, and EEAC designed HES process evaluation activities and this report to serve two purposes. First, to evaluate the recent performance of HES and identify opportunities for improving the current delivery model. Second, to the extent possible given the concurrent but separate nature of this evaluation and planning efforts, help inform the PAs' ongoing residential planning efforts. To this second point, the evaluation team envisions working with the residential planning team beyond the completion of RES 35 to ensure that the team's evaluation findings add context and insight for the final 2019-2021 energy efficiency plan and inform future iterations of HES.

EVALUATION ACTIVITIES

STAKEHOLDER INTERVIEWS

The team began the evaluation by speaking with 14 key staff that manage the implementation of HES for all seven PAs, as well as staff from all three HES LVs: CLEAResult, RISE, and CET. The team also conducted three interviews with CMC staff responsible for providing statewide QA/QC for HES.

CONTRACTOR INTERVIEWS

The team followed these HES manager-level interviews with 18 interviews with the Energy Specialists (which work for the LVs) and HPCs that complete HEAs in participating customers' homes. These interviews complemented top-down perspective offered in the stakeholder interviews and helped highlight the "in the field" strengths of and opportunities for the current HES delivery approach.

REVIEW OF PROGRAM DATA + MATERIALS

Following these interviews, the team reviewed a host of program data and materials (e.g., marketing and customer-facing materials, energy assessment forms, and QA/QC forms and data). The team's data and materials review also included a close look at moderate income and renter offer key performance indicators (KPIs) established by the PAs and EEAC for monitoring the offers' performance.

LITERATURE REVIEW

To understand how program administrators outside Massachusetts deliver comparable residential efficiency programs, the team completed a literature review of 17 programs. The review included an assessment of each program's current approach, as well as plans for responding to similar future challenges (such as declining lighting savings) faced by HES. The team focused its efforts where possible on mature programs and/or programs operating climates zone similar to Massachusetts. The team also completed in-depth follow-up interviews with eight program managers to ask more detailed questions about their experience might benefit the PAs and HES.

KEY PERFORMANCE INDICATOR ANALYSIS

Building on a KPI analysis originally completed as part of a previous HES evaluation, the team used detailed customer-specific data provided by all three LVs to calculate 24 different KPI yielding insight into HES' performance overall, as well as by LV, delivery channel, and PA. Examples of KPIs include: the percentage of customers installation insulation, the percentage of total recommended savings installed, and the percentage of HES customer that also installed a measure through a different PA residential initiative.

MYSTERY SHOPPING

To embed the evaluation team within the initiative and experience the HEA alongside customers, the team used mystery shoppers to experience the HEA process first-hand. The team recruited five households across four different PAs to be a "host house" and observed 13 HEAs completed by LVs and multiple HPCs. Observing multiple HEAs at the same home allowed the team to understand the different approaches Energy Specialists and HPCs use to service identical customers living in identical homes.

PARTICIPANT SURVEYS

The final task completed as part of RES 35 was a survey of 800 customers that received an HEA between Q2 and Q4 2016. The survey, administered in January and February 2018, included a wide-range of topics including: the effectiveness of the HEA, customer's rationale for acting/not acting on HEA recommendations, the HEAT loan, the two new offers, and QA/QC.

TARGETED OFFERS

KEY FINDINGS

#1. Both offers started slow, leading to the PAs to identify opportunities to improve delivery and make midstream changes. Stakeholders were unanimous in their perception that both offers ramped up slowly after the statewide launch in April 2016. They responded, making multiple changes to the way they marketed, delivered, and incentivized the offers.

#2. Many energy specialists and HPCs are uncomfortable talking with customers about income. Energy specialists and HPCs clearly indicated they prefer to avoid discussing income with customers and decide based on their visual assessment of the home whether they will mention the moderate-income offer. The survey findings confirmed this: only 34% of customers recalled the offer mentioned at their HEA. The reticence of energy specialists and HPCs to talk about income is a threat to the success of the moderate-income offer.

#3. A disconnect exists between customer's self-report willingness to complete the income verification process and the rate at which customers actually participate. More than two-thirds of surveyed customers (70%) that self-identified as moderate income expressed a willingness to complete the income verification process. However, the high rate of self-reported willingness to complete the process is at odds with relatively low levels of actual early participation in moderate income offer.

#4. Time is a critical non-monetary barrier for some customers. The disparity between perceived and actual willingness to participate underscores an important truth: customer's time is limited. It's critical the income verification process not only be simple and fast, but also appear simple and fast when presented to customers.

RECOMMENDATIONS

#1. Provide energy specialists and HPCs with verbal tools. One way the PAs can help energy specialists and HPCs broach the topic of income is to provide them with specific language to use. Using specific, vetted language repeatedly will increase comfort with the topic. Another option could be bundling the discussion of the HEAT loan and the moderate-income offer, as both relate to financial offers and energy specialists and HPCs have no problem talking with customers about the HEAT loan.

ONLY 1 IN 3

CUSTOMERS RECALLED THEIR ENERGY SPECIALIST OR HPC MENTIONING THE MODERATE INCOME OFFER

EFFECTIVENESS OF HEAs

KEY FINDINGS

#1. Tension continues to exist between the PAs' desire to comprehensively meet each customer's energy efficiency needs and the limited time energy specialists and HPCs' have in each customer's home. Despite the PAs' best efforts, this long-standing concern about HES still exists. While the rationale behind a comprehensive, whole home approach is clear, the practicalities of effectively delivering it appear to limit the approach's overall value.

#2. Energy specialists and HPCs are finding their own solutions to the "there's not enough time" HEA problem. Interviewees were blunt about finding corners to cut when HEAs run long. They readily shared their personal approaches to saving time; these included avoiding certain ISMs like thermostats and hot water measures and limiting customer interactions at the beginning and end of the HEA. Not all the energy specialists and HPCs are equally experienced and capable of independently deciding which corners to cut.

#3. Thermostats offer an opportunity. Energy specialists and HPCs were clear that not mentioning, let alone offering to install, a thermostat was one of the first shortcuts they take. This is unfortunate since 60% of surveyed customers said they were very or somewhat interested in receiving a thermostat. Alleviating the HEA time pressures and increasing programmable and Wi-Fi thermostat rates would benefit customers and the initiative.

#4. Program stakeholders agree that opportunities exist to modernize, or even reinvent, how the PAs deliver HES. All Interviewee acknowledged that opportunities exist to modernize HES. Many of the PA and LV manager referenced the ongoing 3-year planning saying that wholesale changes to the initiative delivery were possible, if not likely.

To save time, many Energy Specialists and HPCs do not mention programmable or wi-fi thermostats during assessments.

CONSIDERATIONS

In light of the ongoing 2019-2012 planning process, the evaluation team is not offering any specific recommendations for improving the effectiveness of the current HEA model. Rather, below offer four considerations for the HES planning team based on our evaluation findings. It is important to note that some of the considerations below – such as providing energy specialists and HPCs with more specific guidance, as well as giving them greater autonomy – may feel at odds. The PAs will need to carefully consider the relative importance of complementary, as well as potentially conflicting, delivery options as part of the 3-year planning process and make trade-offs as necessary.

#1. Create different assessment paths. Programs reviewed as part of the literature review offered multiple assessment paths, most commonly a

comprehensive assessment and a less intensive walk-through option. The PAs, who indicated they are already exploring multiple paths as part of the ongoing 3-year planning process, will need to carefully design a multiple path approach that balances implementation costs with expected savings and create options other than the current everything-for-everyone approach.

#2. Provide energy specialists and HPCs with specific guidance about how to prioritize their time when an HEA cannot be completed in the allotted time. Energy specialists and HPCs are dealing with their time concerns by taking shortcuts and going as fast as they can. This is not sustainable. In recognition of persistent time issues, the PAs should identify the most critical HEA data collection elements and designate them as mandatory. The energy specialist or HPC should forgo the other less critical elements when there is not enough time.

#3. Establish protocols that provide greater flexibility for energy specialists and HPCs to customize HEAs based on each household's stated needs. Beyond a set of core mandatory elements, the PAs should look to minimize HEA requirements in a manner that allows the energy specialist or HPC to more directly respond to a customer's stated interest.

#4. Leverage technology. Some elements of the HEA still occur on paper, requiring energy specialists and HPCs to subsequently transfer information into an electronic format before generating a customer's recommendations. Inefficiencies such as this are one example of instances greater use of technology could reduce burden and shorten HEAs.

QA/QC

KEY FINDINGS

#1. QA/QC activities are extensive, more than any programs the team reviewed. Most reviewed programs verify installation completeness and quality for about 10% of their projects. CMC alone completes QA/QC for about 10% of projects, while the LVs reported they complete QA/QC inspections for up to 60% of HES projects.

#2. CMC and the LVs capture detailed QA/QC information through the inspection process. However, the LVs and CMC could not provide those detailed QA/QC results electronically. Therefore, it is not possible to quantitatively analyze drivers of QA/QC results and identify opportunities for improvements. Much of the detailed results of the inspections either resides only in hard copy or electronic flat files (e.g., digitally scanned copies of data collection forms with handwritten results and notes) or could not be provided to the evaluation team electronically. As a result, it is not possible for the evaluation team to analyze specific details about the QA/QC visit and/or assess the accuracy or quality of individual QA/QC elements.

There is considerable overlap in CMC and LV activities, yet a lack of consistency in reporting metrics.

#3. Recent changes in CRI's scoring criteria prevented the evaluation team's from assessing statewide trends in QA/QC results over time. The interviewed PAs reported that ongoing QA/QC efforts have improved the quality of HES installation, citing an increasing percentage of IICs qualifying for the initiative's highest performing contractor tier. Data provided by CLEAResult also showed marginal improvements in QA/QC scores

#4. There is considerable overlap in CMC and LV QA/QC activities, information captured, and benefits. Overlaps exist between: 1) CMC's Tier 3 and LVs' final QA/QC, and 2) information gathered in CMC's Tier 2 and Tier 3 QA/QC.

#5. There is a lack of consensus on how QA/QC results should be analyzed, reported, and communicated between PAs and stakeholders. While everyone agrees the purpose of QA/QC is to improve the initiative, the PAs and EEAC have different expectations and perspectives regarding how QA/QC data should be analyzed, reported, and communicated.

#6. Energy specialists and HPCs believe the current QA/QC process has benefits but voiced specific concern around the value of CMC's Tier 1 inspections. Interviewees routinely described CMC's presence as awkward and an imposition, with some feeling it contributes to customer confusion and potentially dissatisfaction.

#7. There is limited feedback around QA/QC results, and no feedback loop related to how energy specialists, HPCs, and/or IICs address identified issues. First, energy specialists and HPCs say they only receive feedback from CMC when there is an issue is discovered. In some instances, feedback occurs weeks after project completion. This leads to delays in rectifying the issue or customer dissatisfaction. Inconsistent communications leaves energy specialists and HPCs unsure on performance. Second, LVs do not share with the PAs or CMC how failed projects are remedied. CMC suggested that this feedback loop be closed so they know the LVs received and addressed their feedback.

#8. CMC and each of the LVs have their own system for calculating performance. This inconsistency confuses energy specialists and contractors, and limits their ability to compare results.

CONSIDERATIONS

#1. Establish a process to capture in-process inspection results. The PAs and EEAC need to work together to agree on how QA/QC results should be used and identify any database requirements needed to make that happen.

#2. The PAs, along with CMC, should consider establishing a process where QA/QC jobs that fail are only marked as complete if CMC verifies the correction is made. For example, LVs could forward follow-up remediation documentation to CMC after completed and approved. CMC would be responsible for reviewing those remediation reports, documenting whether the work sufficiently addressed the issue, marking the QA/QC inspection as complete, and communicating to the LV they closed that project.

RECOMMENDATIONS

#1. Through existing or new working groups, the PAs, EEAC, and any other relevant stakeholders should standardize the type of information collected during inspections and how data are analyzed and shared across stakeholders. The evaluation team recommends the parties agree on the optimal level of QA/QC effort for each HES stage and who (LV, CMC or both) should complete that type of QA/QC. From here, the PAs and EEAC need to determine what data should be collected, analyzed, and reported to various parties for each QA/QC type. The evaluation team recognizes that changing QA/QC processes, data capture, and reporting systems comes with a cost. However, there are also cost inefficiencies under the current system that could be recouped, reallocated more optimally, or improved with additional reporting.

#2. Work with CMC and the LVs to prospectively track the costs for conducting QA/QC statewide and by inspection type. The total cost of statewide QA/QC activities completed by both CMC and LVs, is unknown. Understanding the cost of QA/QC is necessary for determining the value and appropriate level of future investment in QA/QC.

#3. Clearly delineate LV and CMC responsibilities to minimize overlap in QA/QC activities. The evaluation team recommends the PAs work with the LVs and CMC to determine where and how to streamline these activities based on the desired outputs for each type of QA/QC.

#4. Reconsider the format (and potential necessity) of CMC's Tier 1 inspection process. While the PAs report that Tier 1 inspections provide peace of mind related to the energy specialist or HPC interactions with customers, follow-up activities—including customer satisfaction surveys and Tier 2, Tier 3, final inspections, and even evaluation activities—are likely to identify any customer interaction issues. Additionally, it is unclear how the Tier 1 inspection provides on-the-job training since, as currently structured, CMC does not share their inspection in real time. The PAs and CMC should redesign their Tier 1 inspection to involve more immediate and direct communication.

#5. Set up systems to report inspection results that allow the PAs and LVs to more systematically identify specific areas for improvement. Expanding database functionality to report out the individual ratings of all the metrics assessed will enable the PAs and LVs to efficiently analyze and isolate trends and identify where trainings are needed. This additional capability will also more readily allow the PAs to illustrate the value of the QA/QC process to stakeholders.

OVERALL PERFORMANCE

KEY FINDINGS

#1. Annual participation waned somewhat in 2016 and 2017 relative to previous years. Approximately 75,000 customers received HEAs in both 2016 and 2017, a large number, but down from more than 100,000 customers in 2015. Interviewed PA and LVs cited milder winter weather and lower fuel prices as potential factors motivating lower levels of customer enrollment.

#2. Word of mouth remains the dominant way customers learn about HEAs. Of surveyed customers, 31% said they learned about the assessment through a friend, family member, or neighbor. This is more than bill inserts, online searches/MassSave.com, and other mailed marketing materials combined. Also, only a small percentage of customers learned about the assessment via a contractor. This implies that the contractor community is not actively encouraging customers to have a comprehensive assessment through HES.

#3. The online assessment is encouraging participation. Of the survey customers, 20% indicated they completed the online assessment on MassSave.com and that the results led them to sign up for an HEA. This is a non-trivial portion of customers. Overall, more than half of customers visited MassSave.com before their HEA, approximately half of which also took the online assessment.

#4. One-third of all customers installed an HES incentivized major measure. This rate is consistent with the rate determined through the previous KPI study. The similar incidence of major measure customers between studies indicates that, despite the maturity of HES, opportunities continue to exist to weatherize customer homes.

#5. There is a difference in LV recommendation rates. The KPI analysis found that 94% of RISE customers (whether assessed by an energy specialist or HPC) received a recommendation to install insulation. This rate is quite a bit higher than customers served by CLEAResult (71%). The cause of the difference—the LV or the housing stock—is unknown. However, RISE and CLEAResult customers, once recommended insulation, installed at nearly identical rates (42% and 43%, respectively.)

#6. Real differences continue to exist between the LV and HPC channels. Customers receiving their HEA from an LV were more than twice (10.4%) as likely to have been authorized for the HEAT loan as customers served by an HPC (4.9%). The disparity is consistent with the previous KPI study. Also, customers served by HPCs participated less often in the PA's Residential Heating & Cooling Equipment initiative than LV customers (3.9% compared to 6.5%).

CONSIDERATIONS

#1. The PAs need to lessen the gap between delivery channels. As part of the ongoing planning efforts, the PAs should look for opportunities to encourage, whether through systemic changes to HES delivery or targeted incentives, HPCs to more actively promote the HEAT loan and other PA residential programs. Doing so will help ensure the PAs are able to more consistently and completely serve customers statewide.

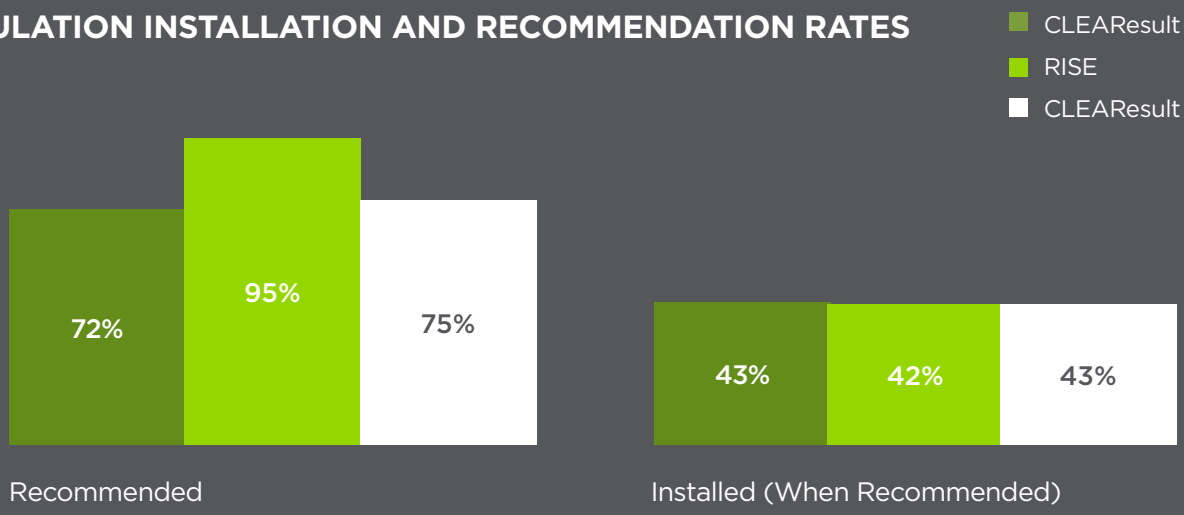
#2. The next implementation cycle needs to include a no-cost assessment option. Of surveyed customers, 96% indicated that the assessment being provided at no-cost was very or somewhat important in their decision have one. Consequently, the PAs should maintain a no-cost path to participation in the next 3-year plan. This recommendation would not preclude the PAs from also offering a more rigorous assessment that required a customer contribution.

RECOMMENDATIONS

#1. The PAs should examine historical trends in participation and consider the implications on future HES design. As noted above, participation in HES declined in 2016 and 2017 relative to previous years. This may be due, as PA and LV managers suggested, to less extreme weather and more favorable fuels prices demotivating customers to enroll. It could also be, at least in part, due to HES, as a result of its long tenure in the state, reaching a participation saturation threshold. It's possible that the customers that have not participated in HES to date will be motivated to do so for different reasons, whether alternative measures or a different delivery mechanism. An analysis of historical HES trends might results in the identification of other harder-to-reach customers segments (specific cultural groups, geographic portions of the state, or customers living in homes of certain age or type) that may be more responsive to alternative strategies.

FIGURE 3

INSULATION INSTALLATION AND RECOMMENDATION RATES



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1. INTRODUCTION

1.1 About the Home Energy Services Initiative

The Home Energy Services (HES) initiative is the cornerstone of the Massachusetts Program Administrators' (PA) residential energy efficiency portfolio. It is the primary mechanism non-low-income residential customers living in 1- to 4-unit homes use to partner with their PA(s) to improve their home's existing efficiency. Through the initiative's whole home energy assessment (HEA), the PAs install instant savings measures (e.g., efficient lighting, efficient showerheads and faucet aerators, advanced smart strips, and thermostats) and promote weatherization measures (e.g., air sealing, attic, wall, and basement insulation). The HEA also provides an opportunity to identify and refer customers to other residential initiatives that incentivize heating, cooling, and water heating equipment upgrades.[1]

The PAs deliver HES through two complementary channels:

- **Lead vendors (LVs).** The PAs work with one of the following LVs to implement HES on their behalf: CLEAResult, RISE Engineering (RISE), and the Center for EcoTechnology (CET).[2] LVs complete HEAs for customers that enter HES through traditional channels, such as the MassSave statewide phone number or MassSave.com. LVs are responsible for managing an extensive network of independent installation contractors (IICs) that air seal and insulate homes following HEAs, including providing quality assurance and quality control (QA/QC) services. The LVs and PAs collaborate through a statewide HES Working Group. While the LVs offer relatively consistent services statewide, some differences exist between LVs. Most notably, CET and CLEAResult use one energy specialist to complete each HEA, whereas RISE employs two. Under RISE's model, one energy specialist is primarily responsible for communicating with the customer while the other completes the physical assessment of the home.
- **Home performance contractors (HPCs).** In 2011, the PAs created a second participation channel. HPCs independently market and recruit customers for HEAs. HPCs differ from the LV and IIC delivery approach, as they provide end-to-end services to customers. HPCs complete the assessment and install any energy efficiency improvements customers decide to complete. These improvements can include weatherization measures incentivized through HES, as well as measures through other PA initiatives (e.g., HVAC equipment installation).

In addition to the QA/QC provided by the LVs, the PAs also contract with CMC Energy Services (CMC, previously Competitive Resources, Inc. [CRI]) to complete independent, third-party QA/QC of the HEAs themselves, as well as the HPCs and IICs' weatherization work. In total, CMC completes some form of QA/QC services for one out of ten HES customers. National Grid also contracts with Abode Energy Management for QA/QC services. Abode is charged with overseeing HPCs for National Grid only, including training, contracting, inspections, and reporting.

[1] Home Energy Services (HES) offers incentives for oil and propane heating and water heating systems, as well as gas and all heating equipment retired early. During the HEA, all heating and cooling incentives and rebates are presented to the customer, including those available through the Heating & Cooling program, i.e., rebates for gas heating equipment not retired early and all cooling equipment rebates

[2] CLEAResult is the LV for Eversource and National Grid, while RISE is the LV for Cape Light Compact, Columbia Gas, Liberty Utilities, and Unitil. CET is the LV for Berkshire Gas.

Energy Federation, Inc. (EFI) also supports the PAs' delivery of HES by processing rebates for a portion of HES measures and the monies related to the PAs' zero-interest HEAT loan financing offer.[3]

Also, under the HES initiative, the PAs target services and enhanced incentives to two harder to reach customer segments: moderate-income customers and renters and/or landlords. The PAs launched these offers statewide in April 2016, only a few months before the start of this evaluation.

- **Moderate-income offer.** Provides enhanced incentives to income-qualified HES customers (customers with incomes between 61% and 80% of the state median income [SMI]) for weatherization and select appliance improvements.[4] The offer increased since the initial launch with all PAs now offering insulation to qualified customers at no cost (versus standard offer of 75% of the total cost). The PAs and EEAC consultants created a set of 13 key performance indicators (KPIs) to track the performance of the offer.
- **Renter and landlord offer.** Provides enhanced incentives to customers in rental properties and landlords when they successfully work with multiple tenants to weatherize a property. Like the moderate-income offer, the PAs identified a set of KPIs to track, starting at the outset of the new offer.

The PAs have completed HEAs at more than 300,000 different homes since July 2014.

It is important to understand the scale of HES. Since July 2014, the PAs have completed more than 300,000 HEAs statewide, including those in moderate-income and rental properties. According to the latest American Community Survey, there are just over 2 million 1- to 4-unit households in Massachusetts. This means that in only 3 years, HES touched more than 15% of customers eligible for HES. Combining this participation rate with the hundreds of thousands of customers that received HEAs prior to July 2014, the considerable reach—and importance—of HES is clear. The magnitude of historical HES participation also underscores the importance of actively tracking participation trends over time. Analysis of these trends will offer the PAs insight into the initiative's overall market penetration and allow them to continue to evolve HES in ways that will help realize the remaining savings opportunities within the residential sector.

1.1.1 Report Terminology

This report uses several important terms throughout:

- **Customer.** An individual or household—identified by a unique account number—that receives an HEA.
- **Participant.** An individual or household, also identified by a unique account number, which installs at least one recommended HES measure (as defined below) following an HEA. HES participants are a subset of HES customers.

[3] HES customers can use the HEAT loan to finance qualifying space and water heating system upgrades, air conditioners and heat pumps, insulation, and window replacements. More information about the HEAT loan and qualifying measures can be found on MassSave.com: https://www.masssave.com/en/saving/residential-rebates/heat-loan-program/

[4] More information about the moderate-income offer can be found on MassSave.com: https://www.masssave.com/en/saving/energy-assessments/enhanced-residential-program/

- **Instant savings measures (ISMs).** ISMs are the measures directly installed by energy specialists during the HEA or, in the case of smart strips and sometimes programmable/Wi-Fi thermostats, are left behind for the customer to install.
- **Recommended measures.** During the HEA, energy specialists identify and recommend more significant energy efficient improvements that the customer could undertake following the HEA. ISMs and recommended measures are mutually exclusive—any measure that is not an ISM is a recommended measure. Recommended measures are not limited to those incentivized through HES and include those offered through the complementary Residential Heating & Cooling Equipment initiative.
- **Major measures.** Not all recommended measures offer similar savings potential. Some recommend measures like insulation provide considerably greater savings, on average, than other recommended measures like pipe wrap. In recognition of these differences, the evaluation team classified a subset of the recommended measures as *major* measures and, like the previous study, used several of the KPIs to directly assess the rate at which customers are installing these important recommended measures.

A complete list of HES measures, including each measure's classification (e.g., ISM, Recommended – Major, Recommended – Non-Major) and fuel type can be found in Portfolio A.

1.2 About the Evaluation

1.2.1 Objectives

In September 2016, the PAs collaborated with Navigant, Cadeo, and ILLUME Advising (known as the "evaluation team" throughout this document) to develop an evaluation plan (RES 35) focused on key aspects of HES to prepare for the next 3-year (2019-2021) implementation plan. Specifically, the PAs and the Energy Efficiency Advisory Council (EEAC) consultants organized evaluation objectives within four primary research areas:

1. Performance of the moderate-income and renter-landlord offers
2. Effectiveness of HEAs
3. QA/QC
4. Overall performance

Portfolio B lists the 18 specific research objectives identified in the Stage 3 plan.

1.2.2 Context

As noted above, the PAs are continuing to undergo intensive planning efforts supporting the impending statewide 2019-2021 implementation plan. While the specifics are still being worked out, the PAs have indicated that they anticipate meaningful changes to HES' current delivery.

The impetus for considering more meaningful changes, versus further refinement of the current process, are many. Some stem from the PA's understanding that the current design, which has grown in scope and complexity over the years in response to the interests of many stakeholders, may now require more time and expertise than some energy specialists, HPCs, and customer can provide. While the PAs came to this understanding on their own, evidence supporting their conclusion can be found throughout this

report. Some of the motivation for larger programmatic change is external to the initiative: increasing federal lighting standards mean that the savings generated by direct install lighting measures, which has historically buoyed total HES savings and offset the non-trivial cost of completing in-person, comprehensive energy assessments, are declining. The lessened future role of direct install lighting savings affords the PA's the opportunity to revisit – in a more fundamental way – the way they currently deliver HES and, potentially, reorient the initiative toward other technologies and/or adopt alternative delivery models.

The PAs are proposing changes to HES delivery as part of the next three-year energy efficiency plan, which has been under development concurrently with this evaluation and will be finalized in October 2018. The evaluation team, PAs, and EEAC designed HES process evaluation activities and this report to serve two purposes. First, to evaluate the recent performance of HES and identify opportunities for improving the current delivery model. Second, to the extent possible given the concurrent but separate nature of this evaluation and planning efforts, help inform the PAs' ongoing residential planning efforts. To this second point, the evaluation team envisions working with the residential planning team beyond the completion of RES 35 to ensure that the team's evaluation findings add context and insight for the final 2019-2021 energy efficiency plan and inform future iterations of HES.

1.2.3 Brief Description of Evaluation Activities

To meet the research objectives listed above, the evaluation team completed seven primary evaluation activities. Each is briefly described below. The report contains additional details related to the methodology of each activity.

Stakeholder interviews. The team began the evaluation by speaking with 14 key staff that manage the implementation of HES for all seven PAs, as well as staff from all three HES LVs (CLEAResult, RISE, and CET). The team also conducted three interviews with CMC staff responsible for providing statewide QA/QC for HES. The interviews primarily focused on the following:

1. Performance of recently launched moderate-income and renter offers
2. Effectiveness of the current HEA delivery model
3. QA/QC requirements, reporting, and communication
4. Any anticipated changes to the PAs' delivery of HES

The team submitted a memo (provided in Portfolio C) summarizing its findings in March 2017.

Energy specialist and HPC interviews. The evaluation team followed the HES manager-level interviews with 18 energy specialist and HPCs interviews. These interviews complemented the top-down perspective offered in the stakeholder interviews and identified the "in the field" strengths of and opportunities for the current HES delivery approach. The team summarized its discussions with the Energy Specialists and HPCs in a memo (provided in Portfolio D) in April 2017.

Review of program data and materials. Next, the team reviewed program data and a variety of materials (e.g., marketing and customer-facing materials, energy assessment forms, and QA/QC forms and data). The team summarized its review of the QA/QC data specifically in a November 2017 memo (Portfolio E). The team's data and materials review also included a close look at moderate-income and renter offer KPIs created by the PAs and EEAC to monitor each offer's performance. The team documented its review of the new offer KPIs, which included diagrams detailing how the PAs deliver the offers, in a May 2017 memo (provided in Portfolio F).

Secondary literature review. To understand how PAs outside Massachusetts deliver comparable residential efficiency programs, the team completed a literature review of 17 similar programs across the country. The review included an assessment of each program's current approach and its plans for responding to similar future challenges (such as declining lighting savings) faced by HES. The team focused its efforts, where possible, on mature programs and/or programs operating in climate zones similar to Massachusetts. The team also completed in-depth follow-up interviews with eight program managers to ask more detailed questions about their experience that could benefit the Massachusetts PAs and HES. The team summarized the literature review and interview findings in a memo (found in Portfolio G) in April 2017.

KPI analysis. Building on a KPI analysis completed as part of a previous HES evaluation,[5] the evaluation team used detailed customer-specific data provided by all three LVs to calculate 24 different KPI-yielding insights into HES' performance overall and by LV, delivery channel, and PA. Examples of KPIs include: the percentage of customers installing insulation, the percentage of total recommended savings installed, and the percentage of HES customers that also installed a measure through a different PA residential initiative. The team presented preliminary KPI results in September 2017 and documented its final KPI calculations via report in November 2017 (provided in Portfolio J).

Mystery shopping. The evaluation team participated as mystery shoppers to experience the HEA process first-hand. The team recruited five households across four different PAs. Participating households set up HEAs with LVs and HPCs, each completing 1-2 HEAs. In total, the team observed 13 HEAs. Observing multiple HEAs at the same home allowed the team to understand the different approaches LV energy specialists and HPCs use to service the same home. The team presented initial findings in June 2017 and documented final findings in a mystery shopping-specific report in August 2017 (Portfolio H).

Participant surveys. The final task completed as part of RES 35 was a survey of 800 customers that received an HEA between Q2 and Q4 2016. The survey, administered in January and February 2018, included a wide range of topics including: the effectiveness of the HEA, a customer's rationale for acting/not acting on HEA recommendations, the HEAT loan, the two new offers, and QA/QC. Prior to launching the survey, the evaluation team created an analysis plan

[5] http://ma-eeac.org/wordpress/wp-content/uploads/HES-and-HEAT-Loan-Program-Assessment-Final-Report.pdf

detailing the survey topic area, the sample frame, and the PA- and channel-specific stratum targets.

1.3 How to Use This Document

This document consists of two parts: **Evaluation Summary** and **Evaluation Portfolio**.

The **Evaluation Summary** (Section 2) distills the findings from the activities the evaluation team completed as part the HES process evaluation. In this section, the evaluation team highlights key findings, related recommendations, important connections across evaluation activities, and implications for the initiative as the PAs head into the next 3-year implementation cycle.

The second part of this report is the **Evaluation Portfolio** (A-K). It contains the 11 deliverables the evaluation team created as part of this study, including task-specific findings memos. The task-specific findings memos offer significantly more detail about each activity's methodology and findings than is provided in the Evaluation Summary. Readers should refer to the Evaluation Portfolio for an in-depth discussion of each activity.

In addition to the Evaluation Summary and Portfolio contained in this document, the evaluation team also created a third, separate **Evaluation Appendix.** Provided separately to the PAs, the Evaluation Appendix includes the half dozen interview guides and survey instruments that the team used to complete this process evaluation.

2. EVALUATION SUMMARY

The evaluation team focused its efforts on four aspects of HES:

1. Moderate-income and renter offers added to HES in April 2016
2. Effectiveness of the HEAs
3. QA/QC process
4. Overall performance of the initiative

The team's findings and recommendations for each topic are summarized in the following sections.

2.1 Targeted Offers

2.1.1 About the Offers

As noted above, the PAs began targeting two harder to reach customer segments (moderate-income customers and renter and landlord) through specialized marketing and enhanced incentives in April 2016.[6]

The process of ensuring awareness of the new offers begins when each customer enrolls. The exact process used by each PA varies, but all PA attempt to determine home ownership status and notify customers regarding the availability of the moderate-income offer when they sign up for their HEA. They also mention the offers in follow-up e-mail communications and promote it via the online assessment on MassSave.com.

If the initiative is unable to definitively establish moderate income qualification prior to the HEA, energy specialists and HPCs are responsible for notifying the customer during the HEA itself. Awareness is key for not only communicating the additional support that renters and moderate income customer may need to improve the efficiency of their own home, but also for spreading word about the offers generally. Even if a specific customer does not qualify, they could know someone else—a neighbor, family member, or friend—that might qualify and benefit from the enhanced incentives. This type of informal communication and promotion is key for newer initiative elements as word of mouth was again identified (through the evaluation's customer survey) as the way most customers heard about HES.

2.1.1.1 Renter Offer

The renter offer was conceived during discussions related to the current 3-year implementation plan (2016-2018 plan). The offer's intent was to encourage greater participation by renters in 1-4-unit homes and, secondarily, landlords of similar rental properties.

The renter and landlord process starts when a customer calls to schedule their assessment. During the initial intake call, the scheduler determines whether the customer is renting their home. If so, the scheduler encourages the renter to engage their landlord and request the landlord attends the HEA. Having the landlord, the final decision maker regarding any air sealing or insulation installation decisions,

[6] CLC has offered the moderate-income and renter-landlord offers since 2007 and 2010, respectively.

at the initial HEA expedites the assessment process and opens access to more comprehensive energy solutions and higher incentive levels.[7] According to PA reporting at the April 2017 EEAC meeting,[8] the intake screen process has been successful, with 83% of renter visits attended by the landlord.

Under the new offer, customers in rental properties and landlords that successfully work with multiple tenants to weatherize an entire property are eligible for enhanced insulation and appliance incentives. At the start of the new offer, the PAs covered 90% of insulation costs up to $3,000 for eligible rental properties, which, at the time, represented an increase from the PA's standard offer of 75% up to $2,000. However, to encourage greater participation for all customers, the PAs since removed the cap on weatherization incentive costs, whether rental properties or not.[9] Consequently, the PA renter new offer became 90% of total insulation costs if all eligible units participate.[10] In addition to the enhanced insulation incentives, all PAs offer higher clothes washer ($400 instead of the standard $300) and refrigerator ($200 rather than $150) incentives for renters and landlords.

2.1.1.2 Moderate-Income Offer

The moderate-income offer provides enhanced insulation and appliance incentives to income-qualified HES customers (those between 61% and 80% of SMI). Like the renter and landlord offer, the moderate-income offer has evolved over time and increased from the original offer of 90% of the costs up to $3,000). The PAs currently provide insulation at no costs, without a cap, for qualifying moderate income customers.[11]

Unlike the renter and landlord offer, which are identified as appropriate when scheduling the assessment, energy specialists or HPCs mention the moderate-income offer and provide customers with a flyer during the HEA if they identify weatherization opportunities within the home. All PAs also communicate information about the moderate income offer in advance of the HEA. The customer then decides whether to participate in a no-cost income verification process completed by a local community action agency.[12] The PAs have taken steps to simplify the income verification process. Currently, customers only need to provide their HEA identification number, a heating or electric bill, and 1 month's proof of income for every adult in the home. Further, at the time of the writing of this evaluation, the PAs were close to introducing an online portal for income verification.

After completing the verification process, the agency notifies the customer's LV with the results. If the agency confirms the customer's income is between 61% and 80% of the SMI, the LV or HPC revises the weatherization contract and appliance rebate forms to reflect the enhanced incentive levels.

Outside of the HEA, the PAs are marketing both offers via landing pages, language and links on MassSave.com, through social media and community events, and through emails In early 2017, the PAs

[7] Offer requirements and incentive levels differ somewhat by PA, building type (1 unit vs. 2-4 units), and the number of participants (everyone in the building or just some tenants). These details are all documented on the Renters page on MassSave.com.

[8] http://ma-eeac.org/wordpress/wp-content/uploads/HES-Renter-Moderate-Income-Update.pdf

[9] Eversource and National Grid removed the cap on weatherization incentives in June 2017; the other PAs did so February 2018.

[10] More information about the renter offer can be found on MassSave.com (https://www.masssave.com/en/saving/energy-assessments/renters/)

[11] More information about the moderate income offer can be found on the MassSave.com.

[12] Unlike the other PAs, CLC completes the income verification process themselves.

partnered with Renew Boston and the Green Justice Coalition to create, print, and distribute thousands of flyers in multiple languages explaining the renter and moderate-income offers.

2.1.1.3 Early Performance

During the first six months (April 2016-September 2016), participation in both offers was limited: only 58 rental buildings received whole building incentives for insulation and 76 moderate income customers completed the income verification process. The evaluation team's interviews with PA and LV managers and a sample of energy specialists and HPCs in late 2016 and early 2017 yielded insight into the early performance of the offers:[13]

- The renter and landlord offer had been more successful than the moderate-income offer to date
- The moderate-income offer was experiencing considerable challenges affecting participation
- The referral process to the moderate-income offer was relatively passive, which may have contributed to slow progress
- Energy specialists and HPCs felt the verification process inhibited customers from participating in moderate-income offer
- Offers had not been implemented long enough to definitively determine their effectiveness

As previously noted, the PAs have made numerous changes to the incentives levels, marketing, and delivery since these interviews to address these early challenges. The PAs are also considering other venues to reach customers, such as through community action agencies (e.g., customers that approach the agencies for income-eligible services but have a household income above 60% of the SMI).

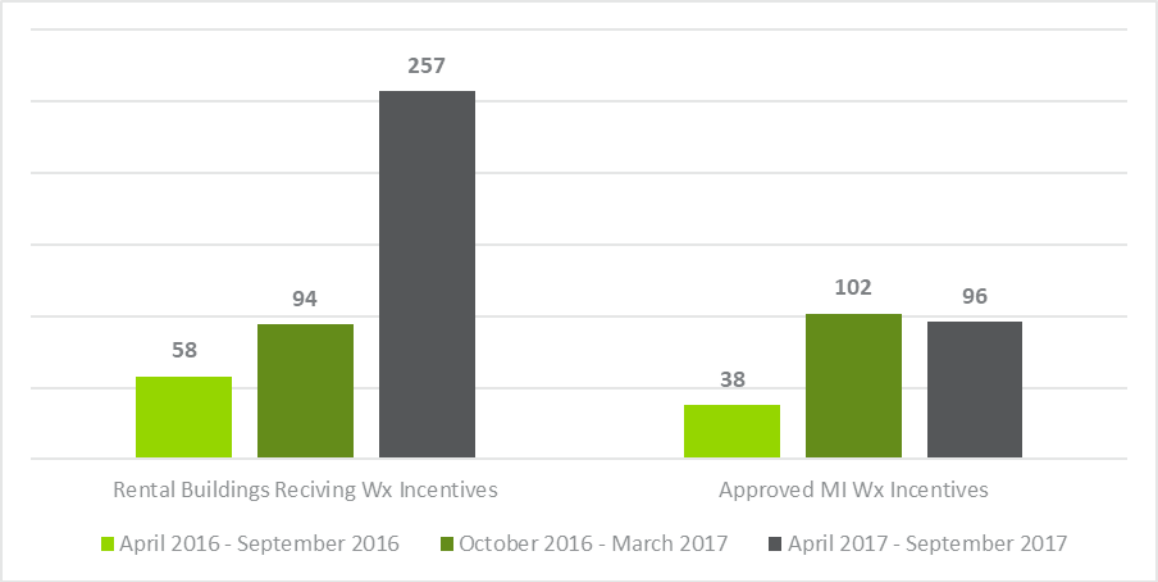
The PAs and EEAC also collaboratively created KPIs, 13 for each offer, to track the participation and effectiveness of the offers. The PAs presented the first year's KPI findings in April 2017. The presentation indicated increased participation, especially for the moderate-income offer, over time. In May 2017, the evaluation team reviewed the KPIs for completeness. The team found the existing set of KPIs was robust and would enable the PAs and EEAC to monitor each offer's performance over time.[14]

Since May, the PAs and EEAC completed another round of KPI analysis, reflecting 18-months of offer implantation. The analysis showed generally increasing participation in the renter offer and improved, but stable, participation in the moderative income offer.

[13] The team communicated these findings to the PAs via task-specific findings memos in December 2016 (PA and LV managers) and April 2017 (Energy Specialists and HPC).

[14] The team's review of the offer KPIs is provided in the Evaluation Portfolio (Portfolio F). The memo also includes flow diagrams illustrating the PAs' delivery of each offer.

Figure 1. New Offer Participation



To understand the perspective of customers that went through the offers, the evaluation team attempted to survey all customers that participated from Q2 to Q4 2016. Unfortunately, the team was only able to complete surveys with a small, statistically insignificant number of customers that received incentives through either offer (15 in total).

While the survey did not yield reliable insight into the experience of offer participants during the first year of the offers, it did provide meaningful insight into how often energy specialists and HPCs are mentioning the offers to customers that potentially qualify (i.e., received recommendations for insulation or appliance update as part of their HEA) and whether customers are willing to go through the additional steps required to participate and qualify for the enhanced incentives.

According to the customer survey, only one-third (34%) of more than 600 surveyed customers that received a recommendation for a weatherization recalled their energy specialist mentioning the moderate-income offer during the HEA. The recall rates were statistically significantly higher[15] for customers that went through the LV channel (37%) than those that received their HEA from an HPC (29%).

Only 1 in 3 customers recalled their energy specialist or HPC mentioning the moderate-income offer.

The low recall rates identified through the customer survey are consistent with the evaluation team's own observations during the mystery shopping visits: none of the energy specialists or HPCs mentioned the enhanced incentive for moderate-income customers to any of the mystery shopping customers. While none of the mystery-shopped customers were eligible for the moderate-income offer (the evaluation team asked each customer prior to their first mystery shopping visit), the visits confirmed that energy specialists and HPCs are making assumptions about customer incomes based on their observations during the HEA rather than notifying all customers about the availability of the offer. The evaluation team's interviews with these energy specialists and HPCs after the mystery shopping confirmed this suspicion and revealed that

[15] The findings were at a 95% confidence.

they, in general, are reluctant to discuss income, prefer to avoid the topic entirely and tend to not mention the offer if a customer – based on their observation of the home and personal judgment – seems unlikely to meet the income qualifications.

70% of HES customers that self-identified as moderate-income expressed a willingness to complete the income verification process.

The survey also included a series of questions where customers could self-identify as likely eligible for the moderate-income offer. The result of this battery contradicts the energy specialists and HPC concern that the income verification process was a significant barrier to participation. In total, 157 customers self-identified as having a household income between 61% and 80% of the SMI and did not participate in the offer. When asked to rate the likelihood that they would participate in the income verification process to qualify for the enhanced incentives (using a scale of 1 to 5, where 1 is not at all likely and 5 is very likely), 70% provided a response of 3, 4, or 5.

Of the 30% indicating they were unlikely to undertake the verification process, most indicated they just did not have time. This survey result indicates that, for almost one-third of customers self-reporting income eligibility, either the current enhanced incentives are insufficient to motivate them to undertake another step in the participation process, or that their barrier to participation is non-monetary. In the latter cases, enabling participation will only happen with improvements to the offer or HES delivery (e.g., making the process faster, simpler, and easier for time-constrained customers to qualify and/or participate).

2.1.2 Key Findings

#1. Both offers started slowly, leading to the PAs to identify opportunities to improve delivery and make midstream changes.
Stakeholders were unanimous in their perception that both offers ramped up slowly after the statewide launch in April 2016. They responded, making multiple changes to the way they marketed, delivered, and incentivized the offers. The PAs and EEAC's next KPI analysis will shed light on how successful these changes were at increasing measure installation rates for these two harder to reach customer segments.

#2. Many energy specialists and HPCs are uncomfortable talking with customers about their income.
The evaluation team's interviews with energy specialists and HPCs, the initiative's primary messengers, clearly indicated that they prefer to avoid discussing income with customers. The mystery shopping task revealed that energy specialists and HPCs are making assumptions based on their visual assessments of the home about a customer's income level and decided whether to mention the moderate-income offer or not. The survey findings confirmed this: only one-third of customers that received a recommendation for insulation or a qualifying appliance recalled that their energy specialist or HPC mentioned the offer at their HEA. Also, customers served by HPCs reported lower recall rates (29%) than customers who received their HEA from a LV energy specialist (37%). The reticence of energy specialists and HPCs alike to talk about income is a threat to the success of the moderate-income offer.

#3. A disconnect exists between customer's self-report willingness to complete the income verification process and the rate at which customers actually participate.
After hearing a description of the moderate income offer, incentives, and income verification process more than two-thirds of surveyed customers (70%) that self-identified as moderate income expressed a willingness to complete the income verification process. However, the high rate of self-reported willingness to complete the process in order to qualify for the enhanced incentives is at odds with relatively low levels of actual early participation in moderate income offer.

#4. Time is a critical non-monetary barrier for some customers.
The disconnect described in the previous finding is due in part to the survey results exhibiting some level of social desirability response bias (i.e., the respondents want to present themselves as accommodating). However, the magnitude of disparity between perceived and actual willingness underscores an important truth: customer's time is limited so the process needs to not only be simple and fast, but also appear simple and fast when presented to customers. When faced with the prospect of starting the income verification process (versus a hypothetical process), it's likely many of the customers that expressed their willingness to do so may find they do not have time for "one more thing". That's the response the evaluation team heard from the nearly one-third of survey customers that indicated they were unlikely to undertake the income verification process. Almost all of them cited time as the reason why. This finding speaks to the importance of making the income verification process itself as simple as possible and, just as importantly, making sure prospective participants perceive the process as straightforward and fast.

2.1.3 Recommendations

#1. Provide energy specialists and HPCs with verbal tools.
One way the PAs can help energy specialists and HPCs overcome their self-reported reticence to talking about income is to provide them with specific language to use. Using scripted, vetted language repeatedly will increase their comfort with the topic. Another way to make energy specialists and HPCs more comfortable would be to leverage their comfort talking about of the HEAT loan by discussing the

moderate-income offer at the same time. While the loan is clearly different than the moderate-income offer, both are money-related mechanisms created by the PAs to enable customers to improve the efficiency of their homes. Discussing the offer and loan jointly will allow the energy specialists and HPCs to build off their existing comfort with the loan and more easily broach the subject of the moderate-income offer.

2.2 HEA Effectiveness

2.2.1 About HEAs

The HEA affords the PAs a valuable opportunity to access customer's home, identify, and recommend whole home energy solutions across fuel types and PA initiatives while delivering instant savings via direct-install measures. The benefits of a comprehensive home assessment delivery model like HES are clear, which is why most of the weatherization programs that the evaluation team assessed as part of its literature review task employ a similar model.

Over time, the PAs have added measures and offers to HES to better serve their customers. Consequently, the complexity of the assessment and the data collection, measure installation, and communications responsibilities of the energy specialist have grown commensurately. In other words, the benefits of adding new elements, however well intended or effective, further add to the list of requirements the energy specialist or HPC needs to complete during their limited time in the customer's home. As a result, the evaluation team heard—both from PA and LV staff that manage HES and from the energy specialists and HPCs conducting the assessments—that it is often difficult to complete all the required HEA elements in the allotted time.

They cited a multitude of reasons, most notably:

- The time required to install the initiative's various direct-install measures
- Collecting the detailed information regarding building characteristics, mechanical equipment, and appliances necessary to generate customized recommendations and reports
- The sheer amount of information they need to communicate to the customer about HES and the PA's complementary offers

2.2.1.1 Implications of Time-Constrained HEAs

Although energy specialists and HPCs said they are generally able to complete assessments in the expected amount of time, they reported they often cut corners to do so. The most common implications of rushing to complete all the required HEA elements include the following:

- **Avoiding time-consuming, non-lighting, direct-install measures, notably programmable and Wi-Fi-enabled thermostats.** Interviewed energy specialists and HPCs readily shared that to save time they either do not mention programmable thermostats to the customer or, when they do, they prefer to leave it behind (which is permitted by the PAs[16]) rather than install it. The team's mystery shopping observations validated this sentiment. During the six HEAs at homes with a manual thermostat, the energy specialist and/or HPC only mentioned the programmable thermostat option to the customer once. (In the instance, the energy specialist left it behind for the customer to install.) Similarly, the Wi-Fi thermostat incentive was only mentioned twice during the 13 HEAs.

> *To save time, many energy specialists and HPCs do not mention programmable or Wi-Fi thermostats during assessments.*

[16] CLC does not permit programmable thermostats to be left behind uninstalled.

During their post-mystery shopping interviews, energy specialists and HPCs were frank that time constraints were the major reason they do not mention or deemphasize thermostats.

Somewhat counter to the statements of the interviewed energy specialists, and the evaluation team's observations while mystery shopping, the KPI analysis indicated, at a statewide level, that approximately 1 in 3 customers do receive at least one thermostat. This rate outpaces the small, qualitative mystery shopping sample and is more than double the thermostat installation rate (15%) determined as part of the previous KPI analysis. Regardless, the evaluation team's discussions with dozens of energy specialists and HPCs clearly reveal that thermostats would likely have a greater penetration if they were not under the current HEA time pressures. It is also important to note that KPI results – that 1 in 3 customers receives at least one thermostat – includes the thermostats energy specialists and HPCs install, as well as those left behind for the customer to install. The installation rate for thermostats left behind with customers is currently unknown.[17]

- **Limiting customer interaction time, particularly the critical end of the HEA results and recommendation discussion.** The time required to install ISMs, complete the required testing, and gather detailed building characteristics directly affects how much time energy specialists and HPCs can spend with the customer. Interviewed energy specialists and HPCs commonly lamented that it was often their direct interactions with the customers—the vital sit-down at the conclusion of the HEA—that was cut short as a result of time constraints. Anecdotally, the team's interviews, as well as mystery shopping observations, indicated this issue – HEA time pressures limiting customer interaction – is more severe for the one-person HEA model. The final discussion with the customer is critical to the success of the HES because that is the forum energy specialists and HPCs use to communicate the value of the identified efficiency improvements, explain the financial support the PAs can provide, and convince the customer to act on the HEA recommendations. It is possible that additional customer interactions would increase the percentage of customers that act on HEA recommendations. The mystery shopping activity found that energy specialists and HPCs spend, on average, 20 minutes with customers at the end of each HEA. During this time, energy specialists and HPCs provide all the required paperwork and options associated with the HEA and discuss recommendations. The evaluation team observed that these interactions often felt rushed. Again, anecdotally, the team did not observe a difference in the length of the post-HEA discussion between the one- and two-person HEAs model. However, the team did observe that the two-person model resulted in more customer interaction throughout the HEA.

2.2.1.2 Streamlining Efforts and Ideas

Hearing that HEAs are complex and time-consuming will not surprise anyone familiar with HES. The PAs have continually worked to streamline the energy specialist/HPC and customer HEA experience and only add elements to the already lengthy list of HEA requirements after much deliberation and discussion.

Recognizing the complexity, the PAs completed several efforts to streamline the initiative. A recent example of streamlining noted by a variety of interviewees was the redesigned HEA materials—often referred to as the leave-behind folder—introduced in July 2016. The PAs collaborated to revamp the previous HEA materials, consolidating what was previously communicated to customers and placing more emphasis on next steps toward participation. The PA and LV managers interviewed said that the new materials appear more effective. The interviewed energy specialists and HPCs agreed. They described

[17] It is important to note that installing wi-fi- thermostats requires more time and expertise than installing a programmable thermostat.

the leave-behind folder as simplified, noting the materials included less detail, which made it easier for customers to digest. The energy specialists and HPC did not go as far as to say that the new materials have shortened the assessment length or helped close more sales, but that the simplified information made it easier to present HEA results and next steps.

The evaluation team's interviews identified a few other potential opportunities to streamline or adjust the current HEA model:

- **Use technology in the HEA.** Although there are a few exceptions, energy specialists and HPCs are primarily capturing data from the walkthrough via paper and entering that information into a laptop at the end of the assessment. They then print the report, which is left behind with the customer. Interviewed energy specialists and HPCs expressed an interest in using tablets or other mobile means for collecting and recording data in real-time while conducting the assessment. Several PAs and one LV manager also discussed a desire for using more mobile devices and electronic processes to gather and communicate information, including web portals to share HEA results with customers. PA and LV managers also shared that an online scheduling tool to complement the phone-based process would be beneficial. Improving technology is often identified as silver bullet, but there are significant equipment and labor costs associated with the large-scale changes. It is possible that the PAs can benefit from National Grid's experience working with EnergySavvy, a utility customer experience platform provider. According to National Grid, the EnergySavvy interface will allow the National Grid to control its software system and data, linking customer-specific data within the interface and manage functions such as intake, scheduling, and energy modeling. The interface is specifically designed to allow energy specialists to enter information using a tablet (which would replace the standard laptops most energy specialist and HPCs currently use) as the assessment is being completed. The system will also change the customer experience; for example, customers will be able to log in and download home assessment reports. Additionally, the system should streamline the income verification and moderate-income eligibility approval process. Because National Grid works with all LVs except CET, many HES stakeholders statewide will be exposed to this system once fully launched. Depending on National Grid's experience, as well as the cost implications, other PAs may elect to adopt a similar approach in the future.

  Much of the information collected during assessments is captured on paper and entered electronically later.

- **Gather more information prior to the HEA.** Another option for streamlining the HEAs is for initiative intake staff to gather more information from the customer during the HEA sign-up process. Obtaining greater information during enrollment would, in theory, reduce the amount of information the energy specialist or HPC would need to collect while at the home. However, interviewed energy specialists and HPCs did not believe that collecting additional information in advance would be helpful, especially if self-reported by the customer. They noted that homeowners are often uninformed or misinformed on the details of their homes and mechanical systems beyond the standard information (approximate size, home type, and year built). However, the interviewed energy specialists and HPCs did feel that having greater insight into why the homeowner or renter signed up for HES would be helpful prior to the HEA. Better information about the specific interests and needs of the customer heading into the HEA would allow the energy specialist or HPC to focus on that customer's interests while also identifying and presenting other meaningful energy efficiency opportunities within the home. Achieving this balance requires skilled energy specialists, but successfully achieving this balance could result in increased installation rates and customer satisfaction and reduced total HEA time.

2.2.2 Key Findings

#1. Tension continues to exist between the PAs' desire to comprehensively meet each customer's energy efficiency needs and the limited time energy specialists and HPCs' have in each customer's home.
Multiple evaluation activities confirmed, despite the PAs' best efforts, that this long-standing concern about HES still exists. While the rationale behind a comprehensive, whole home approach is clear, the practicalities of effectively delivering it appear to limit the approach's overall value.

#2. Energy specialists and HPCs are finding their own solutions to the "there's not enough time" HEA problem.
Interviewees were blunt about finding corners to cut when HEAs run long. They readily shared their personal approaches to saving time; these included avoiding certain ISMs like thermostats, showerheads, and faucet aerators, limiting customer interactions at the beginning and end of the HEA, and eyeballing equipment age rather than seeking out the information on the equipment's name plate. None of the shortcuts shared were unreasonable. Many, like eyeballing the age of the furnace as clearly eligible for the PAs' early retirement incentive, are the kind of real-world actions that savvy and experienced field technicians can and should make. However, not all energy specialists and HPCs are equally experienced and capable of independently deciding which corners to cut. For this reason, energy specialists and HPCs would benefit from—and, in many cases requested—explicit guidance from the PAs about how to handle HEAs that run long.

#3. Thermostats offer an opportunity.
Energy specialists and HPCs stated that not mentioning, let alone offering to install, a thermostat was one of the first shortcuts they take when running out of time during an HEA. This is unfortunate since 60% of surveyed customers said they were very or somewhat interested in receiving a thermostat through the initiative. Alleviating the HEA time pressures and increasing programmable and Wi-Fi thermostat rates would benefit customers and the initiative. It is also possible that the PAs will need thermostats to take a more prominent role within HES as part of the next implementation cycle due to dissipating lighting savings and the ability of smart thermostats to enable participation in future demand response initiatives.

#4. Program stakeholders agree that opportunities exist to modernize, or even reinvent, how the PAs deliver HES.
Interviewed PA and LV managers, energy specialists, and HPCs collectively acknowledged and identified opportunities to modernize HES. Many of the PA and LV manager referenced the ongoing 3-year planning saying that wholesale changes to the initiative delivery were possible, if not likely. The managers were clear that discussions were preliminary, but many topics were on the table, including the creation of different participation paths, increased tailoring of HEAs to focus on the specific interest stated by each customer, more involvement from the state's HVAC contractor community, and greater use of technologies during the HEA, as well as during enrollment and post-HEA follow-up.

2.2.3 Considerations

In light of the ongoing 2019-2012 planning process, the evaluation team is not offering any specific recommendations for improving the effectiveness of the current HEA model. Rather, below offer four considerations for the HES planning team based on our evaluation findings. It is important to note that some of the considerations below – such as providing energy specialists and HPCs with more specific guidance, as well as giving them greater autonomy – may feel at odds. The PAs will need to carefully consider the relative importance of complementary, as well as potentially conflicting, delivery options as part of the 3-year planning process and make trade-offs as necessary.

#1. Create different assessment paths.
Programs reviewed as part of the literature review offered multiple assessment paths, most commonly a comprehensive assessment and a less intensive walk-through option. When the evaluation team interviewed the managers of these programs, the team asked whether there was concern that the dual approach might keep customers from taking the more comprehensive path. The interviewed managers indicated that the dual path approach has not inhibited customer participation in the more comprehensive path. They went on to say that customers that realize they need more after the walk-through assessment often go on to participate in the more in-depth audits and make comprehensive improvements to their home. However, an interviewed program manager for a utility that offered both a comprehensive and walk-through audit in the past shared that they ended their walk-through audit due to cost-effectiveness challenges. Another potential path includes expanding and/or leveraging the current online assessment in a way it could more directly impact the customer's subsequent in-home energy assessment. The PAs, who indicated they are already exploring multiple paths as part of the ongoing 3-year planning process, will need to carefully design a multiple path approach that balances implementation costs with expected savings and create more options than what is currently offered. It is also worth noting that the PAs offered multiple participation paths in the past. It would be helpful to revisit the strengths and weaknesses of the previous multiple path option – in the context of current HES measures and services – and identify any lessons learned relevant to the current or future program design.

#2. Provide energy specialists and HPCs with specific guidance about how to prioritize their time when an HEA cannot be completed in the allotted time.
Energy specialists and HPCs are currently dealing with their time concerns by taking the shortcuts described above and simply going as fast as they can. This is not sustainable. Recognizing persistent time issues, the PAs should identify the most critical HEA data collection elements and designate them as mandatory. The energy specialist or HPC should forgo the other less critical elements when there is not enough time. The evaluation team knows that the process of identifying non-essential HEA elements will not be easy since the PAs, as noted previously, have long been judicious with how they ask energy specialists and HPCs to spend their limited time in a customer's home. Regardless, the realities of the challenges faced during HEAs require that the PAs designate some aspects of the current HEA as mandatory and others as non-essential. This may also require a change to the QA/QC process, as the current process rates energy specialists and HPCs based, in part, on the completeness of their HEA activities.

#3. Establish protocols that provide greater flexibility for energy specialists and HPCs to customize HEAs based on each household's stated needs.
In addition to providing guidance about how to handle time-constrained HEAs, the PAs should revisit the existing HEA protocols to provide energy specialists and HPCs greater autonomy in line with the overarching objectives of the initiative. That is, beyond a set of core mandatory elements, the PAs should look to minimize HEA requirements in a manner that allows the energy specialist or HPC to more directly respond to a customer's stated interest. Allowing assessors, which have benefited from significant training and QA/QC oversight, to focus more on a customer's interests during the HEA and less on the requirements of the HEA itself could result in higher measure adoption rates.

#4. Leverage technology.
Some elements of the HEA still occur on paper, requiring energy specialists and HPC to subsequently transfer information into an electronic format before generating a customer's recommendations. Inefficiencies such as this are one example of instances greater use of technology could reduce burden and shorten HEAs. Opportunities to use technology to improve and/or expedite HES are not limited to the HEA. Other improvements, such as enabling customer to sign up for their HEA online (versus calling the

MassSave statewide phone number) may be the marginal convenience improvements that cause a customer aware of HES to finally enroll. The PAs, again through the 3-year planning process and their ongoing discussions with LV, should seek out opportunities to leverage technology, whether within the current design or as part of a larger HES redesign. As noted above, National Grid's experience using EnergySavvy may offer insight into technological solutions for other PAs.

2.3 QA/QC

2.3.1 About the QA/QC Process

The PAs make considerable investment in the QA/QC process, with multiple types of QA/QC conducted by both the LVs and the statewide contractor, CMC. Therefore, this evaluation had a concerted focus on QA/QC. The remainder of this section describes the existing QA/QC process and highlights key findings and recommendations related to QA/QC.

First, readers should note that this section uses the term *assessment* to refer to the HEA itself, while the term *inspection* refers to the QA/QC of the HEA or installed measure(s). This section also uses the term *contractor* to refer to the person/company that installed the recommended major measure(s). This could be an IIC or HPC.

2.3.1.1 Inspection Activities and Outputs

Two entities primarily complete QA/QC for HES participants: the statewide third-party independent QA/QC contractor, CMC, or the LVs. (As noted previously, Abode also provides National Grid with oversight of HPCs). Both groups verify project quality and identify issues, although their processes and information capture methods vary.

CMC completes QA/QC inspections for up to 10% of HES customers. Between 2015 and 2016, CMC completed provided QA/QC for approximately 15,600 projects, accounting for about 9% of all projects in those years. CMC characterizes its inspections by tier, defined by the focus of the inspection:

- **Tier 1** inspections are those in which CMC accompanies an energy specialist or HPC during the HEA and assesses the installation of ISMs, identifies any missed opportunities (i.e., recommendations that should have been identified but were not), and observes the overall professionalism and interactions with customers.
- **Tier 2** inspections occur after the HEA to verify installation of reported ISMs and to administer customer satisfaction surveys. CMC completes Tier 2 inspections outside of the HEA or IIC processes.
- **Tier 3** inspections verify the proper installation of weatherization measures after the IIC or HPC completes their work. CMC also administers customer satisfaction surveys during Tier 3 inspections.

Each PA individually provides CMC with an annual quota of how many inspections CMC must complete by tier and contractor type (IIC or HPC).

The PAs require that all CMC staff that provide weatherization inspections have BPI Building Envelope and Analyst certifications. The PA's also express a preference for infrared scan certifications, although that is not required. The PAs also require that CMC staff participate in the Mass Save boot camp trainings.

During the QA/QC visit, the CMC inspector documents results via hard copy, noting whether the inspection passed, passed with notifications,[18] or failed. In the event of failure, the inspector also documents the reason for failure and next steps. The evaluation team's analysis of data provided by CMC found that the most common reasons for failure included: reported ISM quantity not found, the wrong product was used, the product is not working, the location where the product is installed is not allowed by HES, and the customer removed the product. Multiple missed opportunities will also cause projects to fail a Tier 2 or Tier 3 inspection. Following the onsite inspection, the inspector or CMC's data entry department enters the data into CMC's system.

To document their findings, CMC provides each PA with PDF files associated with every inspection that failed or passed with notifications weekly. CMC also sends PDF results of all inspections, regardless of the result, and a summary of performance overall and by contractor to the PAs monthly. While CMC enters specific information about each inspection into its internal database, it can only export and provide PAs with summary results of the inspection (e.g., pass/fail), overarching notes for each project, and customer satisfaction ratings by question.

LVs also conduct two types of QA/QC:

- **Weatherization in-process inspections** occur near the end of weatherization-related measure installations. The inspection provides an opportunity to identify installation issues as they are happening, which minimizes IIC and HPC return visits. Again, LVs view in-process inspections as a training opportunity as much as a QC check.
- **Final inspections** verify the proper installation of weatherization measures after the IIC or HPC has completed their work.

Between 2014 and 2016, LVs inspected approximately 32,700 participants, most of which were final inspections. CLEAResult conducted most of the inspections. However, these counts likely underrepresent LVs' overall QA/QC effort since, per interviews, the LVs do not systematically capture in-process inspections.

Similar to CMC, the PAs work with their LVs to set overall inspection quotas and goals by inspection type. According to interviews with the PAs and LVs, CET and CLEAResult are more likely to complete final inspections versus in-process inspections, whereas RISE reportedly completes a similar percentage of in-process and final inspections. Additionally, the LVs view QA/QC, particularly in-process QA/QC, as a part of their standard offerings to the PAs and not a separate line item activity.

LVs do not formally capture results of weatherization in-process inspections; rather they provide feedback directly to the HPC or IIC in real time. LVs do, however, document the results of all final inspections via a hard copy information collection form. The specific information collected by each LV varies, as does the scoring system each uses and what constitutes whether a project passes, although the scoring methodology is largely consistent. At minimum, all LVs record the overall project results (e.g., pass/fail with some project details) electronically. Until early 2017, only CLEAResult consistently entered final inspection details like whether specific installations passed quality requirements into a database. RISE modified its data system in 2017 and now also tracks final inspection results electronically in greater detail.

[18] Pass with notifications indicates measures that passed but the inspector identified areas for improvement or the inspector recorded specific notes, including compliments. The evaluation team's review of Tier 2 and Tier 3 QA/QC data provided by CMC found considerable variability in the type of notes included with pass with notifications results; however, the notes oftentimes reference homeowner accounts and/or concerns.

Table 1 summarizes, by CMC and LV, the type of inspection completed at each stage of HES. Both CMC and the LVs complete inspections during the HEA and after weatherization. Theoretically, CMC and the LVs target different customers, although interviewees noted that there are a small portion of customers that may receive inspections by both groups due to communication issues. The PAs have worked with CMC and LVs to develop processes to eliminate these issues.

Table 1. Inspection Types by Organization

Project Stage	CMC	LV
During the HEA	Tier 1 inspection	N/A[19]
Post-HEA	Tier 2 inspection	N/A
During weatherization	N/A	In-process weatherization
Post weatherization	Tier 3 inspection[20]	Final inspection

Source: Program documentation, interviews, and follow-up communication with PAs

2.3.1.2 How PAs and LVs Use QA/QC

The LVs use the collective results of these inspections, as well as the standardized customer survey, to score IICs and HPCs. The LVs assign those with higher average scores more projects, whereas those with lower scores are identified as needing training or perhaps even put on probation until their quality improves.

LVs notify contractors (IICs and HPCs) of projects that fail or pass with notifications. Contractors report back to LVs when they remedy the issue and may provide photos to show the correction. Finally, the PAs and LVs meet quarterly to discuss QA/QC results, identify prevalent issues, and assess additional training needs. They rely on the project-specific reports produced by CMC and final inspection reports produced by LVs to identify these issues.

Figure 2 summarizes the previously discussed types of QA/QC activities, the focus of each inspection, what information is provided as a result of the inspection, and how the PAs use the results to manage the initiative. As the figure highlights, each type of inspection is reportedly beneficial to the PAs and contributes to the overall quality of HES. Portfolio K catalogs the information provided the evaluation team related to QA/QC. It enumerates the specific detailed reports we received from CMC and the LVs, and the information contained within them, and how the PAs and LVs use the information to deliver HES.

[19] LVs occasionally mentor and shadow (i.e., observe) HPCs during HEAs, but they do not formally complete an HEA-focused inspection.

[20] As of Q4 2017, Eversource is no longer using CMC to QA/QC insulation; CMC now only provides Tier 1 and 2 QA/QC for Eversource

Figure 2. QA/QC Processes and Outputs

		WHAT IS REVIEWED	BEING QA/QC'D	CONDUCTS QA/QC & TYPE	OUTPUTS	BENEFIT
HOME ENERGY ASSESSMENT	DURING	Energy specialist professionalism and communications, proper identification and installation of ISMs, diagnostics tests performed, and customer satisfaction	ES, HPC	CMC (TIER 1)	• Communicated to PAs/LVs • Monthly PDF summaries, by project and overall. • Installation and quality issues communicated via PDF within one week. • Other summary reports produced monthly or quarterly	• Assurance HPCs and energy specialists are following protocols and conducting themselves to MassSave standards
	POST	Installation of reported ISMs, appropriateness of recommendations, missed opportunities, and customer satisfaction	ES, HPC	CMC (TIER 2)	• Communicated to PAs/LVs • Monthly PDF summaries, by project and overall. • Installation and quality issues communicated via PDF within one week. • Other summary reports produced monthly or quarterly	• Independent verification of invoiced ISMs • Confidence in meeting metrics, many of which are based on ISM installation rates • Identify training needs • Score IIC and HPC based on quality and service; distribute work per scores
WEATHERIZATION	DURING	Safe and proper installation of weatherization measures, adherence to MassSave installation guidelines	HPC, IIC	LV* (IN-PROCESS)	• Verbal feedback provided to HPCs and IICs	• Ensure proper installation • On-the-job training • Address installation and quality issues immediately
	POST	Installation of reported ISMs, safe and proper installation of weatherization measures, and customer satisfaction	HPC, IIC	CMC (TIER 3), LV* (FINAL INSPECTION)	• Communicated to PAs and (for CMC) LVs • Monthly PDF summaries, by project and overall. • Installation and quality issues communicated via PDF within one week. • Other summary reports produced monthly or quarterly	• Independent verification of invoiced ISMs • Ensure proper installation • Identify training needs • Score IIC and HPC based on quality and service; distribute work per scores

ES ENERGY SPECIALISTS · LV LEAD VENDOR · HPC HOME PERFORMANCE CONTRACTOR · IIC INDEPENDENT INSTALLATION CONTRACTOR · CMC CONSERVATION MANAGEMENT CORPORATION

*As of Q4 2017, Eversource is no longer using CMC to QA/QC insulation; CMC now only provides Tier 1 and 2 QA/QC for Eversource.

2.3.2 Key Findings

#1. HES QA/QC activities are more extensive than any other program the team reviewed.
As part of the literature review, the evaluation team reviewed available documentation and interviewed staff managing home performance-focused programs across the country about their QA/QC processes. The literature review yielded general information on nature and extent of QA/QC activities but did not obtain the results of the QA/QC activities. Based on our review, no other program had as extensive QA/QC processes as Massachusetts. Most reviewed programs verify installation completeness and quality for about 10% of their projects, which appears to be standard in the industry. In Massachusetts, CMC alone completes QA/QC for about 10% of projects, while the LVs reported they complete either in-process or final weatherization QA/QC inspections for up to 60% of HES projects.

#2. CMC and the LVs capture detailed QA/QC information through the inspection process. However, the LVs and CMC could not provide those detailed QA/QC results electronically. Therefore, it is not possible to quantitatively analyze drivers of QA/QC results and identify opportunities for improvements.
The evaluation team reviewed the QA/QC processes employed by CLEAResult, RISE, CET, and CMC. The team's review indicates that CMC and the LVs are collecting a considerable amount of data during the inspections. However, the detailed results of the inspections either resides only in hard copy or electronic flat files (e.g., digitally scanned copies of data collection forms with handwritten results and notes) or could not be provided to the evaluation team electronically. As a result, it is not possible for the evaluation team to analyze specific details about the QA/QC visit and/or assess the accuracy or quality of individual QA/QC elements.

#3. Recent changes in CRI's scoring criteria prevented the evaluation team's from assessing statewide trends in QA/QC results over time.
The interviewed PAs reported that ongoing QA/QC efforts have improved the quality of HES installation, citing the fact that an increasing percentage of IICs qualify for the initiative's highest performing contractor tier. Unfortunately, it is not possible for the evaluation team to confirm this improvement using CMC data as CMC revised its scoring approach during this review period making year-over-year comparisons inaccurate. However, data provided by CLEAResult, which maintained relatively consistent scoring methods, showed marginal improvements in QA/QC score, with the average score increasing from 9.2 in 2014 to 9.4 in 2016.

#4. There is considerable overlap in CMC and LV QA/QC activities, information captured, and benefits.
Figure 2 illustrates that there is overlap between the CMC and LV processes.

- **Tier 3 and final inspections** completed by CMC and LVs, respectively, look for the same type of information and have the same benefits for HES. It is not clear from the PAs' documentation the value of having both organizations complete these final inspections. The difference in ratings and what is being reviewed leads to confusion and inconsistency in communication of performance to HPCs and IICs (discussed further in subsequent QA/QC findings). It is important to note that some PAs recently stopped using CMC for Tier 3 inspections.
- **CMC's Tier 2 and Tier 3** QA/QC both verify ISM installations and look for missed opportunities. Therefore, it is plausible to use the Tier 3 QA/QC to address the same needs met through Tier 2 QA/QC activities.

#5. There is a lack of consensus on how QA/QC results should be analyzed, reported, and communicated between PAs and stakeholders.
While everyone agrees that the purpose of QA/QC is to improve the initiative, the PAs and EEAC have different expectations and perspectives about how QA/QC data should be analyzed, reported, and communicated. The disagreement stems from differences in expectations. The PAs' implementation teams reported the current process enables them to successfully manage HES and believe it meets the objectives of the QA/QC activities. Other stakeholders do not disagree that the current process is aiding initiative implementation but would like to see QA/QC results used more directly to improve processes and be reported over time as evidence of initiative improvement—in part to justify the significant investment the PAs are making in QA/QC and to justify the effectiveness of QA/QC through objective, quantitative analysis.

#6. Energy specialists and HPCs believe the current QA/QC process has benefits but voiced specific concern around the value of CMC's Tier 1 inspections.
During interviews, energy specialists and HPCs, as well as those part of the mystery shopping task, consistently voiced concern about Tier 1 audits and CMC's presence during the assessment process, which were designed to ensure that HPCs focused on HEA and not selling customers on non-HES items. They routinely described CMC's presence as awkward and an imposition, with some feeling it contributes to customer confusion and potentially dissatisfaction. Interviewees also raised concern about the lack of communication. They commented that they do not receive any feedback on their performance unless there are issues and, on the occasions that they do receive feedback, it is typically provided a week or more after the HEA. They voiced that immediate feedback would be much more valuable than receiving corrective feedback a week or two after the HEA. This does not necessarily mean there is not value for Tier 1 QA/QC. From the PA perspective, CMC's Tier 1 inspection provides peace of mind regarding the energy specialist and HPC interactions with customers and eliminates the need to impose on customers' time to conduct QA/QC activities through a separate visit. However, observational theory might argue that the observed energy specialist/HPC and customer interactions may be different without an inspector present.

#7. There is limited feedback around QA/QC results, and no feedback loop related to how energy specialists, HPCs, and/or IICs address identified issues.
Interviewed PAs, LVs, and energy specialists highlighted two communication gaps. First, consistent with the feedback on Tier 1 inspections, energy specialists, HPCs, and IICs noted they only receive feedback from CMC when there is an issue discovered during the inspection. Further, delays in communication can lead to delays in addressing the issue and customer dissatisfaction. For example, one energy specialist said he encountered three situations in the past 6 months where their team did not receive feedback on a specific issue until weeks after the HEA. (Note that CMC reports that they notify LVs and PAs of failed inspections weekly.) Second, LVs do not share with the PAs or CMC how failed projects are remedied, if they are remedied, and/or any verification that they were remedied properly. LVs do capture this information, it's just that they do not communicate to CMC the corrective actions taken. CMC suggested closing this feedback loop—they would like information on the corrections or actions LVs take to confirm the LVs received their feedback and addressed it appropriately.

#8. CMC and each of the LVs have their own system for calculating performance.
HES has statewide KPIs, requirements, and standards regardless of the implementing PA. Further, CMC and the LVs' overarching objectives—to verify quality of installation and improve program impacts—are consistent. Therefore, it is unclear the benefit of having the verification protocols differ by organization. Additionally, the inconsistency does not allow for the PAs or EEAC to combine the information and report QA/QC results at a statewide level. Note that if there are changes made in what is collected, they will need to be accounted for in what is required within the HEA process (as discussed in the prior section).

2.3.3 Considerations

#1. Establish a process to capture in-process inspection results.
The LVs treat the in-process inspections informally. LVs provide direct feedback to HPCs and IICs while on-site, but do not record the feedback formally. This represents a missed opportunity for identifying common installation issues and then developing training content and process improvements to proactively address the same issues as part of future projects. We recommend the PAs and LVs consider a process for systematically collecting and entering into a tracking system in-process inspection results, both inspections that passed and specific areas for improvement where identified.

#2. The PAs, along with CMC, should consider establishing a process where QA/QC jobs that fail are only marked as complete if CMC verifies the correction is made.
For example, LVs could forward follow-up remediation documentation to CMC after completed and approved. CMC would be responsible for reviewing those remediation reports, documenting whether the work sufficiently addressed the issue, marking the QA/QC inspection as complete, and communicating to the LV they closed that project. Doing so will provide the feedback CMC needs to ensure appropriate corrections took place, a role they should have as the independent statewide QA/QC contractor.

2.3.4 Recommendations

#1. Through existing or new working groups, the PAs, EEAC, and any other relevant stakeholders should standardize the type of information collected during inspections and how data are analyzed and shared across stakeholders.
The evaluation team recommends the parties agree on the optimal level of QA/QC effort for each HES stage and who (LV, CMC or both) should complete that type of QA/QC (per recommendation #3). From here, the PAs and EEAC need to determine what data should be collected, analyzed, and reported to various parties for each QA/QC type. For example, it is worth discussing whether the LVs in-process inspections serve a QA/QC need as well as a training opportunity and, if so, establish systems that ensure the QA/QC element is effective. The evaluation team recognizes that changing QA/QC processes, data capture, and reporting systems comes with a cost. However, there are also cost inefficiencies under the current system that could be recouped, reallocated more optimally, or improved with additional reporting.

#2. Work with CMC and the LVs to prospectively track the costs for conducting QA/QC statewide and by inspection type.
The total cost of statewide QA/QC activities completed by both CMC and LVs, is unknown. The PAs can estimate total QA/QC costs as a percentage of the HES budget but are unable to provide detailed costs on QA/QC. Understanding the cost of QA/QC overall, as a percentage of HES budget, and by type of inspection (in-process, final inspection, and CMC tiers) is one input necessary for determining the value and appropriate level of future investment in QA/QC. Based on interviews, the evaluation team understands the LVs may track QA/QC costs by inspection type. If that is the case, then the PAs should work with those LVs to identify a consistent approach for calculating costs (e.g., estimate full-time

equivalent hours) in the near-term, while establishing requirements for documenting and reporting actual costs as soon as practicable.

#3. Clearly delineate LV and CMC responsibilities to minimize overlap in QA/QC activities.
As documented, there is considerable overlap in CMC and LV activities. This overlap undoubtedly comes with a cost with potentially marginal benefits. The evaluation team recommends the PAs work with the LVs and CMC to determine where and how to streamline these activities based on the desired outputs for each type of QA/QC.

#4. Reconsider the format (and potential necessity) of CMC's Tier 1 inspection process.
While the PAs report that Tier 1inspections provide peace of mind related to the energy specialist or HPC interactions with customers, follow-up activities—including customer satisfaction surveys and Tier 2, Tier 3, final inspections, and even evaluation activities—are likely to identify any customer interaction issues. Additionally, it is unclear how the Tier 1 inspection contributes to the objective of providing on-the-job training since, as currently structured, CMC does not share their inspection in real time, and there is no opportunity for dialogue during or immediately after the HEA. If the intent of this inspection is to provide that real-time training in addition to providing QA/QC during the HEA process, then the PAs and CMC should redesign their Tier 1 inspection to involve more immediate and direct communication. For example, a short debrief immediately following the completion of the HEA would allow CMC to communicate any issues right away and provide instantaneous feedback.

#5. Set up systems to report inspection results that allow the PAs and LVs to more systematically identify specific areas for improvement.
Currently, ratings for inspected areas (e.g., insulation, work quality components, etc.) are only reported on the project-specific forms. All data-focused summary reports focus on the overall grade/rating and, except for customer satisfaction, do not report the individual elements that inform the ratings (e.g., failure reasons). The evaluation team understands that the PAs feel that the current system was designed and works well for program implementation. However, by expanding database functionality to report out the individual ratings of all the metrics assessed, it will be much more efficient to analyze and isolate trends and identify where trainings are needed. This additional capability will also more readily allow the PAs to illustrate to stakeholders the value of the QA/QC process, an important bonus given the cost incurred. Again, this is a discussion that needs to take place in the context of the decisions around how data should be analyzed, per Recommendation #1.

2.4 Overall Performance

In addition to the topic-specific key findings and recommendations in the previous sections, the team's evaluation activities provided several insights into the overall performance of HES.

2.4.1 Key Findings

#1. Annual participation waned somewhat in 2016 and 2017 relative to previous years.
Approximately 75,000 customers received HEAs in both 2016 and 2017, a large number, but down from more than 100,000 customers in 2015. Interviewed PA and LVs cited milder winter weather and lower fuel prices as potential factors motivating lower levels of customer enrollment.

#2. Word of mouth remains the primary way customers learn about HEAs.
Of surveyed customers, 31% said they learned about the assessment through a friend, family member, or neighbor. This is more than bill inserts (10%), online searches/MassSave.com (10%), and other mailed marketing materials (7%) combined. Also, only a small percentage of customers (5%) indicated they first learned about the assessment via a contractor.

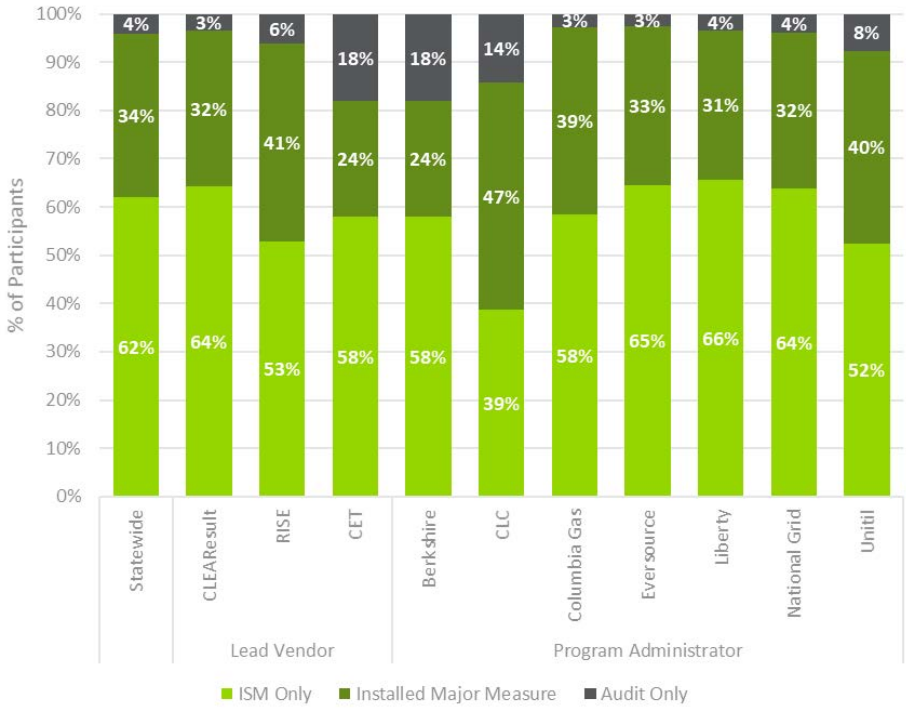
#3. The online assessment is encouraging participation.
Of the survey customers, 20% indicated they completed the online assessment on MassSave.com and that the results led them to sign up for an HEA. This is a non-trivial portion of customers. Overall, more than half of customers visited MassSave.com before their HEA, approximately half of which also took the online assessment.

#4. One-third of all customers[21] installed a HES-incentivized major measure.
This rate is generally consistent with the rate determined through the previous KPI study[22] (32%). The similar incidence of major measure customers between studies indicates that, despite the maturity of HES, opportunities continue to exist to weatherize customer homes. The evaluation team found higher major measure participation rates for CLC, Columbia Gas, Unitil and, relatedly, for RISE.

[21] Customers that received an HEA between July 2014 and the end of 2016.

[22] The previous KPI analysis focused on HES customers that received an HEA between July 2011 and June 2014.

Figure 3. Participation Types

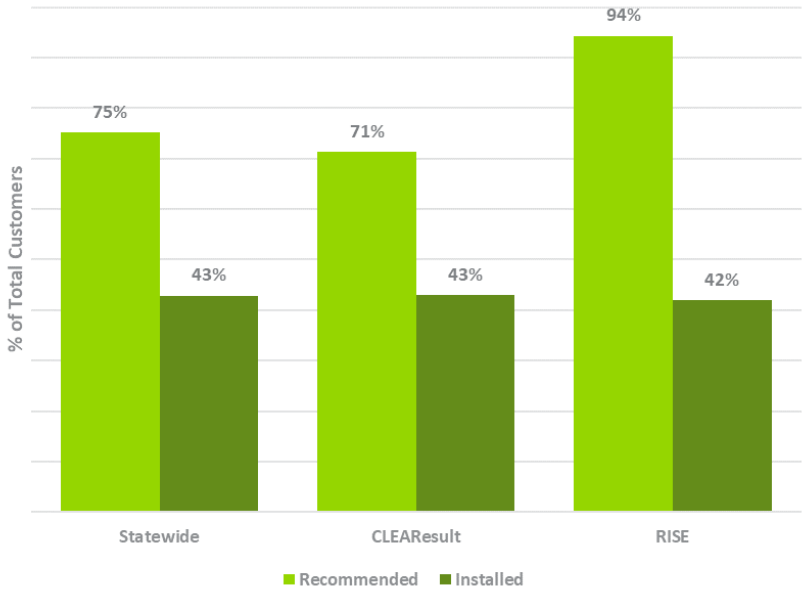


Source: Evaluation team analysis of 2014-2016 HES LV data

#5. There is a difference in LV recommendation rates.

The KPI analysis found that 94% of RISE customers (whether assessed by an energy specialist or HPC) received a recommendation to install insulation. This rate is quite a bit higher than customers served by CLEAResult (71%). The cause of the difference—the LV or the housing stock—is unknown. However, RISE and CLEAResult customers, once recommended insulation, installed at nearly identical rates (42% and 43%, respectively.) Differences in tracking systems between LVs prevented the team from including CET in this comparison.

Figure 4. Insulation Installation and Recommendation Rates



Source: Evaluation team analysis of 2014-2016 HES LV data

#5. Real differences continue to exist between the LV and HPC channels.
While the evaluation team did not observe differences between delivery channels for recommendation or install rates, the team did find a few other notable differences:

- **HEAT loan authorization rates.** The evaluation team found a meaningful difference in HEAT loan authorization rates between delivery channels. Specifically, customers receiving their HEA from an LV were more than twice (10.4%) as likely to have been authorized for the HEAT loan as customers served by an HPC (4.9%). The disparity by delivery channel is not new; the previous KPI study found nearly identical delivery channel-specific findings: 10% authorization rates for LV customers and 5% for HPC customers.

- **Cross-initiative participation.** Customers served by HPCs are also less likely to participate in the PAs' Residential Heating & Cooling Equipment initiative. The team's KPI analysis found—again, similar to the findings of the previous KPI study—a meaningful lower rate of cross-participation for HPC customers (3.9%) than customers assessed by energy specialists (6.5%). This may be a function of the fact that many HPCs are former IICs and more comfortable with insulation measures than with heating and cooling equipment. This relates to the finding immediately above; if customers served by HPCs are less likely to cross-participate then it follows that they would also be less likely to seek authorization for the HEAT loan since the out-of-pocket cost of insulation is much lower than heating and cooling equipment, even after accounting for PA incentives. Statewide, the team determined that 5.7% of HES customers are cross-participants. This represents a modest increase from the previous KPI analysis result (5.3%), although the two values are unlikely to be statistically different.

2.4.2 Considerations

#1. The PAs need to lessen the gap between delivery channels.
As part of the ongoing planning efforts, the PAs should look for opportunities to encourage, whether through systemic changes to HES delivery or targeted incentives, HPCs to more actively promote the

HEAT loan and other PA residential programs. The current gap, which has persisted since the addition of the HPC channel, likely means that greater savings—achieved through greater cross-initiative participation and improving education and promotion related to financing—are being missed. It is important that the PAs make all reasonable efforts to decease the current disparity. Doing so will help ensure the PAs are able to more consistently and completely service customers statewide.

#2. The next implementation cycle needs to include a no-cost assessment option.
Of surveyed customers, 83% indicated that the assessment being provided at no-cost was very important in their decision have one. Another 16% said it was somewhat important. These results indicate that a sizable percentage of customers might not have enrolled in HES if the PAs charged an assessment fee. Although the savings generated by lighting ISMs will likely be unable to underwrite the cost associated with free assessments to the same degree as previous cycles, the PAs should maintain a no-cost path to participation in the next 3-year plan. This recommendation would not preclude the PAs from also offering a more rigorous assessment that required a customer contribution. It also does not preclude a program design where customer pay a free for their assessment, but the fee is waived if the customer installs a recommended major measure.

2.4.3 Recommendations

#1. The PAs should examine historical trends in participation and consider the implications on future HES design.
As noted above, participation in HES declined in 2016 and 2017 relative to previous years. This may be due, as PA and LV managers suggested, to less extreme weather and more favorable fuels prices demotivating customers to enroll. It could also be, at least in part, due to HES' long tenure in the state reaching a participation saturation threshold. It's possible that the customers that have not participated in HES to date will be motivated to do so for different reasons, whether alternative measures or a different delivery mechanism. It's also likely the remaining customers may exhibit a certain harder-to-reach profile that requires tailored outreach or program design. The PAs' current efforts to encourage greater participation from renters and moderate-income customers are an example of this kind of targeted program design. An analysis of historical HES trends might results in the identification of other harder-to-reach customers segments (specific cultural groups, geographic portions of the state, or customers living in homes of certain age or type) that may be more responsive to alternative strategies.

3. EVALUATION PORTFOLIO

The Evaluation Portfolio (documents A-K) contains the following 10 deliverables created as part of this study. These deliverables include task-specific findings memos:[23]

Portfolio A: HES Measures

Portfolio B Detailed Evaluation Research Questions

Portfolio C: Program Administrator and Lead Vendor Initiative Managers Interview Findings Memo (Task 1)

Portfolio D: Energy Specialists and Home Performance Contractors Interview Findings Memo (Task 2)

Portfolio E: QA/QC Data Review Findings Memo (Task 3)

Portfolio F: New Offer KPI Findings Memo (Task 3)

Portfolio G: Secondary Research Findings Memo (Task 4)

Portfolio H: Mystery Shopping Report (Task 5)

Portfolio I: Participant Survey Key Findings (Task 6)

Portfolio J: Key Performance Indicator Findings Memo (Task 8)

Portfolio K: Additional QA/QC Reporting Details

The task-specific findings memos, which the team submitted to the PAs and EEAC throughout RES 35, offer significantly more detail about each activity's methodology and findings than what is provided in the Evaluation Summary.

The team limited the Evaluation Portfolio to findings memos and similar deliverables. A separate Evaluation Appendix includes eight interview guides, survey instruments, and analysis plans that the evaluation team used to complete this process evaluation.

[23] The RES 35 Stage 3 plan included two other tasks. The first, Task 7, was an analysis quantitatively comparing the installation rates of customers offered the enhanced incentives with the historical installation rates of past moderate-income customers and renters visited by HES. However, the historical data maintained by the program did not support the proposed analysis. The second, Task 9, was customer journey mapping. To maximize the value of the journey mapping exercise, the evaluation team, PAs, and EEAC jointly decided to wait until the first draft of the 3-year plan was available to create maps that can be used prospectively.

PORTFOLIO A. HES MEASURES

Table A-1 details the measure type that the evaluation team assigned to each HES measure. It also includes the relevant fuel types incentivized through HES.

Table A-1. HES Measure Types

Measure	Measure Type	Relevant Fuel Types*
Faucet Aerator	ISM	All
LED Bulb	ISM	E
LED Bulb (EISA Exempt)	ISM	E
LED Bulb (Reflectors)	ISM	E
LED Recessed Trim Kits	ISM	E
Low-Flow Showerhead	ISM	All
Programmable Thermostat	ISM	All
Smart Strip	ISM	E
Smart Strip, Tier 2	ISM	E
Wi-Fi Thermostat	ISM	All
Air Sealing	Recommended – Major^	All
Duct Insulation	Recommended – Major	All
Duct Seal	Recommended – Major	All
Insulation	Recommended – Major	All
Clothes Washer (Early Retirement)	Recommended – Major	All
Combo Condensing Boiler/Water Heater 90%	Recommended – Major	O
Combo Condensing Boiler/Water Heater 95%	Recommended – Major	O
Forced Hot Water Boiler (Early Retirement)	Recommended – Major	NG, HO, O
Furnace (Early Retirement)	Recommended – Major	NG, HO, O
Heating System Replacement (Boiler)	Recommended – Major	HO, O
Heating System Replacement (Furnace)	Recommended – Major	HO, O
Indirect Water Heater	Recommended – Major	HO, O
On-Demand Water Heater	Recommended – Major	O
Refrigerator	Recommended – Major	E
Steam Boiler (Early Retirement)	Recommended – Major	NG, HO, O
Boiler Reset Control	Recommended – Non-Major	HO, O
Pipe Wrap (Heating)	Recommended – Non-Major	NG, HO, O
Pipe Wrap (Water Heating)	Recommended – Non-Major	All

*NG = Natural Gas, E = Electricity, HO = Heating Oil, and O = Other, typically propane

^ The correlation between air sealing and insulation participation is nearly 1. In other words, almost early customer that had their home air sealed also installed wall, attic, or basement insulation (and vice versa).

PORTFOLIO B. DETAILED EVALUATION RESEARCH QUESTIONS

Performance of New Offers for Moderate-Income and Renter-Occupied Households

1. How much more effective are the new offers at encouraging moderate-income and renters/landlords to install recommended measures?
2. Are the PAs tracking all the key performance indicators (KPIs) necessary to determine the success of the moderate-income and renter offers?

Effectiveness of Home Energy Assessments

1. Are there structural or procedural changes to the current delivery of HES that would increase the initiative's overall effectiveness (i.e., enrolling customers and generating residential energy savings)?
2. Are there opportunities to make HEAs more effective and efficient? These could include collecting more information prior to the assessment, using different data collection software or hardware tools, tailoring HEA approach or level of effort based on a specific customer's interests or needs, or reducing the total number of requirements while in the home.
3. What delivery approaches are similar initiatives around the country using to streamline HEAs and increase installation rates and total savings? Are there more effective delivery models and/or specific practices that the PAs could adopt?
4. What are the most effective practices currently employed by LV Energy Specialists and HPC Energy Specialists, in terms of engaging customers, communicating the eligible efficiency measures, and encouraging action?
5. Are the recently revised HEA materials more effective at encouraging customers to install recommended measures? Are further improvements possible?

Quality Assurance/Quality Control

1. What are the current goals, metrics, data, processes, and standards for quality assurance/quality control (QA/QC) and are they consistent among LVs and HPCs?
2. How are QA/QC results communicated to all relevant parties?
3. How effectively does the QA/QC process enable the PAs to assess LV, HPC, and independent implementation contractor (IIC) performance? Have the PAs identified differences between QA/AC delivered by LV compared to QA/QC delivered by the independent vendor?
4. How effective is the QA/QC process at helping Energy Specialists, HPCs, and IICs improve their delivery of HES?
5. Over time, is the QA/QC process resulting in an improved experience and level of service for customers?
6. Where is the QA/QC process currently not working well, and what opportunities exist to improve the overall process?
7. What approaches are similar initiatives around the country using for QA/QC? Are there effective practices that the PAs could adopt?

Overall Performance

1. How has initiative performance, overall and by delivery channel, changed relative to the results of the previous KPI analysis?
2. Are there additional KPIs that would offer the PAs greater insight into ongoing HES performance?
3. How are similar initiatives around the country evolving? What changes to delivery or measure mix are these initiatives making to replace lost lighting savings? Are there effective practices that the PAs could adopt?
4. How well is HES integrating with the PAs' other residential initiatives to meet customers' overall efficiency needs?

Table B-1. Evaluation Activities and Research Questions Mapping

	PM IDIs	LV/HPC IDIs	M&D Review	SR	MS	Surveys	NO	KPI	JM
Performance of New Offers for Moderate Income and Renter-Occupied Households									
1. How much more effective are the new offers at encouraging moderate income and renters/landlords to install recommended measures?	•	•	•			•	•	•	•
2. Are the PAs tracking all the key performance indicators (KPIs) necessary to determine the success of the moderate income and renter offers?	•	•	•					•	
Effectiveness of Home Energy Assessments									
3. Are there structural or procedural changes to the current delivery of HES that would increase the initiative's overall effectiveness (i.e., enrolling customers and generating residential energy savings)?	•	•	•	•	•	•		•	•
4. Are there opportunities to make HEAs more effective and efficient? These could include collecting more information prior to the assessment, using different data collection software or hardware tools, tailoring HEA approach or level of effort based on a specific customer's interests or needs, or reducing the total number of requirements while in the home.	•	•	•	•	•	•		•	•
5. What delivery approaches are similar initiatives around the country using to streamline HEAs and increase installation rates and total savings? Are there more effective delivery models and/or specific practices that the PAs could adopt?				•					
6. What are the most effective practices currently employed by LV Energy Specialists and HPC Energy Specialists, in terms of engaging customers, communicating the eligible efficiency measures, and encouraging action?	•	•			•	•			•
7. Are the recently revised HEA materials more effective at encouraging customers to install recommended measures? Are further improvements possible?	•	•	•		•	•		•	•

PM IDIs = Interviews with HES Managers, LV/HPC IDIs = Interviews with LV/HPC Energy Specialists, M&D Review = Review of HES Materials/Data, SR = Secondary Research, MS = Mystery Shopping, Surveys = Surveys with Parts & Nonparts, NO = Analysis of New Offers, KPI = KPI Analysis, JM = Journey Mapping

	PM IDIs	LV/HPC IDIs	M&D Review	SR	MS	Surveys	NO	KPI	JM
Quality Assurance/Quality Control									
8. What are the current goals, metrics, data, processes, and standards for quality assurance/quality control (QA/QC) and are they consistent among LVs and HPCs?	•	•	•						
9. How are QA/QC results communicated to all relevant parties?	•	•	•			•			•
10. How effectively does the QA/QC process enable the PAs to assess LV, HPC, and independent implementation contractor (IIC) performance? Have the PAs identified differences between QA/AC delivered by LV compared to QA/QC delivered by the independent vendor?	•	•							
11. How effective is the QA/QC process at helping Energy Specialists, HPCs, and IICs improve their delivery of HES?	•	•				•			
12. Over time, is the QA/QC process resulting in an improved experience and level of service for customers?	•	•	•					•	
13. Where is the QA/QC process currently not working well, and what opportunities exist to improve the overall process?	•	•	•			•		•	•
14. What approaches are similar initiatives around the country using for QA/QC? Are there effective practices that the PAs could adopt?	•	•		•					
Overall Performance									
15. How has initiative performance, overall and by delivery channel, changed relative to the results of the previous KPI analysis?	•	•						•	
16. Are there additional KPIs that would offer the PAs greater insight into ongoing HES performance?	•	•	•					•	•
17. How are similar initiatives around the country evolving? What changes to delivery or measure mix are these initiatives making to replace lost lighting savings? Are there effective practices that the PAs could adopt?				•					
18. How well is HES integrating with the PAs' other residential initiatives to meet customers' overall efficiency needs?	•	•	•		•	•		•	•

PM IDIs = Interviews with HES Managers, LV/HPC IDIs = Interviews with LV/HPC Energy Specialists, M&D Review = Review of HES Materials/Data, SR = Secondary Research, MS = Mystery Shopping, Surveys = Surveys with Parts & Nonparts, NO = Analysis of New Offers, KPI = KPI Analysis, JM = Journey Mapping

PORTFOLIO C. PROGRAM ADMINISTRATOR AND LEAD VENDOR INITIATIVE MANAGERS INTERVIEW FINDINGS MEMO (TASK 1)

NAVIGANT

ILLUME cadeo bellomy research LEXICON ENERGY CONSULTING INCORPORATED

Memorandum

To: Massachusetts Program Administrators (PAs)

From: Laura Schauer and Sara Conzemius, ILLUME; Doug Bruchs, Cadeo

Date: March 21, 2017

Re: Home Energy Services (HES) Process Evaluation (RES 35): PA Program Manager and Lead Vendor (LV) Interview Summary Findings Memo (Task 1)

This memorandum presents the key findings resulting from interviews with program administrator (PA) Home Energy Services (HES) program managers, their Lead Vendors (LV), and the statewide quality assurance/quality control (QA/QC) contractor.

The purpose of these interviews was to provide the Navigant Research evaluation team with initiative context for the current process evaluation. The interviews allowed the team to solicit information regarding three overarching areas of interest: 1) performance of new offers for moderate income and renter-occupied housing, 2) effectiveness of home energy assessments (HEAs), and 3) QA/QC. Specifically, the interviews investigated the following:

- Initiative goals and key performance indicators (KPIs)
- Implementation and HEA processes and challenges
- Marketing efforts
- QA/QC processes, experiences, feedback loops, and needs
- Progress and experiences with two new offers

The evaluation team spoke with staff that manage the implementation of HES for all PAs, as well as staff from all three HES LVs: CLEAResult, RISE Engineering, and Center for EcoTechnology (CET). Most interviews were completed in December 2016 with one follow-up interview completed in February 2017. These interviews lasted about an hour each. The evaluation team also conducted three interviews in January 2017 with the Competitive Resources, Inc (CRI) staff responsible for providing statewide QA/QC for HES.

The evaluation team completed these interviews at the outset of the current process evaluation to gather key input and insight to inform future evaluation activities. Rather than use this memo to reiterate the history and context of the HES initiative discussed during the interviews—with which the PAs are well familiar—the evaluation team structured this memorandum to focus on the key research questions defined in the Stage 3 plan and the implications these interviews provided for the remaining

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tasks. Therefore, this memorandum is organized by the three overarching research areas discussed above, including implications of findings where relevant.

A. Performance of New Offers for Moderate Income and Renter-occupied Households

The PAs have been providing the moderate income and renter-occupied household offers under HES since April 2016. Performance for these two new offers varies by PA, but generally the moderate income offering has been difficult to ramp up. The renter-occupied household offering has performed better for some PAs but there is question by some about the need for or value of this specific program offering. Many interviewees noted they had been working closely with renter-occupied homes for years.

The following sections provide key findings related to the new offers for moderate income and renter-occupied households and their implications on planned research.

Finding A1. The moderate income offering is experiencing considerable challenges that are affecting participation; PAs are attempting to address these challenges.

Of the two new offerings, the moderate income offer appears to be the more challenging. With the exception of one PA (who has prior experience with this model), PAs report that the moderate income offer is struggling to gain traction. They describe this offer as slow going and difficult to administer. (In fact, Unitil, which previously operated as its own LV, outsourced this role to RISE beginning in 2014, in part to manage the additional customer demand and reporting requirements associated with new initiatives.) One of the primary challenges mentioned by many PAs, as well as the LVs, is the current process for identifying and engaging qualifying households. While there are some exceptions by PA[1], customers are generally first informed of the moderate income offering at the time of the HEA. The energy specialists (ESs) or home performance contractors (HPCs) provide information about the increased incentive offers with the leave-behind packet. To qualify, customers need to provide personal income-related details to the income verifier following the HEA.

Some of the issues raised by PAs and LVs include the following:

- The current approach is not the most proactive means for identifying and providing outreach to income-eligible households.
- Some customers are not comfortable providing personal information required for qualification.
- The qualification process may be too cumbersome for some customers, who, as a result, are unwilling to reach out to the income verification vendor.
- The additional incentive available to qualifying customers is not large enough to motivate customers to go through the income verification process

Several PAs stated they started working through local community action agencies to receive referrals for those households that did not qualify for the statewide low-income weatherization program. Another PA recommended working with grassroots and community organizations as a valuable approach for marketing to both the moderate income and rental markets.

[1] For example, Cape Light Compact (CLC) completes more proactive and targeted outreach to these potentially income-eligible customers. They send income verification forms to customers that schedule an assessment (CLC completes income verification in-house) and let RISE know, prior to the assessment, whether the customer qualifies as moderate income. They also have relationships with community organizations It is worth noting that CLC has been providing these two offers for many years and already has systems in place.

Finding A2. While there is value in targeting the rental market, some PAs and LVs felt that serving the target market—renters outside of their landlords/property managers—may not be as effective as planned in reaching this difficult-to-serve market.

The renter-focused offer provides near-term energy efficiency opportunities through direct installation of measures along with a shorter audit than provided through the HES initiative. Per one interviewee, a benefit of the offer is to serve renters whose landlord or property manager may be a barrier for receiving these services, although in practice engaging the landlord or property manager through the tenant relationship is optimal. Several PAs and LVs reported that while one objective is to reach the renters, they end up serving the property manager and/or landlord in cases where rental units are identified. This is reportedly not much different than how they previously engaged the rental market before this offer was available. Further, if they can service the building (versus just the light-touch tenant service) they will do that. From a cost-effectiveness and goals perspective, it is more beneficial to the PAs and LVs to offer services to the building comprehensively rather than individual units. The interviews, therefore, raised the question of whether the renter-occupied offer as implemented is meeting a new need or simply adding layers of complexities and cost to what PAs and LVs were already doing. The inclusion of the KPIs also add effort for oversight.

Finding A3. PAs report they are managing to statewide KPIs; however, more time is needed to assess the usefulness and practicality of these KPIs as well as the progress toward these KPIs.

The PAs met and agreed upon statewide KPIs for the moderate income and renter-occupied offers. For the renter offering these KPIs include, but are not limited to:

- Number of visits
- Number of HEAs provided
- Number of incentives processed
- Percentage of rental units that implement measures because of the HEA
- Average number of installation measures by building type and heating type
- Number of enhanced rebates processed

For the moderate income offering, these KPIs include, but are not limited to:

- Total applicants that came through the program
- Number of moderate income applicants approved
- Percentages that result in weatherization jobs
- Number of approved enhanced moderate income rebates
- Number of approved incentives by heating fuel

The interviews did not dive into the KPI process or concerns about specific KPIs; instead, many PAs reported simply attempting to increase participation. Additionally, there currently are no formal goals the PAs need to attain related to these offers. At this point the KPIs are primarily used as a reference point for the PAs to assess an offer's overall viability. PAs had no suggestions for adding or removing KPIs.

Finding A4. It is too early to definitively determine the effectiveness of the moderate income and renter-occupied offers.

PAs rolled out these offerings in April 2016. Throughout the year, they have experienced challenges, discussed briefly above, and are proactively working to address some of those early challenges.

Process evaluations can be highly valuable for supporting newer initiatives in early stages; however, evaluation activities need to be carefully timed. If done too early, they may not provide the insight needed by the program and instead provide information that prematurely characterizes program performance and processes.

Implications for Activities: Findings A1-A4
Several of the tasks outlined in the Stage 3 plan touch on the new offerings. The key research question these tasks are attempting to address is: how much more effective are the new offerings at encouraging moderate income and renters/landlords to install recommended measures? At this point in program implementation, however, the PAs are just trying to identify the best approaches for reaching and engaging the target markets. Much of the focus of team efforts should therefore be on that issue: means for better engaging and reaching customers. Below, the team documents the recommendations for shifts in research focus (mapped by task in Stage 3) based on these findings:

- Include questions in Task 2 interviews with ESs and HPCs regarding how the new offers integrate into processes and customers' responses.
- When completing mystery shopping (Task 5), observe how the energy specialist/LV approaches the moderate income offer, if at all.
- Target questions in customer surveys (Task 6) related to these new offers on outreach, engagement, barriers to participation, and changes to promote participation, rather than performance and effectiveness. Also, include in the customer survey task the value of the increased incentive for this group and opportunity/effectiveness to encourage installations. Given the relatively slow progress, the results should be used for early process insights only. Additionally, include eligibility-determining questions early in the survey for general HES participants (not related to these additional offers). Use these questions to ask about awareness of the offer, source of awareness, reason for nonparticipation (if potentially qualified per income and household size questions), and conduct cross-sectional analysis of process questions for those that may and may not be eligible.
- In the analysis of new offers (Task 7) complete the empirical (tracking system) analysis by PA, recognizing that some PAs may not have sufficient data to complete this analysis. Recognize in the analysis and reporting that PAs are still working through processes that may in time affect program influence.
- The KPI analysis (Task 8) will need to be a soft review of the new offers in recognition of the new offers' nascence and relatively low participation.

B. Effectiveness of HEAs

The interviews addressed HES progress, goals, marketing, and implementation strategies. The team discusses each of these topics in the key findings below. Because the topics presented are so varied, implications for research immediately follow a finding. Note that not all findings have implications on future evaluation tasks.

Finding B1. Many PAs will not meet goals in 2016 due, in part, to external conditions.

Most of the PAs and their LVs report they were behind in meeting 2016 targets (as identified in the 3-year implementation plan), both in terms of completed HEAs and energy savings goals. Most attributed the slower-than-anticipated participation to warmer weather. Program activity strongly correlates with seasonal weather, with a colder winter more likely to result in greater participation. Therefore, with the milder winter in 2016, participation was slower than projected. Additionally, several interviewees speculated that lower heating oil prices also contributed to reduced participation. Last, the closure of Next Step Living, a large HPC that worked across multiple PAs, had significant implications on progress. Next Step Living conducted a considerable number of HEAs, particularly for the larger PAs (National Grid and Eversource). This HPC's unexpected closure also required the PAs and their LVs to quickly refocus resources on finishing jobs with previous Next Step Living customers.

Four of the smaller PAs—Liberty, CLC, Unitil, and Berkshire—reported that they were on track to meet their savings goals, at a minimum. Two of these PAs (CLC and Berkshire) thought they would be behind in reaching the target number of assessments but felt confident about meeting savings goals. It is possible that these projects are resulting in higher average savings per household and/or higher conversion rates, although these PAs could not definitively state that was the case.

Finding B2. The revised HEA materials are viewed positively and as an example of PAs collaborating to streamline and improve the assessment process.

PAs worked together to revamp the HEA materials. The revised materials consolidated what was previously communicated to customers and imparts a more unified Mass Save branding while still maintaining individual PA cobranding. It also is intended to more clearly direct customers toward next steps. The LVs and PAs believe that the materials are more effective because all the information is provided in a fewer-stop-shop.

Finding B3. It likely will not be possible to definitively determine whether the revised materials are *more* effective at encouraging installations.

One of the research questions posed in the Stage 3 plan is whether the revised materials are more effective at encouraging installations than prior materials. There are various factors that play into the installation process, not least of which are ES and HPC communications. While the revisions are seen as positive changes for the program, PAs and LVs interviewed could not comment on whether the revised documents were more positively received than prior materials, nor could they comment on whether there was an incremental benefit in terms of increased measure adoption. Each customer is different, and customers cannot provide feedback on their opinion of the materials before and after the change. This is a research question that is best addressed by the ESs and HPCs that participated using both material formats.

Finding B4. The two auditor model employed by RISE reportedly reduces time in the home and enhances the assessment's focus on the customer.

One of the main ways the LVs vary is in their audit approach. CET and CLEAResult use a single auditor model, where that individual is responsible for all elements of the HEA. RISE, on the other hand, uses a two auditor approach. With this approach, one auditor is responsible for communicating with the customer and gathering data from the customer while the other auditor completes the physical assessment of the building. The benefit to this two auditor approach, according to RISE and their PAs, is the reduced total time at each home and greater ability to focus on the customer's

experience and needs. According to the team's interviews, the two audit method reduces the assessment time from an average of 4 hours to 2 hours. CET reported they try to complete the assessment in 2 hours, although they also commented that time was tight given all that needs to be done in the home and depending on the home may take longer.

Implications for Research: Finding B4
In Task 6 (customer surveys) the evaluation team will ensure sufficient customers are sampled by LV to confidently identify differences in time in a home and, more importantly, satisfaction with the process by the one versus two assessor model. The survey will also verify the length of time ESs are in the home for the HEA process. Task 9 (journey mapping) will differentiate the customer experiences by model.

Finding B5. There is interest and/or movement to advance technological solutions to optimize HES' processes for all parties.

ESs and LVs continue to use laptops and printers to capture and relay information. In probing the issue with LVs, two said that their systems worked fine and there were no improvements needed. However, changes are currently underway or being considered. At the time of interviews, National Grid was close to launching a project management software through EnergySavvy. This package will allow National Grid to control their software system and data, linking customer-specific data within the interface and managing functions such as intake, scheduling, and energy modeling for the home. The system will also change the customer experience; for example, customers will be able to log in and download home assessment reports. Additionally, the system should streamline the income verification and moderate income eligibility approval process. National Grid works with all LVs; thus, all LVs will be exposed to this system once fully launched.

None of the other PAs have near-term plans to follow a similar approach. With that said, Eversource does see a need to improve the use of technology for this initiative and is in the investigation stage for determining which solutions would be most beneficial. They are currently looking for solutions that give them more visibility into the process and customer engagement as well as more accessible ways to provide information to customers. For example, while likely relevant for all PAs, Eversource specifically mentioned that they first learn which customers participate in the HES through the post-HEA invoicing process. Currently they do not have any visibility into the scheduling and or the recommendations made to their customers. Most of this information is housed on CLEAResult's systems.

Looking forward, a number of PAs and one LV discussed the desire for using more mobile devices and electronic processes. This includes using tablets to gather and communicate information, email or web portals to communicate results to customers, and an online scheduling tool (rather than the existing process of calling in to the Mass Save telephone line to schedule the assessment).

Implications for Research: Finding B5
Given the timing of this HES process evaluation, it will not be possible to assess the effectiveness and implications of new systems on program processes and/or efficiencies as part of this study. Additionally, the potential requirements of contractors to use different systems may be something for the PAs to consider when looking into advancing technologies or solution products. A focused process evaluation in the future may be valuable, especially if the other PAs are interested in engaging in a similar tool.

Finding B6. While LVs and PAs see the benefit to the dual LV/HPC delivery model, QC may be a concern.

ESs currently complete the majority of HEAs. Two PAs exclusively engage with ESs (i.e., do not have HPCs), while some work with a small number HPCs. For the largest PAs, ESs complete approximately 60%-70% completed by ESs, with HPCs completing the remainder (up to 30%-40%).

Several PAs expressed some QC concerns related to HPCs and indicated they felt there was more control over quality when working directly with the ESs than the HPCs. And one PA added the perspective that IICs are focused on one activity – installation – whereas HPCs have multiple responsibilities which, while not tied to QC, could also have implications. However, it is important to note that this is their perception, and no specific examples were provided).

Implication for Research: Finding B6
The QA/QC analysis will determine if there is a difference in results by whether the Independent Installation Contractor (IIC) or HPC completes the work to determine if there are QC trends by those two groups. When completing the analysis, the team will take care to review results associated with HPCs that complete the installation (versus subcontract to an IIC) as well as IIC performance associated with those working with HPCs or LVs.

C. QA/QC

QA/QC is a topic that will receive concerted focus from the HES process evaluation in early 2017. The findings below reflect the perspectives from the PAs, LVs, and the QA/QC contractors.

There is a high level of QA/QC taking place given the multiple layers of QA/QC conducted by both the LVs and the statewide contractor, CRI. There are benefits to this level of QA/QC, including positive customer perception of initiative rigor and increased confidence and quality (and subsequent realization rates). However, possible inefficiencies and customer burden are also a consideration when reviewing a QA/QC structure.

Finding C1. CRI completes tiered QA/QC audits with up to 10% of HES customers, experiencing varying levels of interaction with customers and contractors based on tier.

CRI completes three types of audits, referred to as tiers:

- **Tier 1** audits are those where CRI accompanies the auditor during the assessment process itself. They observe the combustion safety (CAZ) testing, ensure the energy specialist or HPC is following appropriate health and safely protocols, and confirm the auditor is addressing every instant savings opportunity possible. They are also making sure the auditor is correctly identifying all weatherization opportunities or issues that might pose weatherization barriers such as moisture or other health and safety issues. CRI also observes the communication and all information provided from the auditor to the customer. CRI has little to no direct interaction with the customer during a Tier 1 audit.
- **Tier 2** audits are completed directly by CRI and occur outside the HEA or IIC's processes. CRI goes into the home to ensure the instant savings measures were installed, the tracking data accurately captures the installation information, that there were no missed opportunities to install additional instant savings measures, and that the CAZ testing was done properly. CRI contacts the customer and directly schedules the visit. CRI also administers an in-person satisfaction survey with customers while onsite.

- **Tier 3** audits are those where CRI verifies the proper installation of any weatherization measures that were installed through the HES program. Like the Tier 2 audits, there is also a verification of instant savings measures and the administration of an in-person satisfaction survey with customers while onsite. Unlike the Tier 2 audit, there is no CAZ testing. The inspector will include an infrared scan of the walls during the visit if the household received wall insulation.

Each PA gives CRI a quota for the number of audits by tier and contractor type (IIC vs. HPC) that needs to be completed per year. The proportion of each type of audit by PA varies slightly. Interviews did not discuss the proportion by PA or the effectiveness of the tier structure.

Of the 10% of projects that receive a QA/QC inspection by CRI, roughly 60% of these are completed on HPC projects, with 40% completed on the IIC projects.

Finding C2. The percentage of projects that get QA/QC from the LV and the type of QA/QC completed by the LVs varies by PA.

The percentage of projects that receive QA/QC from the LVs varies. PAs work with the LV to set these goals and the volume can range from 20% to 80% of projects, with many PAs falling within the 50%-60% range. The LV QA/QC happens either when the installation is in progress or after the work is completed (referred to as final inspection). RISE noted that most of their audits are in-progress audits. They noted that they use this format to build relationships with the contractors and avoid the "gotcha" perspective that is more prevalent with final inspections. CET and CLEAResult, on the other hand, indicated they are more likely to complete final inspections versus in-progress audits.

This volume of LV QA/QC paired with the 10% completed by CRI means that an extensive number of projects get some firsthand QA/QC. One PA noted that contractors complain there is a lot of QA/QC.

Implications for Research: Finding C2
Assess the LV QA/QC data to determine if there are differences in QA/QC results based on if the project was subject to an in-progress or a final inspection. Assess whether there are systematic issues caught in the inspection that differ from what is found in the CRI audits. Through the secondary research investigate how other jurisdictions complete their QA/QC and types of QA/QC activities completed at various points of the program process.

Finding C3. Challenging and/or limited communication within the QA/QC process was mentioned throughout interviews.

Interviews highlighted three areas where communication was challenging or limited: 1) receiving and sharing data; 2) the sharing of QA/QC results; and 3) lack of a feedback loop on how projects with failed ratings per CRI inspections are resolved. Each of these issues are discussed below.

1. Receiving and sharing data
CRI and the LVs have just two primary communication points:

1. The monthly data transfer
2. The daily, weekly, and/or monthly inspection reports

Other than the monthly transfer of data from the LVs to CRI and then the transfer of findings back from CRI to the PAs, these parties seem to have almost no direct communication. One area of challenge is with the data transfer from CLEAResult. CRI reports that there are

consistent challenges with obtaining the monthly data transfer from this LV in particular. These challenges include:

- Data rarely arriving by the predetermined delivery date each month, requiring reminder telephone calls and resulting in receiving data weeks or a month late.
- Data arriving with missing information such as homeowner phone number or utility account number.
- Data that does not correctly identify or remove customers who already received an quality control visit through the LV. CRI indicated that when they report missing information from the data back to the LV they rarely, if ever, get a response or resolution.

According to Eversource, CLEAResult shares lists of customers they have not reached out to for inspections with CRI. CRI then picks from a list of eligible customers that have not had QA/QC from CLEAResult. CRI indicated that while they receive a spreadsheet each month that is supposed to include only those customers who have not received an inspection by CLEAResult, they often find when calling to schedule their visits that the customers on that list indicate have already received a QA/QC visit.

One final communication issue mentioned by CRI relates to Tier 1 inspections. According to CRI, it is not uncommon for their inspector to show up to meet an auditor for a Tier 1 visit only to find the audit has been cancelled by the customer. CRI indicated they are rarely notified in advance when this happens.

2. Findings from QA/QC not shared consistently with the PAs.

CRI staff noted that they send the results of all inspections to both the LVs and the PAs. The frequency of reporting varies based on the type of finding, specifically:

- Projects that fail because of a health and safety issue are shared the day the inspection was completed.
- Projects that fail or pass with notes that do not pose a specific health and safety threat are shared via a weekly data report.
- Projects that passed are shared via a monthly data report.

Conversely, the PAs do not receive any formal reports or results of QA/QC visits completed by the LV, regardless if they are an in-progress or final inspection. However, it does appear from documentation review that LVs are capturing in-progress and return visit results.

This noted, the PAs did not voice concerns over the ability to track HPC or IIC performance using the QA/QC results completed by the LV. Except for one PA, who felt additional communication from CRI was an area for improvement, they seemed sufficiently satisfied with the communication, particularly from the statewide QA/QC vendor. And while they do not receive written reports from the LVs QA/QC process, they trust they are providing the level of QA/QC needed to ensure program success.

3. There is no feedback on how those projects with failed ratings are addressed/remedied.

It appears from documentation review that LVs are capturing the data from projects that require some kind of return visit due to a failed QA/QC inspection. However, how those projects are remedied, if they are remedied, and/or any verification that they were remedied properly are not shared with the PAs nor with CRI. Although the PAs did not note this as a concern in interviews and the LVs reported that all rectified issues are documented and

captured via photo or other supporting documentation, CRI mentioned this as a possible area for improvement.

Implications for Research: Finding C3
The Stage 3 plan includes quantitative analysis of QA/QC results, including an assessment of the rigor of the Massachusetts QA/QC process and to compare that rigor between the LVs and CRI. To ensure a thorough review, the team would require not only the QA/QC data from CRI but also from the LVs. The 10% from CRI will be useful, but the evaluation team recognizes it will only represent 10% of projects.

A critical piece of the QA/QC research is intended to ensure that the heavy volume of QA/QC being completed for HES is leading to properly completed projects and a more highly qualified contractor force. The lack of clarity around what data is available for those projects remedied after a failed or passed with notes QA/QC visit may limit the evaluation's ability to fully assess this. Further data review will be needed to confirm this.

Finding C4. PAs and LVs noted a desire for more consistency.

The PA interviews noted that the QA/QC conducted by the statewide contractor and LVs can be inconsistent and "don't always line up." Both CRI and the LVs commented on this same issue.

While there has been effort and direction provided by National Grid and Eversource to ensure the LVs and CRI align the QA/QC process and data collected, the two entities (LVs vs CRI) do not align. As noted earlier, CRI completes three tiers of inspections, whereas the LVs focus on what they call "in-progress" and "completed" inspections. Additionally, the QA/QC results/data collected by the LVs and CRI are not compiled in a single place nor are they compared to ensure there is indeed consistency in what data is being collected in these visits.

In addition to inconsistency between the LVs and CRI, there is also inconsistency between the LVs and the quantity and type of QA/QC completed. Additionally, each PA has its own quota for the volume and type of QA/QC inspections it would like the LV and CRI to complete.

The LVs and CRI did note that they have worked to make sure that the customer satisfaction surveys being collected are identical, something both parties noted as a positive improvement. However, it appears there is no single repository for the data collected in these coordinated customer satisfaction surveys.

Implication for Research: Finding C4
The differences in QA/QC requirements and results reporting is an issue to investigate with the HPCs and ESs in Task 2. The qualitative QA/QC data review in Task 4 will also attempt to identify where there are differences in QA/QC reporting and findings by LVs and CRI as well as differences in QA/QC requirements by PA.

The evaluation team will need to obtain the customer satisfaction survey results from the LVs and CRI for review for variances in results between the two and to confirm there is consistency with the customer survey task (Task 6). The customer survey results will also be used in Task 4 (subtask quantitative QA/QC review) as well as Task 9 (journey mapping).

Finding C5. It can be difficult to gain customer cooperation when making QA/QC requests, especially for those customers being asked to participate in Tier 2, Tier 3, or what LVs refer to as "completed" inspections.

LVs discussed the potential burden multiple contacts put on customers. One interviewee surmised that a customer could have up to five visits inclusive of: the initial HEA, measure installation, LV inspection, follow-up health and safety inspection, and CRI inspection. Additionally, the LV will need to return to the home if health and safety issues are identified.

There is some effort made to limit these visits, which include: 1) Tier 1 inspections occurring during the actual customer audit with the QA/QC auditor attending along with the HES auditor, and 2) the LVs providing CRI with a list of customers already slated for or who have already received final inspection by the LV so they can avoid reaching out to those customers for an additional inspection. While this should reduce redundancy, CRI indicated that there are often omissions or errors in the data received from the LVs, which causes them to reach out to a customer who has already received a final inspection by an LV.

CRI also noted that Tier 2 inspections are the hardest to schedule. Tier 3 customers see value or benefit in having a third party come out and inspect the job to ensure it was done correctly—they have likely invested a significant amount of money in the work, so knowing it was done well is seen as a service. In contrast, Tier 2 inspections are viewed by customers as an inconvenience; they see little personal benefit in having an inspector come out to verify the instant savings measures were installed in their home.

An additional challenge to getting customer cooperation for the CRI QA/QC visits is lack of awareness of who CRI is. CRI staff all indicated that while there is a current effort underway to list CRI on the program website, they are still an unknown to most customers and this causes customers to be wary of letting them in for the inspections. CRI indicated several steps to help customers and customer services centers increase familiarity with CRI to address this scheduling challenge. These steps include a listing on the website, a leave-behind at the time of the initial audit notifying customers that they may be contacted by CRI for an inspection, and ensuring that all of the PA customer service centers know who CRI is and that their visits are legitimate.

Implications for Research: Finding C5
This finding has implications on multiple tasks.

- First, in Task 3 (review of HES materials and data), the team will stratify its quantitative QA/QC analysis by projects where CRI is the first and only visit and those projects where CRI is the subsequent visit. The analysis will discern whether there is a difference in incidence of issues identified where LVs provide QA/QC prior to CRI to assess the benefit of multiple visits.
- Second, Task 6 (customer surveys) will specifically ask questions related to the number of times customers were visited during the program—in particular for QA/QC needs—and their perception and satisfaction with that process.
- Last, Task 7 (journey mapping) will lay out the potential for these multiple contacts and overlay customers' response to this process.

Finding C6. Communication and coordination issues aside, QA/QCs are seen as training opportunities.

Regardless of who is completing the QA/QC, whether it is the LV or CRI, the PAs see considerable value in the process. Several commented that over the years they have experienced higher realization rates and the ability to keep abreast of quality and customer satisfaction as a result. But a less tangible (and measurable) benefit is the potential to use the process as a training opportunity. The LVs and, to a lesser extent, CRI may be onsite with the contractors throughout the QA/QC process. It is in these in-person meetings that LVs in particular are finding opportunities to complete hands-on training with the contractors. The quality of the QA/QC, along with the communication from the QA/QC, is a stand-out element for some PAs when discussing the QA/QC provided by their LV specifically.

In addition to the onsite training, LVs use the QA/QC results to frame their follow-up training. For example, several PAs described a process where an LV (RISE) takes the prior 3 months' QA/QC results and goes over all the issues found within those past 3 months. Any systematic issues result in a more rigorous training with the contractors. The qualitative QA/QC review will investigate these issues and document training that was provided as a result.

One note: because there is so little communication between the LVs and CRI there may be lost opportunities to identify training needs that are recognized through the findings in those third-party QA/QC visits.

PORTFOLIO D. ENERGY SPECIALISTS AND HOME PERFORMANCE CONTRACTORS INTERVIEW FINDINGS MEMO (TASK 2)

NAVIGANT

ILLUME cadeo bellomy research LEXICON ENERGY CONSULTING INCORPORATED

Memorandum

To: Massachusetts Program Administrators (PAs)

From: Laura Schauer and Shannon Kahl, ILLUME; Doug Bruchs, Cadeo

Date: April 28, 2017

Re: HES Process Evaluation (RES 35): Home Performance Contractor (HPC) and Energy Specialist (ES) Interview Summary (FINAL)

This memorandum presents the key findings resulting from interviews with Home Performance Contractors (HPC) and Energy Specialists (ES) (also referred to collectively as energy specialists throughout) delivering the Home Energy Services (HES) initiative. The purpose of these interviews was to provide the Evaluation Team with context for the current process evaluation, and to investigate topics raised in the Program Administrator (PA)/Lead Vendor (LV) and third-party Quality Assurance/Quality Control contractor (QA/QC) interviews.

The HPC and ES interviews were designed to solicit information regarding three overarching areas of interest: 1) performance of new offers for moderate income and renter-occupied housing, 2) effectiveness of home energy assessments (HEAs), and 3) QA/QC. Specifically, the interviews investigated:

- Experiences with two new offers (moderate income and renter-occupied offers)
- Implementation and HEA processes and challenges
- Effectiveness of new program marketing materials
- Marketing efforts
- Interactions with LV
- Metrics and key performance indicators (KPIs)
- QA/QC processes, experiences, feedback loops, and needs

To support the evaluation, all three LVs provided the Evaluation Team a list of all the HPCs and ES staff that delivered HEAs in 2016. Using this list, the team first categorized the provided HPC contacts into three activity levels: high (greater than 200 assessments in 2016), medium (100-200 assessments), and low (fewer than 100 assessments). The team then randomly sampled HPCs within each category to ensure representation for each LV and HPC organization. In total, the Evaluation Team interviewed seven HPCs, five of which the team identified as highly activity in HES.

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The team had intended to interview 10 HPCs but found that it was particularly difficult to reach and/or complete interviews with them. In total, the team reached out to 18 different HPCs. Several HPCs scheduled, but repeatedly cancelled, interviews with the Evaluation Team. Several others requested documentation on the authenticity of the study but, once received, did not eventually complete an interview. Many of these HPCs were willing to participate in an interview but continually cited scheduling conflicts that prevented them from doing so. The information obtained through the seven interviews completed was relatively consistent and represented varied HPC organizations.

The team also interviewed 11 ESs from CLEAResult (n=6), RISE (n=4), and Center for EcoTechnology (CET) (n=1). RISE and CET did not provide the number of HEAs that each of their ESs had completed in 2016, but CLEAResult did. To maximize the value of our research, we limited our interview sample of CLEAResult ESs to only those that had completed more than 250 HEAs.

Table 1 provides a summary of the number of HPC and ES interviewees by activity level. The table also documents the total number of HEA completed by each respondent.

Table 1. Interviews by Activity Level

	High (Greater than 200 HEAs)	**Medium** (100 to 200)	**Low** (Fewer than 100)	**Unknown**
HPC	5 *(257, 264, 283, 317, 435 HEAs)*	1 *(113 HEAs)*	1 *(84 HEAs)*	0
ES	6 *(257, 395, 411, 441, 452, 455 HEAs)*	0	0	5*****

*RISE and CET did not specify the number of HEAs completed by each of their ES staff.

The remainder of this memorandum details the key findings from HPC and ES interviews within the three overarching research areas discussed above: performance of moderate income and renter-occupied offers, HEA effectiveness, and QA/QC efforts. Consistent with the memo structure from Task 1 (interviews with PAs, LVs, and QA/QC staff) the analysis includes the research implications of findings where relevant.

In summary, by topical area:

- **New offers:** These interviews were generally consistent with PA and LV reports on progress and challenges related to the moderate income and renter-occupied offers. The HPCs and ESs provided additional insight into the processes and engagement of customers (or lack thereof) during HEAs, as well as perceived issues related to having a third-party verifier included in the moderate income offer process. The customer surveys and mystery shopping will be integral for investigating these issues further.
- **HEA effectiveness:** Interviewees were largely positive about the program. However, consistent with PA interviews, they would like to see the HEA move toward a more mobile platform. And while ES and HPC staff are typically able to complete assessments in 2-3 hours as planned, HEA length varies considerably by age of home and lighting needs (direct install of instant savings measures takes considerable time).
- **QA/QC Processes**: ES and HPCs tended to provide more feedback regarding the statewide QA/QC process relative to topics noted above**.** While many interviewees saw the value of

including a statewide QA/QC process, there were a myriad of issues raised related to the Tier 1 audit specifically, including: timing of the statewide auditor arriving onsite, perception of the auditor's presence, and what many consistently described as an awkward experience.

The following sections explore, these topic areas in greater detail.

A. Performance of New Offers for Moderate Income and Renter-Occupied Offers

The PAs began providing specific moderate income and renter-occupied household offers under HES in April 2016. The HPC and ES interviews included questions to gauge their experiences with the new offers and to obtain any recommendations for improvement. The following section provides key findings related to the new offers for moderate income and renter-occupied households.

Finding A1. The referral process to the moderate income offer is relatively passive, which may partially contribute to slow progress.

Energy specialists tread lightly when informing customers of the moderate income offer. Typically, they let customers know of the option when providing leave-behind materials at the end of the assessment. While meeting with the customers they briefly address the offering at a high level, primarily to inform the customer that it is available to them if helpful and relevant. Some interviewees commented that it was not an easy discussion, as they did not want to make the customer uncomfortable. Interviewees noted that income is a sensitive subject, especially since they are generally unaware of customers' income situations and do not want to imply that the customer might be eligible. As one HPC stated, "moderate income is awkward, it's a little difficult to walk through someone's house and make an assumption on their income."

To that end, many energy specialists mentioned that one of the primary challenges is the current process for identifying and engaging qualifying households, in part due to their respect for households' privacy around sensitive issues. It is important to note that this relatively limited approach to engaging customers in the moderate income offering is intentional; the PAs directed the LVs to provide information, but not directly engage, in the offering to avoid putting the participant in an uncomfortable position and/or feel obligated to share sensitive information.

Finding A2. A number of interviewees felt the verification process inhibited moderate income offer progress.

LVs work with LEAN, the firm contracted by the PAs to field calls from interested customers and verify those customers' eligibility to participate in the moderate income offer. The most common concern interviewees raised with the verification process related to the difficulties customers encounter with this third-party income verifier. Several interviewees mentioned that there is a backlog in the verification process because the vendor is busy, which may turn customers off to the process. Additionally, interviewees shared that customers have expressed concern about sharing sensitive information with what seems like an unknown entity to them. Last, energy specialists reported that their customers encountered problems when they attempted to speak with the verifier. In one instance, they spoke with a representative unfamiliar with the moderate income offer and worked instead on the low-income program, which offended some customers. Other customers struggled to navigate the phone prompts to reach the appropriate person or were transferred to multiple representatives before finding the appropriate contact.

The multi-step process—and the extended timing related to that process—was also raised as a barrier. Customers receive recommendations via the HEA, then if interested in moderate income need to go through the steps of qualification and application. This process can take time, potentially causing customers to lose interest (or not feel the process is worth the benefits). As one HPC stated, "The qualification process is tricky because people need to get qualified first and then come back, so you lose a lot of momentum."

Specific recommendations to improve the verification process provided by the energy specialists are documented below. Note that we report these recommendations as they were provided to the evaluation team. The energy specialists did not necessarily consider the resource, timing, and cost implications when offering their recommendations. It is not the evaluation team's intent that this feedback be considered official recommendations from the evaluation team. The team will reserve all recommendations until we have completed the remaining tasks and drafted our comprehensive final report.

- Pre-qualifying customers in advance of the HEA, as done in the Cape Light Compact (CLC) HES program. Pre-qualifying allows the energy specialists to write up the contract with the appropriate incentive levels at the time of the assessment, thereby maintaining customer momentum toward action. *Note that this recommendation does not account for the implications pre-qualification would have on LEAN, cost implications, or HES processes as a whole.*
- Provide in-home verification by allowing the energy specialist to call in with the home owner during the assessment. This would also enable the energy specialist to print contracts with the appropriate incentive levels at the time of assessment, combatting the loss of momentum. The energy specialist can also serve as a guide helping to ensure that the customer is able to speak to the appropriate person at the verification firm. *Note that this recommendation counters energy specialists' feedback that engaging customers in income qualification discussion can be uncomfortable, and the fact that processes purposefully exclude this level of engagement due to those sensitivities and confidentiality issues.*
- Develop an improved screening process by working with other income-qualified agencies to obtain lists of qualifying homes, such as those deemed over-income for statewide low-income weatherization offerings. *Note that this type of list may not exist; rather, working with other entities to develop such as list was presented as an option.*

Finding A3. Consistent with PA/LV interviews, ES and HPC staff feel the renter-occupied offer has been more successful than the moderate income offer.

Of the two new offerings, the renter-occupied offer appears to be easier for energy specialists to provide to customers; many reported that they have had more success with the renter offer than the moderate income offer. Four interviewees did not have direct experience with customers who went through the renter-occupied offer, but those familiar with the offer generally provided more positive feedback than they did for the moderate income offer. This relative success is at least in part due to the long history the HES program has working with renters. One mentioned that better advertising for the program could help further that success.

Only one energy specialist gave negative feedback. He did not think that the process of doing a shorter renter visit and then going back to the house after the tenant engaged the landlord is efficient, and stated that the fees are about the same as those for a standard assessment but for two trips

rather than one. He suggested billing for the whole assessment at the time of the renter visit and scheduling a visit with the landlord after the fact.

Implications for Research: Findings A1-A4

- The customer surveys (Task 6) will include questions up-front to determine whether the respondent could potentially be eligible for the moderate income or renter-occupied offering to flag follow-up questions to address these offer-specific issues. Based on customers' self-report responses they may be directed to sections of the survey specifically related to the offers and asked about awareness of the offer, source of awareness, reason for nonparticipation, and conduct cross-sectional analysis of process questions for those that may and may not be eligible. The survey will also assess the income verification process for the moderate income offering, notably the time it takes to complete the process.

B. Effectiveness of HEAs

The interviews addressed the HEA processes (time, logistics, etc.), effectiveness of new marketing materials and marketing, HPC and ES interactions with LVs, and KPIs. The team discusses each of these topics in the key findings that follow.

Finding B1. Per program design, it takes on average 2 to 3 hours to complete an HEA, install LEDs, using the HEA software, and diagramming the home requiring the most time.

Energy specialists generally reported that it takes 2 to 3 hours to complete a typical assessment. Lengthier assessments, which are not uncommon, occur at older and/or larger homes, when the energy specialist needs to install a larger number of light bulbs. HPCs were more likely to report an audit time of 3 hours while most ESs reported an average audit time of 2 to 2.5 hours. The ESs that work in two-person teams for RISE did not report significantly shorter audit times than those ESs working alone.

Despite the limited information energy specialists typically have prior to the assessment, they do not believe that collecting additional information in advance would be helpful, especially if self-reported by the customer. Energy specialists noted that homeowners are often uninformed or misinformed on the details of their homes and mechanical systems. Energy specialists usually have the contact information, utility, and a basic home description that might include an approximate size, home type, and year built prior to the assessment. Only a few mentioned that they have insight into why the homeowner/renter scheduled the appointment in advance. Many energy specialists use tools such as city energy specialist databases, Google Earth, or Google Street View before visiting the home.

Most energy specialists reported that their time in the home is evenly distributed between the combustion safety testing, walkthrough/building inspection, direct install, data entry/modeling and talking with the customer, although this can vary depending on the house or customer. A few aspects of the HEA emerged as taking longer than the energy specialists think they should:

- **Direct install of LED bulbs:** Energy specialists replace all existing bulbs with LEDs. While an extreme case, more than one energy specialist noted he has installed more than 100 bulbs at a home. The process of removing existing bulbs and direct installing the LEDs is reportedly time intensive, especially for larger homes.

- **Program software:** Each LV has their own unique energy modeling software, which energy specialists use to record data and model the energy savings. Energy specialists reported that entering data into the different modeling software (especially as it relates to the LED bulbs) and running the model can be time consuming. Several also stated that streamlining data entry and improving model processing time could reduce assessment length.
- **Diagramming the home:** A few energy specialists mentioned that the sketch of the home they are required to make is time consuming. This sketch is completed while on-site and represents the internal structure, including insulation needs, of the home. This plan view diagram is required to inform the project costs and benefits.

Finally, the process of sitting down and discussing findings with customers was mentioned as something that takes considerable time. However, there were no complaints or suggestions made to reduce the amount of time spent with customers. Energy specialists said they invite all customers to walk through the home with them through the assessment process, although not all customers do so. Some energy specialists mentioned that it takes less time when customers walk through the home with the energy specialist while they are doing the assessment because then the customers already have the background information and have seen first-hand any issues resulting in recommendations.

Implications for Research: Finding B1

Use customer surveys (Task 6) to:

- Assess customer perceptions of the amount of time the assessment takes
- Determine if customers knew what to expect going in to the assessment, with respect to:
    - How long it would take for the assessment
    - What would be expected of them during the assessment (e.g., walking through home with energy specialist)
    - What energy-saving items would be installed, including which types of light bulbs could be replaced with the LEDs

Finding B2. Energy specialists felt integrating electronic mobile tools, such as tablets, would improve efficiencies with the data collection process.

Although there are a few exceptions, energy specialists are primarily capturing data gathered through the walkthrough via paper, and entering that information into a laptop at the end of the assessment. They then print the report that is left behind with the customer. HPCs and ESs also said that, in most cases, they do not send customers a copy of the report via email later.

Energy specialists expressed an interest in using tablets or other mobile means for collecting and recording data in real-time while conducting the assessment. More than half responded that using tablets would improve data collection, especially if they could also access all documents and contracts on the tablet and use digital signatures. One HPC company currently uses tablets and is in the process of transitioning to having initial work completed on the tablet rather than paper. As noted above, energy specialists also have considerable post-assessment data entry and paperwork that they complete in-office. Having a system, such as a real-time data collection with a tablet, may be able to reduce time associated with that process.

Finding B3. Several interviewees report prioritizing recommendations across a two year timeframe as a strategy to help customers overcome financial barriers to participation.

Two ESs and one HPC reported that they are helping customers overcome financial barriers by prioritizing recommendations into two phases over 2 years. They report this approach has been a successful way to help move customers through the HES process as it allows them to spread out the costs and receive incentives for both phases. Other strategies used by energy specialists to help move customers forward include: continuing to follow up with them after the assessment, providing a detailed breakdown of the cost and savings, and providing information on financing options, such as the HEAT Loan and explaining recommendations in terms that customers can understand. For example, one HPC stated he uses analogies like, "Weatherization is like putting a windbreaker over a sweater." Health and safety issues, such as the presence of knob and tube wiring, add to the total cost and were noted as the most frequent barriers to customers completing work.

Implications for Research: Findings B3

- As part of the KPI analysis, assess the incidence of customers that received a rebate(s) just once versus those that appear to have split work into multiple phases. If possible, filter results for those energy specialists that report using this strategy. While this analysis may not provide conclusive evidence of whether the strategy is effective, it may be informative as the PAs think through alternate ways to overcome financial barriers.

Finding B4. There may be instances where households receive multiple assessments in a short period of time.

One ES who has been with the program several years noted that that there are houses he has been to three or four times and, as a result, there is often nothing to recommend. He said the reason for multiple participation varies, sometimes there are new homeowners or a new program offer. Although this was only mentioned by one ES, it does seem to warrant a data review to determine the extent to which this is an issue.

Implications for Research: Findings B4

- Analyze program data to determine the extent to which one site receives multiple assessments in the program and if instances of repeat assessments are with the same or different homeowners.
- Include in the customer survey a question related to number of prior assessments. If the customer had multiple assessments investigate the reason for the multiple assessments.

Finding B5. The revised HEA marketing materials are viewed positively and have been effective in simplifying things for both the customer and the energy specialist.

When asked how the marketing materials have changed, energy specialists described that the leave-behind folder has become more general and simplified. Many highlighted that the leave-behind materials were no longer utility specific and included less detail, which in their view is easier for customers to digest. They also reported that customers were now directed online for additional

information. None of the energy specialists went so far as to say that the new materials have shortened the assessment length or helped close more sales, but they generally believe the simplified information has made things easier for them by reducing the total number of materials they must go over and eliminating the need to make sure each customer has their utility specific materials.

Finding B6. HPCs do HES-related marketing beyond the statewide MassSave marketing.

Direct mail was noted as being most effective among HPCs who use it, with one noticing a trend that direct mail recipients are more likely to move forward than customers who learned about the program through other means. One HPC uses radio and has found that to be as effective as direct mail.

C. QA/QC Processes

Energy specialists had a lot to share regarding the statewide QA/QC process. The findings below reflect the perspectives from the HPCs and ESs interviewed.

Finding C1. While some energy specialists felt the current QA/QC process, implemented by Competitive Resources Inc (CRI), is working fine, most had concerns around the interactions with the statewide QA/QC contractor when at the customer site.

The QA/QC process received mixed feedback from energy specialists. The energy specialists that remarked positively about the process focused on the benefit of being held to high standards. Several also mentioned that the believe customer perception and satisfaction is higher because of the QA/QC process. These findings are consistent with PA and LV reports, as documented in the Task 1 results memo.

However, there were two main areas of concern with the QA/QC contractor visits to customer's home, both of which are relevant for Tier 1 audits only. The first area of concern is timing, both the time when the inspector arrives at the assessment and the amount of time spent in the home. Several energy specialists noted that the QA/QC inspector often arrives after the assessment has started, missing the introductions and combustion safety testing that contain many of the items the inspectors are evaluating. Their arrival is also disruptive to the process. Further, several interviewees expressed that late arriving QA/QC inspectors may also leave early (sometimes staying only 10 to 20 minutes). Depending on what is happening at that point (e.g., installing LEDs), this timing does not give the inspector a full picture of the assessment. As one HPC said, "[It] doesn't seem effective to have someone [come by] for 10 minutes. [QA/QC is] a good idea, but if you really want a sense of how it is going they need to stay longer. They need to spend more time to get a more accurate picture of the assessment as a whole and how it is going."

A more significant concern raised by many interviewees was CRI's presence during the assessment process in general (completed Tier 1 audits). Interviewees consistently described CRI's presence as awkward, and some felt it could potentially lead to customer dissatisfaction. Specific concerns mentioned by both ESs and HPCs interviewed included the following:

- The inspector not properly introducing themselves and their role.
    - Multiple energy specialists recalled being asked "Who was that guy and what was he doing?" after the inspector leaves.

  - Homeowners are sometimes confused about who to interact with when they are unsure of the role of the inspector. They sometimes perceive the inspector as the supervisor and start interacting with them rather than the energy specialist.
  - Some energy specialists felt it might be uncomfortable for a homeowner, especially women who are home alone during the audit, to have two strangers in their home. They believe this is exacerbated when the inspector does not explain who they are and what they are doing there.
  - One interviewee felt the presence of the inspector marginalized his role and could lead to customers' perceiving that he needed oversight. He described that CRI could seem like his boss overseeing what he is doing, which could then decrease customers' confidence in him as an energy specialist.
- Inspectors not following protocol per discussions with HPC, ES, and QA/QC staff.
  - Energy specialists cited instances of inspectors not wearing shoe protectors and sitting on the furniture.
  - There have also been times when the inspector has started communicating program details to the customer rather than observing and letting the energy specialist do their job.
  - Inspectors have corrected energy specialists in front of customers.
  - Recognizing the cost associated with Tier 1 audits, and considering that cost against the benefit he feels he and the HES receives, one interviewee wondered about the value of CRI being onsite during the assessment.

Finding C2. ES and HPC staff report they do not always receive the results of the QA/QC visits.

Similar to what the PAs reported and is documented in the Task 1 PA/LV results memo, interviews noted that there is a communication gap, and that energy specialists only receive feedback when there is an issue discovered during the inspection and that communication can be delayed. Some energy specialists said they operate on the assumption that "no news is good news," but are not positive that is the case. In fact, one energy specialist said he encountered three situations in the past 6 months where their team did not receive feedback on a specific issue for weeks after the audit, which led to having angry customers. Note that CRI reports that they notify LVs and PAs of failed inspections weekly.

Implications for Research: Findings C1 and C2

- Ensure sampling for customer surveys achieves sufficient representation of customers who receive QA/QC from CRI and assess for potential differences in satisfaction levels.
- Use customer surveys to assess customer perceptions of the inspection process, including:
  - How the auditor introduced themselves
  - How they understood the role of the QA/QC auditor from CRI
  - If the auditor behaved in a professional manner

PORTFOLIO E. QA/QC DATA REVIEW FINDINGS MEMO (TASK 3)

NAVIGANT

ILLUME cadeo bellomy research LEXICON ENERGY CONSULTING INCORPORATED

Memorandum

To: Massachusetts Program Administrators and Energy Efficiency Advisory Council

From: Laura Schauer, Courtney Henderson, and Andrew Mielcarek, ILLUME;
Doug Bruchs, Cadeo

Date: November 6, 2017

Re: RES 35: Home Energy Services Process Evaluation
Task 3: QA/QC Findings Memo (Revised)

This memorandum presents key findings from the evaluation team's qualitative and quantitative analysis of the Home Energy Services (HES) Initiative's quality assurance/quality control (QA/QC) procedures. The purpose of this task was to document and review the QA/QC activities and processes. While evaluating QA/QC is a cross-cutting issue addressed through multiple tasks in the study, this analysis is a component of Task 3 (Review of HES Materials and Data).

Four main data sources informed this analysis:

1. **Interviews with program administrator (PA) and lead vendor (LV) staff:** The evaluation team spoke with PA staff who manage the implementation of the HES and HES LV staff from CLEAResult, RISE Engineering, and the Center for EcoTechnology (CET).
2. **Interviews and follow-up discussions with Competitive Resources, Inc (CRI) staff:** The evaluation team also spoke with CRI staff that provide third-party statewide QA/QC for HES.
3. **QA/QC data provided by CRI:** In January and September 2017, the evaluation team received 11 total QA/QC data files from CRI. These data files are organized by year of inspection (2015 or 2016) and inspection tier (1, 2, or 3), and contain site-level QA/QC results and responses to CRI's customer satisfaction survey.
4. **Data provided by CLEAResult, RISE, and CET:** The evaluation team collected QA/QC-related data from the three LVs. The evaluation team asked each LV to provide all electronically available QA/QC data for this analysis. In most instances, the LVs provided QA/QC data that indicated the result of the inspection overall (versus at a measure level), as

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well as documentation detailing their QA/QC approach. CLEAResult and RISE provided data for inspections from 2014 through 2016[1], while CET could only provide data for 2016.

Using these data sources, the evaluation aimed to investigate five research questions detailed within the Stage 3 plan in the QA/QC section of Task 3 (Review of HES Materials and Data). These questions (slightly modified from their original form in the plan) are:

- What QA/QC data is collected?
- How is the QA/QC data analyzed, reported, and used to improve HES quality?
- Are the data adequate for understanding and improving quality?
- How frequently do instances of QA/QC problems occur? Do these rates differ by delivery channel (i.e., LVs and Home Performance Contractors [HPC])?
- What happens when issues do occur and what are the consequences of those issues?

The Stage 3 plan includes a more extensive list of research issues for the QA/QC analysis that span multiple RES 35 evaluation tasks. This memo focuses on the abovementioned research questions. The team will use the RES 35 final report to pull all QA/QC findings across the comprehensive evaluation and address the broader project research questions detailed in the Stage 3 plan.

As a clarification on terminology: this memo uses the term “assessment” to refer to the home energy assessment (HEA) itself. The term “inspection” refers to the QA/QC of the HEA or installed measure(s). This memo also uses the term “contractor” to refer to the person/company that installed the recommended efficiency measure(s). This could be an Independent Installation Contractor (IIC) or HPC.

The following presents a summary of findings. The summary is followed by the evaluation team’s detailed findings, next steps, and supporting documentation.

Summary of Findings

Massachusetts PAs make considerable investments in the QA/QC process. The LVs provide in-process inspections intended to identify and correct issues as they occur, and CRI attends and provides feedback on the HEA assessments. Further, both LVs and CRI inspect jobs after the work is complete. CRI is contracted to visit up to 10% of serviced homes.[2] The LVs’ QA/QC rate varies, but interviews determined that up to 60% of homes that install a recommended measure receive in-process or final verification QA/QC by LVs.

Key Finding 1.

CRI and the LVs capture detailed QA/QC information through the inspection process. However, the LVs and CRI could not provide the detailed QA/QC results. Therefore, it is not possible to quantitatively analyze drivers of QA/QC results and identify opportunities for improvements in this memo.

[1] The data provided by CLEAResult only represented the subset of HES participants that installed insulation and utilized the PA’s HEAT loan.
[2] Serviced homes include those that receive the assessment only, as well as those that receive measures (including weatherization).

The evaluation team closely reviewed the QA/QC processes employed by CLEAResult, RISE, CET, and CRI. The team's review indicates that CRI and the LVs are collecting a considerable amount of data during the inspections. However, follow-up conversations with CRI, RISE, and CET confirmed that much of this data resides only in hard copy or electronic flat files (e.g., digitally scanned copies of data collection forms with handwritten results and notes). At a statewide level, few of the QA/QC details are currently collected, stored, and available in an electronic format that lends itself to analysis (e.g., an Excel databook and database). As a result, it is not practicable for the evaluation team to analyze specific details about the QA/QC visit and/or assess the accuracy or quality of individual QA/QC elements at this time.

- CRI and CET captured detailed QA/QC information, but are unable to extract and/or run reports on the specific data collected in the forms (such as results of a specific elements of the project that were inspected). Both use the information primarily to determine the overall job score.
- RISE primarily collected information primarily via paper forms prior to 2017. At that time, RISE entered some, but not all, QA/QC results into a tracking database. RISE revised its processes in 2017. It now enters all QA/QC details consistently (including individual metric scores) into a tracking database that lends itself to data extraction and analysis.
- Starting in 2017, RISE also began capturing the detailed in-process and final inspection results in its data system. RISE can run reports that provide its PAs with information about QA/QC activities and the most common reasons for project failure. At the time of this reporting, CLEAResult was investigating whether it is possible to extract that level of detail (for the 2014 – 2016 period) for the evaluation team to analyze.

Key Finding 2.

QA/QC data collected and scoring criteria varies by CRI and the LVs, limiting the evaluation team's ability to draw comparisons across LVs and CRI.

The type of data differs collected differs by each LV, as well as between the LVs and CRI, differs. This memo documents the various information collected by each organization. The overarching metrics may be similar (e.g., accuracy of paperwork, behavior with customers, blower door operations); however, the specific elements assessed in the QA/QC forms differ.

Additionally, the scoring criteria for each organization differs. CRI determines whether the job passes, passes with notifications, or fails for each customer. A job fails if any of the individual elements fail. Further, a job can fail in the event CRI identified through their inspections that there were too many missed opportunities, even if the work completed was high quality. This is different from LV results, who calculate scores based on the inspection results of work completed. Further, the LVs do not assess HEA quality in their final inspection; therefore, they do not include missed opportunities in their scoring.

The LVs' scoring systems also vary. For example, each organization weights specific components to calculate an overall score. Those individual weights differ by LV.

These differences indicate that it is not possible to draw apples-to-apples comparisons on QA/QC results, and any direct comparisons made would require caveats. Therefore, the evaluation team does not include a comparative analysis between the LVs themselves or CRI and the LVs in this memo.

However, evaluators did find that contractors administer customer satisfaction surveys consistently; CRI and LVs now use the same questions to assess customer satisfaction.

Key Finding 3.

Recent changes in CRI's scoring criteria inhibit the evaluation team's ability to accurately identify statewide trends in QA/QC results over time; however, CLEAResult data does indicate marginal improvement in inspection results.

One of the key research questions is whether QA/QC activities are leading to improved initiative quality. Theoretically, CRI data is the optimal resource for answering this research issue given it uses a consistent process and scoring system for assessing job performance statewide. However, interviews with CRI revealed that in November 2015, CRI instituted a revised scoring approach in collaboration with the PAs, limiting the evaluation team's ability to assess statewide trends over time.

Review of CRI data for 2015 and 2016 showed a 10-percentage point increase in jobs marked as a fail. Prior to 2016, a job typically only had to meet one of three criteria to fail: health and safety, uninstalled lighting left behind for a customer to install, and customer dissatisfaction or damage. CRI marked quality installation issues with the category "pass with note." However, starting in 2016, CRI and the PAs modified the system so that a failure in any of the individual elements, including quality of installation, resulted in a failure for the job as a whole.

Furthermore, multiple missed opportunities that should have been identified within the HEA process failed a job, regardless of the quality of the work completed. These changes resulted in considerably higher failure rates in 2016 when compared with 2015. This change increased the number of projects that failed, which inaccurately indicates HES performed more poorly year-over-year.

However, the evaluation team did review CLEAResult's year-over-year results. While not representative of the full HES participant population, CLEAResult's scoring methods have stayed relatively consistent over the years and therefore one source to assess trends. According to the data, CLEAResult has seen marginal improvements in QA/QC scores over the three years reviewed (2014 – 2016).

Summary of Findings by Research Question

As noted above, this data analysis task, combined with qualitative interviews and materials review from Tasks 1 and 2, intended to address five research questions. This section summarizes the findings related to these specific research questions. Supporting evidence for the summaries are within this document and within the final Task 1 deliverable.[3]

[3] Home Energy Services (HES) Process Evaluation (RES 35) PA Program Manager and Lead Vendor (LV) Interview Summary Findings Memo dated March 1, 2017.

What QA/QC Data Is Collected?

The QA/QC forms completed by the LVs and CRI for the inspection of a weatherization job are extensive and collect data related to installations, quantity, quality, and necessary improvements. For each metric, the form documents whether the job passed and provides a place for inspector notes. Additionally, collected QA/QC data includes customer satisfaction survey results. According to interviews, the LVs historically collected QA/QC data via paper copy, which is stored as PDFs and made available as requested or necessary (e.g., a health and safety fail or customer requests, for example).

As noted in Key Finding 1., both the type of data and whether the data is captured electronically varies. The evaluation team received electronic data in Excel format for each jobs' QA/QC results at a job level. The data includes overall customer-level results, but not the measure-specific results that LVs and CRI collected in PDF form. Based on follow-up discussions with CRI and the LVs, this data is either collected—but not extractable—from the tracking system, or the ability to extract the data is still unknown (as is the case for CLEAResult).

How Is QA/QC Data Analyzed, Reported, and Used to Improve HES Quality?

According to interviews with the PAs and LVs, contractors (both HPCs and IICs), and Energy Specialists (ES) receive feedback when issues are identified. In-process inspections provide real-time feedback and training for contractors, and LVs use weatherization-related inspection results to develop training content. Interviewed HES stakeholders believe the in-process inspections improve HES performance, although the evaluation team cannot evaluate this claim with the data currently available. Last, CLEAResult reports having the option to summarize detailed results of the QA/QC which, in theory, provides information that may be useful in improving quality.

LVs also use the overall QA/QC results, both from CRI and their own inspections, to rate their IICs and HPCs. For example, RISE calculates rolling averages for their contractors based on the inspection scores. The scores dictate their status and number of jobs assigned to them. Those with the highest scores (a rolling average score of 90 to 100 points) are considered full participants and receive work based on their capacity. Conditional participants—contractors with average scores from 80 to 89 points—receive fewer assignments until their rolling average score reaches 90 or better. Those with rolling average scores of fewer than 80 and fewer than 70 are placed on probation and suspended, respectively. According to interviews and documentation, RISE conducts increased inspections for previously suspended contractors. CLEAResult takes a similar approach to its scoring system and contractor assignments. Newer contractors receive a higher rate of inspections to ensure work quality and accuracy from the onset.

Are the Data Collected Adequate for Understanding and Improving Quality?

Generally, the information collected in the LV and CRI QA/QC forms is adequate for understanding and improving HES quality. However, without the detailed results it is not possible for the evaluation team to systematically assess quality issues at a statewide level, or to assess what specific issues are driving the final ratings or scores. For example, CRI's failure rate encompasses jobs with missed opportunities, which is more of an implementation quality (versus installation quality) issue. Without that level of detail, it is impossible for the evaluation team or PAs to ascertain what portion of the failures are a result of installation-level quality or the assessor missing the opportunity.

The evaluation team received Excel files with summary results (e.g., pass, fail, and scores) and, in the case of CRI, data textual fields with notes. The qualitative data provided in the textual fields do not allow the evaluation team to reliably analyze the reasons for the pass or fail status. Additionally, the type of information captured by CRI and LVs are slightly different. These differences impede a consistent apples-to-apples statewide analysis of QA/QC activities and results (including identifying differences by delivery channel).

How Frequently Do Instances of QA/QC Problems Occur? Do These Rates Differ by Delivery Channel (i.e., LV and HPC)?

Analysis of the CRI data indicated that approximately 16% of jobs that received a Tier 3 inspection in 2015 and 2016 failed or required a return visit. As documented throughout this memo, a failure rating is not necessarily indicative of a quality installation issue, and could include other factors such as the ES or HPC missing energy efficiency opportunities during the HEA. Although details were collected, CRI was unable to provide the evaluation team with the detail what it needed to analyze the prevalent reasons for not passing inspections.

The scoring system adopted by LVs does not necessarily indicate instances of QA/QC problems. Lower inspection scores certainly indicate issues; however, given the combination of metrics embedded within those scores, it is difficult to determine the frequency of specific problems leading to the lower score. Additionally, a job with a high score may still warrant a return visit to the site. This could be the case where the customer has reason to request a return visit, or something needs correction but is not necessarily considered a failed installation.

At this time, the evaluation team is unable to determine statewide differences in performance between IICs and HPCs using the CRI data. This is because the evaluation team cannot map the CRI data to the LV data (which indicates whether a given customer was served by an IIC or HPC) without a common customer identifier. The evaluation team requested that the residential data management team contractor, DNV GL, provide this common identifier, but the team did not receive this data at the time of this memo. As a result, the evaluation team will include analysis related to differences by delivery channel in the final report.

What Happens When Issues Occur and What Are the Consequences of Those Issues?

The LV and CRI communication issues were identified during LV final inspection and CRI Tier 2 or Tier 3 inspections to the relevant contractor via electronic communication (typically a PDF form).[4] The IIC or HPC then needs to address any issues identified and report to the LV when the issue is rectified. The results of the follow-up activities are not always documented electronically, and when documented is not in a format that is extractable; therefore, the data does not reflect these follow-up activities.

Scores calculated by the LVs based on the QA/QC activities are used to assign future work, with those with higher scores likely to receive more jobs. Contractors that receive, on average, low ratings (defined by each LV) will either be put on probation and receive increased inspections until their scores improve or possibly removed from the program altogether. CRI customer satisfaction results may also affect contractor grading, bonuses, and number of job assignments.

[4] An example of a CLEAResult's in-process form can be found at the end of this document.

Detailed Findings

CRI, the PA's statewide QA/QC contractor, completes QA/QC inspections for up to 10% of HES customers. This percentage is generally split between weatherization jobs and HEAs, the proportions of which vary by PA per each PA's contractual agreement with CRI.

The LVs also conduct QA/QC inspections. PAs work with the LVs to set inspection quota goals. The LV-conducted inspections occur either during installation (in-process), or after installation has been completed (referred to as a final inspection). According to interviews with the PAs and LVs, CET and CLEAResult are more likely to complete final inspections versus in-process inspections, whereas RISE reportedly completes similar numbers of in-process and final inspections.

Review of documentation and tracking data revealed that QA/QC data collected by CRI and the LVs vary. It is important to note that the data received electronically do not fully encompass all data collected by CRI or the LVs. CRI and LVs collected a host of QA/QC data, much of which either was not recorded into a tracking system or was captured but not extractable for the evaluation team. The exception is CLEAResult who, per interviews, may be able to provide those details for the final report.

The following section includes detailed findings related to QA/QC data available to the evaluation team and quantitative analysis possible using the data available. Detailed findings are presented in the following sections:

- CRI QA/QC Processes and Results
- CLEAResult QA/QC Processes and Results
- RISE QA/QC Processes and Results
- CET QA/QC Processes and Results
- Next Steps and Data Needs
- Supporting References

CRI QA/QC Processes and Results

CRI characterizes its inspections by tier, as defined below. Each PA provides CRI with an annual quota of how many inspections must be completed by tier and contractor type (IIC or HPC). The distribution of projects by tier level varies by PA.

Tier 1 inspections are those in which CRI accompanies an assessor during the assessment process itself. The inspection documents a score for specific elements reviewed. Specifically, for each metric assessed, the inspector will mark whether the assessor passed (3), passed with notifications (2), or failed (1). Broad categories assessed include:

- Customer education on arrival
- Refrigerator assessment
- Combustion safety testing
- Insulation assessment

- Additional exterior assessment
- Electric heat thermostat assessment
- Air sealing opportunities
- Roadblocks identified
- Installation of measures
- Recommendations and presentation
- Diagnostic testing visit

Tier 2 inspections verify installation of reported equipment. It is a visual inspection to verify that what is reported is actually installed. The Tier 2 inspections are completed directly by CRI and occur outside of HEA or IIC processes.

Tier 3 inspections verify the proper installation of weatherization measures after the work has been completed.

The process for capturing and recording data is similar for Tier 2 and Tier 3 inspections. The LVs send CRI customer data that CRI then uses to select customers to receive a Tier 2 or Tier 3 inspection. Customer and measure-specific data provided by the LVs after project completion is imported into a PDF form, which is then sent to the CRI inspector.

During the QA/QC visit, the inspector documents results via hard copy, indicating at a measure level whether the inspection passed, passed with notifications,[5] or failed; the reason for failure; and next steps. Reasons for failure include: quantity not found, wrong product used, product is not working, the location where the product is installed is not allowed, and customer removed the product. The inspector or data entry department then enters the data into CRI's system.

Once the inspection is complete, the project receives an inspection status rating (e.g., pass, pass with compliment). Typically, the overall project score represents the "lowest" measure score. For example, if a measure fails, then a project fails.

Example Tier 1, Tier 2, and Tier 3 forms provided by CRI are appended to this document.
The data files provided by CRI contain data related to customers, initiative details, inspection notes, and satisfaction (Table 1). In addition, the CRI data indicates whether the project passed or failed.[6]

[5] As referenced earlier, pass with notifications indicates measures that passed but the inspector identified areas for improvements or the inspector recorded specific notes, including compliments. Review of Tier 2 and Tier 3 QA/QC data provided by CRI illustrates considerable variability in the type of notes included with pass with notifications results; however, the notes oftentimes reference homeowner accounts and/or concerns.
[6] Failure indicates that corrective action was needed or the work did not comply with HES requirements.

Table 1. CRI Data Availability

Type of Information	Data Variables
Customer	Customer Name, Address, City, State, ZIP Code, Fuel Type
Administrative	Vendor, PA
Inspection	Inspection Tier, Inspection Status (pass, pass with compliment, pass with notifications, fail, return required), presented at roject level
Additional	Customer Satisfaction Score, Qualitative Notes

Source: CRI Tracking Data

CRI documentation denoted whether a project passed, failed, or required a return visit, with some subcategories within those groups (e.g., passed with compliment). “Failed” and “required a return visit ” are essentially synonymous and indicate the inspection revealed an issue that required attention.

In addition, CRI captures inspection results via two open-ended text fields: *Survey Notes* and *Notes*. Notes are included regardless of whether a project passes or fails. The two fields appear to capture similar types of information.

CRI Inspection Activity by Tier and PA

The distribution of CRI’s activity by tier varies by PA. PAs contract with CRI to meet QA/QC targets by tier. These target proportions vary by PA, as indicated Table 2. The table also illustrates that CRI generally meets its target inspection goals by tier by PA. Most PAs see more Tier 3 inspections than other tiers. Eversource and Unitil are exceptions.

Overall, Tier 3 inspections make up nearly half (46%) of inspections completed in 2015 and 2016. Columbia Gas, Cape Light Compact, and Liberty target the highest proportion of Tier 3 inspections among PAs (50% to 70%).

Tier 1 inspections are the second most common, with an average of 38% of inspections with this category. PAs generally require 40% to 50% of inspections to be Tier 1. Liberty requires the fewest at 30%. Unitil customers receive the greatest proportion of Tier 1 inspections compared to other PAs, followed by Eversource customers (Table 2).

Relatively few inspections are Tier 2 (16%). In fact, two PAs—Columbia Gas and Liberty—do not ask CRI to provide Tier 2 inspections for HES.

Table 2 includes a count of all 2015 and 2016 HES Initiative customers. Based on the data, 9% of 2015 and 2016 customers received an inspection. National Grid and Berkshire Gas each have QA/QC rates of 10%. Unitil and Liberty’s QA/QC rates are lower (3% and 4%, respectively). Note that while CRI attempts to inspect up to 10% of completed projects for various reasons, including customer cancellations, CRI reports it does not always reach the 10% targeted.

Table 2. CRI Inspection Frequency and Target by PA and Tier (2015 and 2016)

PA	Tier 1 (% of all QA/QC)	Tier 2 (% of all QA/QC)	Tier 3 (% of all QA/QC)	Total	Total Participating Customers (% of customers receiving any QA/QC)[7]
National Grid[8]	3,631 (39%) *Target: 40%*	1,452 (16%) *Target: 20%*	4,241 (45%) *Target: 40%*	9,324	94,501 (10%)
Eversource[9]	973 (28%) *Target: 45%*	1,018 (29%) *Target: 25%*	1,499 (43%) *Target: 30%*	3,490	47,333 (7%)
Columbia Gas	968 (48%) *Target: 50%*	38 (2%) *Target: 0%*	996 (50%) *Target: 50%*	2,002	22,045 (9%)
Cape Light Compact	210 (40%) *Target: 40%*	33 (6%) *Target: 10%*	289 (54%) *Target: 50%*	532	8,241 (7%)
Berkshire Gas	73 (46%) *Target: 50%*	26 (16%) *Target: 20%*	61 (38%) *Target: 30%*	160	1,531 (10%)
Unitil*	23 (51%) *Target: 50%*	5 (11%) *Target: 20%*	17 (38%) *Target: 40%*	45	1,604 (3%)
Liberty Utilities	26 (34%) *Target: 30%*	0 (0%) *Target: 0%*	50 (66%) *Target: 70%*	76	1,892 (4%)
Total	**5,904 (38%)**	**2,572 (16%)**	**7,153 (46%)**	**15,629**	**177,147 (9%)**

Source: CRI Tracking Data.
**Target percentages provided by CRI sum to greater than 100%. The evaluation team will clarify and correct these targets before including this table in the final report.*

CRI QA/QC Results

Analysis of CRI data by the evaluation team shows a difference in QA/QC results by tier. The data provided by CRI indicates that nearly all of Tier 1, 97% of Tier 2, and 84% of Tier 3 jobs passed (Table 3). “Fail” and “Return required” are fundamentally similar; both indicate an issue was identified that needed to be rectified or corrected with a return visit.

Table 3. Results of CRI QA/QC by Status (2015 and 2016)

Status	Tier 1	Tier 2	Tier 3
Pass	5,894 (99%)	2,486 (97%)	6,039 (84%)
Fail or Return Required (Tier 2 or Tier 3 only)	10 (1%)	86 (3%)	1,114 (16%)
Total	**5,904**	**2,572 (100%)**	**7,153 (100%)**

Source: CRI Tracking Data.

[7] Source: Analysis of 2015 and 2016 participants provided by Cadeo, conducted for KPI review and reporting.
[8] Includes Keyspan.
[9] Includes NSTAR and WMECO.

According to interviews with CRI, the criteria for determining whether a job passes or fails changed in 2016. It is therefore not possible to identify from CRI data whether QA/QC results improved over the prior 2 years, or if any trends exist.

Few conditions resulted in a failed score prior to 2016. These conditions were: health and safety issues, incorrect or removed number of bulbs, and customer complaints. In 2016, PAs and CRI worked together to revise the scoring criteria, which now includes measure-level assessments and whether there are missed opportunities (see earlier in the memo for more details on scoring). This change had significant implications, increasing the number of jobs that resulted in a fail or return required, and is reflected in Table 4.

Table 4. Results of CRI QA/QC by Year (2015 and 2016)

Year	Pass	Fail or Return Required	Total
Tier 2 (2015)	1,746 (99%)	17 (1%)	1,763 (100%)
Tier 2 (2016)	740 (91%)	69 (9%)	809 (100%)
Tier 3 (2015)	3,421 (89%)	407 (11%)	3,828 (100%)
Tier 3 (2016)	2,618 (79%)	707 (21%)	3,325 (100%)

Source: CRI Tracking Data.

CRI captures details on whether an individual measure passed or failed in its inspection forms, and in cases of failure the reason. CRI is unable to provide this type of information electronically; therefore, it is not possible to discern the most common reasons for a job to fail or require a return to the site.

CLEAResult QA/QC Processes and Results

CLEAResult data captures customers that receive an in-process or final inspection, and indicates whether the customer received a HEAT Loan inspection (associated with those who received a HEAT Loan) and provides the final inspection score. CLEAResult only provides inspection scores if the customer received a HEAT Loan and/or final inspection.

For each, CLEAResult calculates an overall score based on QA/QC results within three areas: 1) work quality, 2) documentation and data quality, and 3) customer service. Per CLEAResult documentation:[10]

- **Work Quality (approximately 70% of all available points):** All measures and testing requirements are listed with the associated tasks that are necessary to successfully complete each. The field inspector rates the conditions in the house for each task, and the tasks are weighted based on relative importance. The sum of all the weighted ratings become the work quality score. This score is reduced by one-third if a return/repair is required for the job.
- **Documentation/Data Quality (25% of all available points):** The field inspector rates how well the documented information compares with the actual onsite conditions, and an administrator rates the timeliness and completeness of paperwork and any discrepancies between the various documents that are submitted (either hard copy or electronically). The

[10] _Merit-Based Work Allocation Policy final.doc

ratings are weighted based on relative importance, and the sum of all the weighted ratings become the document quality score.

- **Customer Service (5% of all available points):** After the inspection, the field inspector asks the customer a series of standard questions about the professionalism of the contractor throughout the work process. The answers are weighted based on relative importance, and the sum of all the weighted answers becomes the customer service score.

CLEAResults assigns contractors to either one of three tiers or probationary status based on their average scores, with 9.2 and higher assigned a Tier 1 and less than 8.0 assigned a probationary status. Contractors with higher tier ratings receive more work than those with lower tier ratings, and those with probationary status will not receive any other jobs unless they develop and abide by a work plan to improve their status. All new contractors automatically receive provisional status until they receive five successful inspections within the first 3 months.

The data provided by CLEAResult also includes information related to the customer, program details, and inspection status. Data variables included in the CLEAResult data are summarized in Table 5.

Table 5. CLEAResult Data Availability

Type of Information	Data Variables
Customer	Customer Name, Site ID, City, Renter/Owner Status
Program	PA indicator (via an invoice code); Company Name (HPC or LV)
Inspection	In-Process Inspection, Heat Loan Thermal Inspection, and Final Inspection indicators (Y or blank); Inspection Score (2-10 range)
Additional	Roadblocks, Insulation, Heat System

Source: CLEAResult Tracking Data

Table 6 details the number of customers in CLEAResult's data that received QA/QC by inspection type and the average inspection score. The analysis shows that from 2014 through 2016 CLEAResult completed QA/QC for nearly 60% of customers the HEAT loan customers that installed insulation. Again, these results are specific to HEAT loan customer that installed insulation, which are a subset of the HES participants. The team did not receive data for other types of HES participants.

Table 6. CLEAResult Reported Inspection Results

Inspection Type	Number of Customers with Inspection Score	Percent of Projects (n=4,699 projects in data)	Average Inspection Score
Heat Loan Thermal	2,758	58.6%	9.3

Source: CLEAResult data provided to the evaluation team ("hes_data_reva_2014_2016_fk_nav.xls")

The CLEAResult data demonstrates that year-over-year inspection results have been improving. This trend does not change when reviewing results by inspection type.

Table 7. CLEAResult Inspection Results by Year

Year	Number of Customers with Inspection Score	Average Inspection Score
2014	9,765	9.17
2015	8,673	9.24
2016	5,985	9.43
Total	24,423	9.26

Source: CLEAResult data provide to the evaluation team ("hes_data_reva_2014_2016_fk_nav.xls")

RISE QA/QC Processes and Results

RISE calculates a job level inspection score for each project inspected. According to the RISE's Job Scoring Criteria and Methodology,[11] the inspection score is a weighted average of four evaluation factors:

1. **Customer service** (43% of total score): Composite of 11 subcategories with the greatest points assigned to:
    a. Completed to customer's/inspector's satisfaction with no deficiencies (15 points)
    b. Cleaned up satisfactorily when all work is completed (10 points)
    c. Work zones maintained are neat and orderly (5 points)
    d. Informed RISE inspector of problems or concerns (5 points)
2. **Safety** (19% of total score): Composite of six subcategories with the greatest points assigned to:
    a. Tested out and left house in safe condition (6 points)
    b. Applied all materials safely and appropriately (5 points)
3. **Materials and installation** (30% of total score): Composite of seven subcategories with the greatest points assigned to:
    a. Prioritized air sealing and sealed effectively (7 points)
    b. Installed correct materials (6 points)
    c. Achieved correct R-values, densities, bag counts, and left form (5 points)
4. **Post work follow-up** (8% of total score): Composite of four subcategories, including:
    a. Invoiced in a timely manner with all required paperwork (4 points)
    b. Accuracy of invoice (1 point)

[11] ATT C_Job Performance InspectionsV2 (RISE)

The data provided did not include the individual scoring elements, so it is not possible to identify prevalent reasons for the inspection scores. The evaluation team submitted a request to RISE to identify whether these scores are available. The final evaluation report will document the availability of the scores and related analysis (if available).

RISE calculates rolling averages for its contractors based on the inspection scores. The scores dictate their status and number of jobs assigned to them. Those with the highest scores (rolling average score from 90 to 100 points) are considered full participants and receive work based on their capacity. Conditional participants, who have average scores from 80 to 89 points, receive fewer assignments until their rolling average score reaches 90 or better. Those with rolling average scores of fewer than 80 and fewer than 70 are placed on probation and suspended, respectively. According to interviews and documentation, RISE conducts increased inspections for probationary contractors. CLEAResult takes a similar approach to its scoring system and contractor assignments.

Table 8 documents the data the evaluation team received from RISE.

Table 8. RISE Data Availability

Type of Information	Data Variables
Customer	Customer Number, Last Name
Program	Subcontractor name, PA, LV/HPC designation
Inspection	Score (0-100), Date, Inspection Type (Final vs. In-Process)
Additional	None

Source: RISE Tracking Data

The RISE data includes a QA score (the scores in the tracking system ranged from 70 to 100) along with a designation of whether the inspection occurred in-process or as a final inspection. Further designation of PA and subcontractor is also provided. RISE provides an inspection score, but not a pass or fail designation for each job.

Table 9 details the average inspection score reported in the RISE data. The table only includes final inspections as, according to RISE, those are the only types of inspections that should receive a score. The scores recorded are high; an average of approximately 98 out of a maximum of 100. However, the reported scores exclude cases that fail (which do not receive a score); in total, 160 cases across all 3 years were marked as fails. There is no data in the dataset to indicate why jobs failed.

Only 30% of projects that received an inspection also received an inspection score. According to interviews with RISE, its contractors primarily collected QA/QC results via hard paper copy prior to 2017 and did not consistently enter the data into a tracking system. Therefore, the inspection results within the tracking data provided by RISE are incomplete. Starting in 2017, RISE changed its system to capture detailed QA/QC results for all projects in a system. This data, which can be extracted from the system, allows RISE to provide more detailed feedback to contractors including drivers of the final inspection score.

Table 9. RISE Reported Final Inspection Results (2014 to 2016)

Inspection Type	Number of Customers Received Inspection	Number of Customers with Inspection Score	Percentage of Customers with Inspection Score	Average Inspection Score[12]
Final Inspection	8,193	2,481	30%	97.8

Source: RISE data provided to the evaluation team ("inspections from eplus 2014_2016..xls"), incomplete set of inspection results per RISE interviews

CET QA/QC Processes and Results

CET calculates three separate QA/QC scores: QA field score, QA doc score, and QA survey score. According to CET staff and documentation, these three scores are defined as:

- **QA field score reflects the quality of work.** The score reflects necessary rework or follow-up, and provides a score based on the following areas: return or repair needed (yes or no), billing adjustment needed (yes or no), and discrepancies identified (yes or no). The QA field score also captures whether each installed measure passes, conditionally passes, or fails. Any identification of safety issues automatically fails the entire job. The final QA field score reflects an average of the ratings, which is further reduced by 20% if a return or repair is required. QA field scores range from 0 to 1.
- **QA doc score relates to the completeness and accuracy of the contractor's paperwork.** It scores in the following areas: completed job packet (pass or fail), paperwork completeness (pass or fail), and any discrepancies identified in paperwork when inspected (good with no discrepancies, fair but no resubmission required, poor resubmission required, and fail). Each pass rating receives a score of 1 and the final QA doc score is an average of each of the ratings in this category. QA doc scores range from 0.4 to 1.
- **QA survey score refers to the results of the customer survey.** Each question asked can earn up to a point, with excellent or good result rating 1, a fair result rating 0.7, and a poor result rating 0.4. The scores are averaged for a final QA survey score. The QA survey scores range from 0.67 to 1.

CET determines an overall contractor score through a weighted average of these three scores. The quality of work (QA field score) is worth 60%, customer satisfaction (QA survey score) is worth 25%, and document quality (QA doc score) is worth15% of the overall contractor score. CET reports inspection results as decimals ranging from 0 to 1.

[12] Excludes 164 final inspection jobs with a score of "fail".

The data received from CET differs from that provided by CLEAResult and CRI, and is summarized in Table 10.

Table 10. CET Data Availability

Type of Information	Data Variables
Customer	Customer Name, Site ID, Town
Program	Contractor Name
Inspection	QA Field Score, QA Doc Score, QA Survey Score, Pass Status (binary)
Additional	None

Source: CET Tracking Data

Table 11 details the average inspection score reported in the CET data, by QA scoring method. The number of projects that received inspections totaled 97. CET provided QA/QC for most (91%) customers and 84% of the projects passed inspection. Data shows that some projects required a return visit, however no information is provided as to the reason for the return or what these visits entailed. Per communication with CET, this information is captured electronically but is not available to the evaluation team via an extract.

Table 11. CET Reported Inspection Results

QA Score Type	Average Inspection Score
QA Field Score	0.96
QA Doc Score	0.92
QA Survey Score	0.99

Source: CET data provided to the evaluation team ("qa_2016_report_fk_nav_CET..xls")

Next Steps

This memorandum documents QA/QC findings based on data in-hand at the time of this reporting. As documented in this memo, an outstanding item is the availability of detailed QA/QC results collected and entered into an electronic system by CLEAResult. The final report will include the CLEAResult analysis if received or update the reader on the availability of that data.

One of the research questions not addressed within this analysis is the difference in performance between IIC and HPC. The evaluation team needs additional data to be able to provide this analysis. The team requested the data from the statewide database contractor, DNV GL, necessary to do this analysis in mid-August. This analysis will be included in the final report.

Supporting References

CRI Tier 1 Inspection Report

Tier 1 Field Inspection Form Ver

CRI Tier 2 Inspection Report

Tier 2 Field Data Collection Form201

CRI Tier 3 Inspection Report

Tier 3 Field Data Collection Form201

CLEAResult In-Process Inspection Report

Contractor Facing Inspection Report E

CLEAResult Final Inspection Report

CLEAResult Post Job Inspection Form

CET In-Process Inspection Report

CET In-Process.pdf

CET Final Inspection Report

CET Post Job Inspection Berkshire

RISE In-Process Inspection Report

RISE Subcontractor Inspection Results F

RISE Final Inspection Report

RISE inspection form 2016.pdf

PORTFOLIO F. NEW OFFER KPI FINDINGS MEMO (TASK 3)

Memorandum

To: Massachusetts Program Administrators (PAs)

From: Doug Bruchs and Katie Arquiette, Cadeo

Date: May 26, 2017

Re: Home Energy Services (HES) Process Evaluation (RES 35): New Offer KPI Review Findings Memo

This memo summarizes the evaluation team's review of the Key Performance Indicators (KPIs) associated with the Home Energy Services (HES) Renter/Landlord and Moderate Income offers. The Program Administrators (PAs) and the Energy Efficiency Advisory Council (EEAC) collaboratively created these KPIs to track participation in and the effectiveness of the two new offers.

The purpose of the team's review was to determine whether the current set of KPIs provide sufficient information for the PAs and EEAC to assess each offer's performance, as well as to identify opportunities for improvement. Our team's review was informed by:

- Task 1 interviews with HES Lead Vendors (LVs) and PAs
- Task 2 interviews with Home Performance Contractors (HPCs) and Energy Specialists (ES)
- Review of HES marketing materials for each offer
- Creation of process flow diagrams for each offer

For each offer, the team created three tables to facilitate and document our review. These tables, in the order presented in this memo, include:

1. Summary of the new offer KPIs, including the quantitative indicators and associated data points for each
2. Description of data points collected
3. The evaluation team's notes and suggestions for each KPI

Following these tables, the team lists additional KPIs that the PAs and EEAC should consider. As a reference, the team also included the process flow diagrams we created for each offer as an appendix.

A. Renter/Landlord Offer

Table 1 provides an overview of the current KPIs for the Renter/Landlord offer. This table also includes the associated data points and calculations the PAs and EEAC identified for each KPI, which are further defined in Table 2.

Table 1. Renter/Landlord Offer KPIs

KPI	Quantitative Indicators	Associated Data Points/Calculation
1	Number of renter visits provided	A
2	Number of full HEAs provided to landlords	B
3	Number of whole building incentives provided to rental units	C, H
4	Percentage of renter visits that convert to a full HEA with landlord	B/A
5	Percentage of full HEAs with landlord that result in weatherization jobs	C/B
6	Average instant savings measure (ISM) installation per renter visit	F/A
7	Renter visit by building type (1,2,3 or 4 units)	A, D
8	Renter visit by heating fuel	A, E
9	Whole building incentive by building type for rental units (1,2,3 or 4 units)	C/D
10	Number of enhanced renter rebates processed	G
11	Weatherization incentives by heating fuel	C, E
12	Average measures other than whole building incentives provided to landlords (e.g., air sealing, common area lighting) per full landlord HEA	B, H
13	Average savings per renter visits and/or unit[1]	A, F, G, H

Table 2. Renter/Landlord Offer Data Points Collected

Data Points	Description
A	Number of renter visits provided
B	Number of full HEAs provided to landlords
C	Number of whole building incentives completed/processed for rental units (number of accounts accessing the WBI)
D	Building type (1, 2, 3, or 4 units)
E	Heating fuel (electric, gas, oil, other)
F	Number of ISMs installed in rental units (measures F1, F2, F3, etc.)
G	Number of enhanced renter rebates processed
H	Number of renter units getting weatherization

The team closely reviewed this existing set of Renter/Landlord KPIs and associated data points and summarized our findings in Table 3. The team provides suggestions for the PAs and EEAC to consider in the 'Suggestions' column. Most of the team's suggestions center on clarifying the language as the current language is inconsistent in places or does not clearly map to the associated data points. Again, these suggestions are all aimed at reducing ambiguity; none of them require the PAs to collect additional data.

[1] The team will calculate this KPI as part of RES 35's KPI analysis for the entire HES initiative (Task 8)

Table 3. Renter/Landlord KPI Review

KPI	Quantitative Indicators	Reviewer Notes	Suggestions
1	Number of renter visits provided	None	None
2	Number of full HEAs provided to landlords	None	None
3	Number of whole building incentives completed/processed for rental units	The terms “whole building incentives” and “weatherization jobs” appear to be used interchangeably; better to be consistent.	None
4	Percentage of renter visits that convert to a full HEA with landlord	The data provided by the PAs includes the percentage of renter visits that convert to a full HEA with landlord, but not the number. Having the number would make the KPI calculations more transparent.	None
5	Percentage of full HEAs with landlord that result in weatherization jobs	None	None
6	Average ISM installation per renter visit	None	None
7	Renter visit by building type (1,2,3 or 4 units)	None	None
8	Renter visit by heating fuel	None	None
9	Whole building incentive by building type for rental units (1,2,3 or 4 units)	Language is somewhat unclear.	None
10	Number of enhanced renter rebates processed	None	None
11	Weatherization incentives by heating fuel	None.	None
12	Average measures other than whole building incentives provided to landlords (e.g., air sealing,) per full landlord HEA	None	None
13	Average savings per renter visits and/or unit	Language is somewhat unclear. The associated data points/calculation do not specify how average savings will be calculated.	Consider making the unit of analysis (per visit, per site, per customer, per unit) clearer

Other KPIs to Consider:

Overall, the team believes the current set of KPIs is comprehensive and will be effective at tracking the progress of the new offers.

We understand that the PAs would like to minimize the data collection and administrative burden associated with tracking new offer KPIs and that suggesting more KPIs may be problematic at this time. Consequently, the team offers only one forward looking suggestion. When the offer matures and the PAs and EEAC revisit this initial set of KPI we suggest considering the following KPI:

- **Lead source per initial visit.** This KPI would allow the PAs to track how renters and landlords enter the initiative (e.g., mass media, social media, bill insert, or LV/HPC), which would shed light on effective marketing strategies and identify the most common pathways for participation.

B. Moderate Income Offer

Table 4 provides an overview of the KPIs that the PAs and EEAC agreed to track for the Moderate Income offer. This table also includes the associated data points and calculations the PAs and EEAC identified for each KPI, which are defined in Table 5.

Table 4. Moderate Income Offer KPIs

KPI	Quantitative Indicators	Associated Data Points/Calculation
1	Number of approved moderate income applicants	A, B
2	Percentage of approved moderate income applicants that result in weatherization jobs	D/B
3	Average ISM installation per approved moderate income household	E/B
4	Number of approved moderate income applicants by heating fuel	B, F
5	Number of approved enhanced moderate income rebates processed (i.e., refrigerators and clothes washers)	G
6	Number of approved moderate income weatherization incentives by heating fuel	D, F
7	Average savings per participating approved moderate income household[2]	B, D, E, G

[2] The team will calculate this KPI as part of RES 35's KPI analysis for the entire HES initiative (Task 8)

Table 5. Moderate Income Offer Data Points Collected

Data Points	Description
A	Number of applicants for moderate income qualification
B	Number of approved moderate income applicants
C	Lead source
D	Number of approved moderate income households getting weatherization
E	Number of ISMs installed in approved moderate income households (measures F1, F2, F3, etc.)
F	Heating fuel (electric, gas, oil, other)
G	Number of approved moderate income enhanced rebates processed (i.e., refrigerators and clothes washers)

The team closely reviewed this existing set of Moderate Income KPIs and associated data points and summarized our findings in Table 6. As evident in the table, the team found the existing set of KPIs to be clear and comprehensive. The team did not have any suggestions for improving the KPIs at this time.

Table 6. Moderate Income KPI Review

KPI	Quantitative Indicators	Reviewer Notes	Suggestions
1	Number of approved moderate income applicants	None	None
2	Percentage of approved moderate income applicants that result in weatherization jobs	None	None
3	Average ISM installation per approved moderate income household	None	None
4	Number of approved moderate income applicants by heating fuel	None	None
5	Number of approved enhanced moderate income rebates processed (i.e., refrigerators and clothes washers)	None	None
6	Number of approved moderate income weatherization incentives by heating fuel	None	None
7	Average savings per participating approved moderate income household	None	None

Other KPIs to Consider:

In addition to the potential language adjustments above, the team also suggests the PAs and EEAC consider adding one new KPI. We believe this KPIs could improve the PAs ability to assess the moderate income offer's performance.

- **Participation by delivery channel.** The team also reviewed notes where the PAs documented wanting to track moderate income offer participation by delivery channel (e.g., LV or HPC). Since provider information is already collected for all HES participants, this KPI would be easy to analyze.

C. Process Flow Diagrams for New Offers

The team created process flow diagrams for each new offer as a component of the KPI review. This was a critical step in the review process, allowing the team to identify unclear KPIs, missing data points, and gaps where the KPIs were not adequately describing the overall flow of the initiatives. Findings from the creation of the process flow diagrams contributed to the team's recommendations identified in Table 3 and Table 6.

The following two pages contain the Renter/Landlord and Moderate Income process flow diagrams, respectively.

Figure 1. Renter/Landlord Offer Process Flow

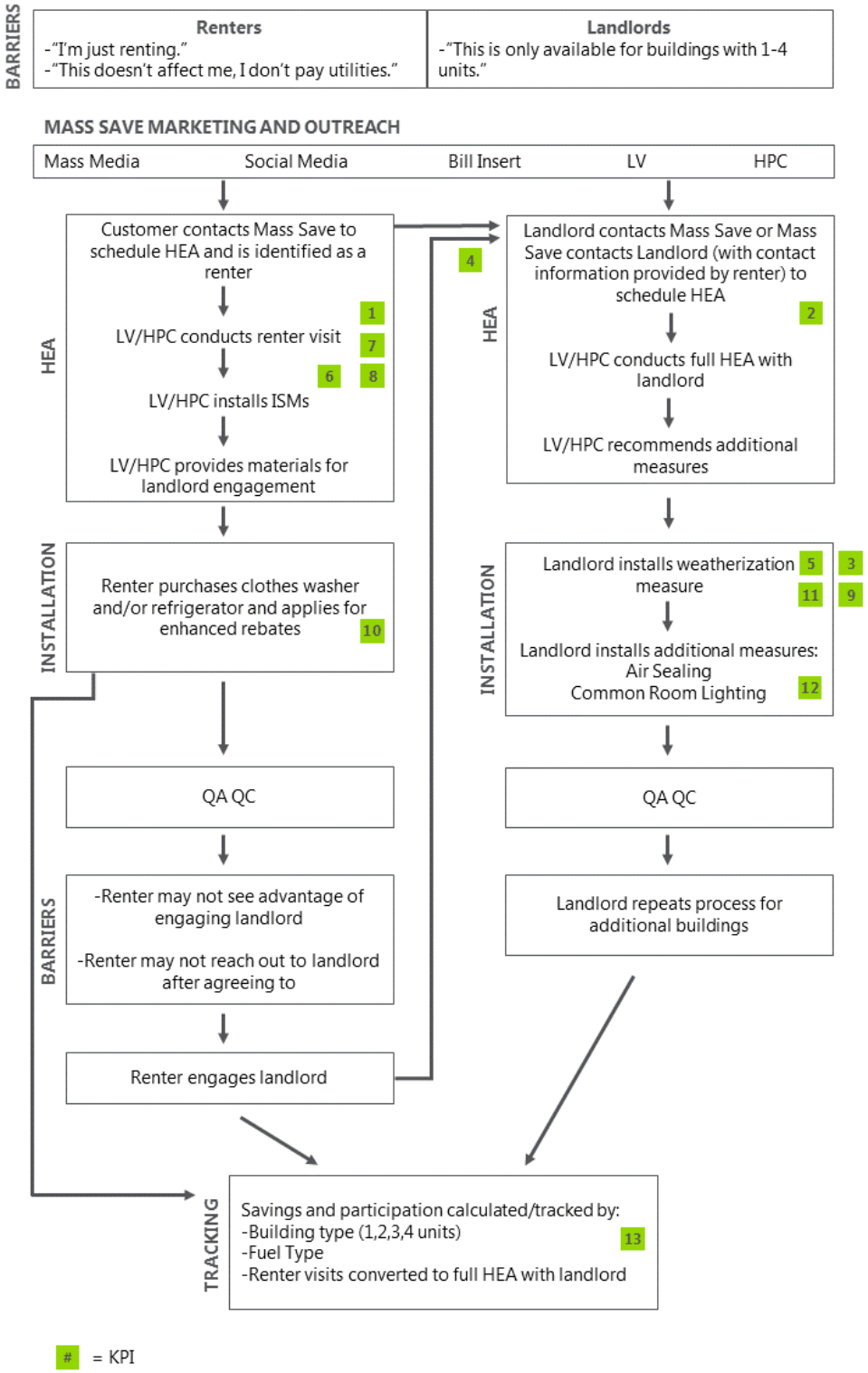
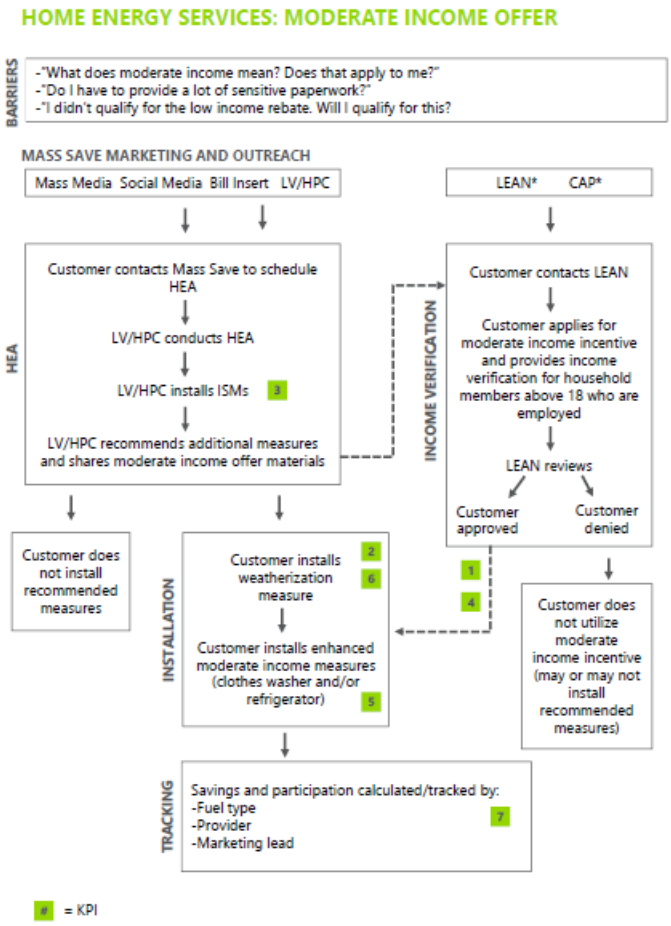


Figure 2. Moderate Income Process Flow



*Includes customers who received information about the Moderate Income offer when learning they were ineligible for the Fuel Assistance and/or Low Income programs

PORTFOLIO G. SECONDARY RESEARCH FINDINGS MEMO (TASK 4)

NAVIGANT

ILLUME cadeo bellomy research LEXICON ENERGY CONSULTING INCORPORATED

Memorandum

To: Massachusetts Program Administrators (PAs)

From: Laura Schauer and Sara Conzemius, ILLUME, and Doug Bruchs, Cadeo

Date: April 10, 2017

Re: HES Process Evaluation (RES 35): Secondary Program Research and Interview Finding Summary (Task 4)

One objective of the Home Energy Services (HES) Process Evaluation (RES 35) is to understand how program administrators (PAs) outside of Massachusetts are delivering comparable programs and responding to similar changes in the residential energy efficiency market. Task 4, Secondary Research, addresses this research objective, with the end goal of providing context, ideas, and guidance for the Massachusetts PAs regarding strategies that have worked well and are cost-effective in other parts of the country.

Task 4 included both primary and secondary research of other comprehensive home retrofit programs similar to the HES that are offered in utilities with similarly mature programs and/or climates as Massachusetts.[1] This memorandum presents the results of this research, based on the following activities:

- Secondary analysis of 17 programs run by 13 utilities
- Interviews with eight program managers running 12 home retrofit programs across the country

The evaluation team also included insights from past research efforts which included interviews with programs not included in this study as well as national home retrofit thought leaders, including the US Department of Energy (DOE) and the leaders for the Better Building national evaluation efforts.

[1] The research team collaborated with the PAs and Equal Employment Advisory Council to identify the appropriate utilities/programs to research and interview.

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303.728.2500 main
navigant.com

Together, the secondary research and in-depth interviews address the following key questions:

- **Program Models:** What are the types of home audit models being employed by utilities across the country?
- **Program Processes:** What are the key processes used by the different programs, and what is the rationale behind them?
- **Quality Assessment/Quality Control (QA/QC) Processes:** What type of QA/QC processes are used by the different programs? How does this compare to the QA/QC processes used within Massachusetts?
- **Cost-Effectiveness:** How does the changing landscape of direct install measures (i.e., measures installed during the assessment), specifically lighting measures, affect cost-effectiveness if at all? How reliant are others on direct install measures for cost-effectiveness? Are there insights from other utilities that HES could employ to further evolve to increase cost-effectiveness? Are there insights into how other programs calculate cost-effectiveness that might be of use, for example are other programs measuring and including non-energy benefits in their cost-effectiveness assessments? Are there any non-energy benefits that the PAs should be capturing?

This memo focuses on the findings from the secondary review and interviews and does not include specific recommendations for the PAs. While there are findings of interest and approaches that may be worth considering, without looking at each in the specific context of the current approach in Massachusetts suggesting changes after this level of review would be premature.

Note that the evaluation team will extend the findings related to the QA/QC findings in this memo to Task 4 (quantitative and qualitative QA/QC review) and may at that point include recommendations for QA/QC at that time.

Methodology

The evaluation team reviewed programs for 13 program administrators/utilities. The team conducted interviews with eight program managers representing 11 of the evaluated programs. Those programs where interviews were conducted were chosen because through investigation, the team found they were 1) piloting new approaches into which this team wanted to gather more insight; 2) were lacking publicly available information on key research questions; or 3) were specifically making program changes to address cost-effectiveness.

When selecting these programs, the evaluation team considered the following:

- **Program Maturity:** Focused on longer-standing programs that, like HES, are in a mature state.
- **Climate:** Targeted programs running in similar climates, making comparability around measures and issues related to cost-effectiveness more relevant to MA.
- **Fuel Mix:** Sought dual fuel programs, similar to HES.
- **Direct Install Components:** Focused on programs that use direct install (DI) as a part of their program or as a companion program to assess how changes in lighting savings might affect program cost-effectiveness and/or design considerations.

- **QA/QC Rigor:** Prioritized programs that are known to include a significant level of QA/QC for comparability purposes.
- **Innovation:** Identified programs that have invested some effort in innovative or more forward looking approaches to program delivery, marketing and outreach or positioning.

Table 1 provides a list of the programs that the team investigated and the associated program administrator/utility. It also indicates whether an interview was completed for that program.

Table 1. Programs Researched

Utility/Program	Program	Interview Conducted
East Coast State-Wide	Home Performance with ENERGY STAR® (HPw/ES)	Yes
Consumers Energy	HPw/ES	Yes
Georgia Power	Home Energy Improvement Program (HEIP)[2]	Yes
ComEd	Home Energy Assessment	Yes
MidAmerican Energy	HomeCheck®	No
Focus on Energy	HPw/ES[3]	Yes
Energy Upgrade CA®	Home Upgrade	No
Xcel Energy	Efficiency United	No
New Jersey's Clean Energy Program	HPw/ES	No
Austin Energy	HPw/ES	No
BG&E Maryland	HPw/ES	Yes
Pepco Maryland and DC	HPw/ES	Yes
SMECO Maryland	HPw/ES	Yes

Program Models and Processes

Below, this memo describes program models defined by three characteristics: 1) assessment/audit offering and requirements; 2) rebate structures; and 3) inclusion of direct install measures.

Assessment/Audit Types

The programs the team reviewed generally take one of three approaches to customer onboarding.

1. **Comprehensive home energy audit:** This comprehensive audit often includes full diagnostic testing and a leave-behind report that provides detailed findings, recommendations, and an overview of the applicable incentives.

[2] Nearly identical program structure to HPwES.

[3] Program has been recently restructured to align with HPwES.

2. **Less intensive walk-through audit:** This type of audit does not include any diagnostic testing, but relies on a visual inspection of the home. A report is also left behind outlining findings and an overview of incentive opportunities. In both the case of comprehensive and walk-through audits the team found that DI measures are typically, but not always, offered.
3. **Rebate options with no audit requirement (a la carte):** Some utilities offer but do not require an assessment to qualify for a rebate. The team refers to this as an a la carte approach. Please refer to table 2 for details on programs by type.

The comprehensive audit is offered by 10 of the programs that the team reviewed. Most of these programs are a true Home Performance with ENERGY STAR® (HPw/ES) model. The two programs we reviewed with a comprehensive audit that is not classified as HPw/ES are Georgia Power's Home Energy Improvement Program (HEIP), and Energy Upgrade CA's® Home Upgrade, which are akin to HPw/ES but delivered outside of the ENERGY STAR® brand umbrella. In most cases, these programs utilize a network of Building Performance Institute (BPI) contractors, who conduct an initial comprehensive home assessment—the cost of which is either partially or fully incentivized[4] through the program. These assessments align with Mass Save's Home Energy Assessment (HEA) model in that they take a whole home approach, inspecting heating and cooling systems and performing insulation checks, appliance checks, various tests to determine the overall safety and comfort of the home, and (in many cases) blower-door tests. Upon completion of the assessment, these programs present customers with a report that details the assessment's findings and provides several suggested home improvement projects along with the corresponding incentives for each recommended measure.

In contrast to the comprehensive audits, two of the utilities that the team reviewed offer a less rigorous walk-through audit that is less extensive and time intensive (ComEd and MidAmerican). Both walk-through audit programs are free and, in almost all cases, include free direct install measures. The walk-through audits provide customers with a big picture view of their home's energy use and provide suggestions for various upgrades that align with the programs rebates and incentives, though they do so with lesser detail (no thermal imaging or blower-door tests) than the comprehensive audit.

Four utilities offer both comprehensive and less intensive walk-through audits. When asked during interviews (all four were interviewed) whether there was concern that the dual assessment approach might keep customers from taking a more comprehensive path, the staff managing these programs indicated that the dual path helps and does not inhibit customer participation in the comprehensive program offering. All four interviewees noted that customers that need more after the walk-through assessment often move on to participate in the more in-depth audits and complete comprehensive improvements. By offering both options, the feedback was that they can afford those customers who do not need a comprehensive solution an opportunity to learn about their homes and save some energy for a much lower investment. One program interviewed, Focus on Energy, offered both a comprehensive and walk-through audit in the past, but ended the walk-through audit because of cost-effectiveness challenges with the program.

Of the programs reviewed, five allow customers to receive insulation and other weatherization-type measure rebates without requiring an assessment (referred to as an a la carte rebate/incentive structure) in these cases there is no program verification of pre-existing conditions nor is there program QA/QC of the installation of these measures. The five programs are administered by

[4] See Table 3

ComEd, Efficiency United, Energy Upgrade California®, Georgia Power, and Consumers Energy. All other utilities require an assessment to qualify for these measures.

Georgia Power, Energy Upgrade California® and Consumers Energy offer these a la carte paths in addition to comprehensive programs. Two of the three were interviewed, and the team asked both utilities if there was any concern that the availability of an a la carte option was keeping customers from taking a whole house approach in favor of single measure replacements. In both cases, the managers indicated that they see these as two distinct customer types and that by offering both options they are able to reach more customers than they would if they required all customers to go through a comprehensive audit before being eligible for upgrades.

Incentive Structure

The majority of programs researched (9/13) offer incentive bundles or tiers, whereby customers receive proportionally larger incentives when installing a greater number of improvements, or when they achieve a higher percentage of total energy saved (a performance-based incentive). Two additional programs are considering adopting either a tiered or performance-based strategy in the future. Four programs only offer bundled incentives wherein customers must install some prescribed combination of measures to attain rebates, while five programs offer customers the option to either bundle or address issues individually.

Eight programs use some type of a performance-based bundle that requires that customers hit a certain level of savings to receive a rebate[5] or offers increasing rebates based on level of performance. Three of these programs are in Maryland. This is a relatively new model for these utilities, adopted at the start of 2017. In interviews, the team asked if there was concern that the performance approach to incentives was prohibitive from a customer understanding, contractor implementation, or administrative perspective. All utilities interviewed indicated that there were no concerns with the model and that, once explained to contractors, the approach was being easily accepted.

Georgia Power has been running this model for some time; the team specifically asked if there were difficulties associated with a performance-based incentive and was told that there were none. As a follow-up we asked how often a customer's work did not meet the modeled performance jeopardizing the incentive amount they were expecting. Again, the feedback was that this was rarely an issue and that the benefit of offering larger incentives for larger savings/larger projects far outweighed the occasional risk of lower than expected savings.

Focus on Energy found that they were seeing big differences between modeled and evaluated savings. It recently switched its modeling software to one that it feels is more accurate in predicting savings and has no concerns continuing with a performance-based incentive model.

Inclusion of Direct Install Measures

Five of the 13 PAs the research team reviewed offer direct install measures. In three cases, they offer both a comprehensive and less intensive walk-through audit; the direct installation is provided in the walk-through portion, not the comprehensive component. This is because while the walk-through audit is conducted by staff of the program implementation team who can easily access, manage, and

[5] Georgia Power requires a 25% kWh energy reduction over replaced equipment to qualify for rebates. Both Focus on Energy & Energy Upgrade CA® require 10%.

QA/QC a direct install component, the comprehensive audit is delivered by independent contractors. The feeling is that managing the DI stock and QA/QC is both cost prohibitive and complex (e.g., coordinating measures on hand with a large pool of contractors adds logistics and complications that are costly without equal benefits to the program). Focus on Energy used to offer DI as a part of the comprehensive audit but recently stopped due to contractor complaints about managing and carrying the inventory and the feeling that the contractors were serving as handymen for the program.

All the programs that incorporate direct install measures do so in a nearly identical manner and include a nearly identical set of base measures. There is slight variation based on fuel type and a few utilities are offering a more comprehensive set of measures and/or piloting some additional measures. Generally, all programs include:

- LED of CFL bulbs (although almost all indicated they are moving fully away from CFL)
- Faucet aerators
- High efficiency showerheads
- Water heater pipe insulation

Additional but less frequently cited direct install measures include:

- Smart power strips
- Furnace filter whistles
- Shower starts (stops the flow of water once the shower reaches temperature until the user gets into the shower)[6]
- Smart thermostats (in many cases, these require a co-pay)

Of those reviewed, only the Maryland utilities and Mass Save include a direct install in their comprehensive home energy audit programs. That said, several other utilities also provide a less intensive walk-through audit and report providing direct install measures through that component.

There are a number of utilities looking to add new measures to their list of direct install measures in an attempt to obtain more savings. In most cases, beyond smart thermostats, the inclusion of new measures was still in a pilot phase. These include: smart power strips, connected lighting, smart window shades, and the shower start.

Table 2 provides a summary of the programs, their delivery model, type of audit offered, inclusion of direct install, and the incentive structure. Items of note include:

- Of the comprehensive programs reviewed, seven have some type of performance-based incentive, making this more common than not.
- Four offer both a comprehensive and walk-through audit. Of those that offer both, all believe the walk-through is a companion not competitor to the comprehensive audit.
- Direct install in the comprehensive is not the norm, with only five of the 13 offering it through their comprehensive audit. The reason for not offering DI in the comprehensive audit is the complications of having independent contractors manage the effort.

[6] The program offering shower starts has not yet had an evaluation of that measure yet but indicated that is in process.

- The number of implementation companies that deliver whole house programs across the country is rather limited, thus limiting the differences between program models.

Table 2. Program Designs

Utility/ Program	Program Model	Audit Type	Direct Install	Walk-through Available as Well?	Incentive Structure	Implementer
East Coast State-Wide	HPwES	Comprehensive audit	No	No	Prescriptive	Various by Utility
Consumers Energy	HPwES	Comprehensive audit	No	Yes	Prescriptive & Performance-based	ICF
Georgia Power	HEIP	Comprehensive audit	No	No – offered formerly but canceled due to costs	Prescriptive & Performance-based	ICF
ComEd	Home Energy Assessment	Walk-through audit	Yes	Only Offers a walk-through	Prescriptive	Franklin Energy
MidAmerican Energy	HomeCheck®	Walk-through audit	Yes	Only offers a walk-through	Prescriptive	CLEAResult
Focus on Energy	HPwES[7]	Comprehensive audit	No	No – offered formerly but canceled due to costs	Prescriptive & Performance-based	CLEAResult
Energy Upgrade CA®	Home Upgrade	Comprehensive audit with standalone rebate/incentive	No	No	Prescriptive & Performance-based	Various
Xcel Energy	Efficiency United	Standalone rebate/incentive	No	No	Prescriptive	CLEAResult
New Jersey's Clean Energy Program	HPwES	Comprehensive audit	No	No	Performance-based	AEG
Austin Energy	HPwES	Comprehensive audit	No	No	Prescriptive	Utility
BG&E Maryland	HPwES	Comprehensive audit	Yes	Yes	Performance-based	ICF
Pepco Maryland and DC	HPwES	Comprehensive audit	Yes	Yes	Performance-based	ICF

[7] Program has been recently restructured to align with HPwES.

Utility/ Program	Program Model	Audit Type	Direct Install	Walk-through Available as Well?	Incentive Structure	Implementer
SMECO Maryland	HPwES	Comprehensive audit	Yes	Yes	Performance-based	ICF

Table 3. Program Features

Utility/ Program	Fuel Types Covered	Measures Offered	Assessment Incentive	Incentive Amounts	Savings Requirement	% Receiving QA/QC
East Coast State-Wide	Dual	HVAC, Shell, Plumbing	Free or reduced cost for all, free for income qualified	10% (paid to contractor)	Based on efficiency of installed measure, some requirements for equipment being replaced	100% of first 3-5 projects, ~15% of all projects ~5% for experienced contractors
Consumers Energy [i]	Dual	HVAC, Shell, Plumbing, Appliances	$200 rebate on assessment when 3 measures are completed	Specified $ amount per measure installed, varying by % reduction, with differing caps.[8] Multiple measure bonuses [9]	Based on efficiency of installed measure, some requirements for equipment being replaced	100% customer satisfaction survey – 5% of completed projects for each contractor
Georgia Power[ii]	Dual	HVAC, Shell, Plumbing	50% of cost up to $200	Specified $ amount for per measure installed, or 50% of total costs w/ $800 cap for whole house	25% kWh reduction	None for individual improvements, 100% for first 5 contractor projects, 10% thereafter for whole house improvements
ComEd[iii]	Dual	HVAC, Shell, Appliance	NA	Specified $ amount per measure installed	NA	QA/QC varies by implementer

[8] $3500 cap for gas and dual fuel, $1800 cap for electric only.

[9] 3 measures up to $200, 4 measures up to $250, 5 measures up to $300, 6 measures up to $350, 7+ measures up to $500. Bonuses for dual fuel and gas customers are twice those for electric only

Utility/ Program	Fuel Types Covered	Measures Offered	Assessment Incentive	Incentive Amounts	Savings Requirement	% Receiving QA/QC
MidAmerican Energy [iv]	MidAm must supply primary heating fuel to home	Iowa & Illinois: HVAC, Shell, Plumbing. Nebraska & South Dakota: DI walkthrough only	NA	Specified $ amount per measure installed	NA	NA
Focus on Energy [v]	Dual: At least 50% of home must be heated with natural gas or electricity	HVAC, Shell	Market Price, reduced to $50 for income qualified	Specified $ amount per energy reduction level [10]	10% minimum energy savings requirement	10% of all projects
Energy Upgrade CA® [vi] [vii]	Dual	HVAC, Shell, Appliances	Market Price	Specified $ amount per measure installed, some varying by % reduction	10% minimum energy savings requirement	60% of contractors first 5 projects, 20% of next 20 jobs, random thereafter
Xcel Energy [viii]	Dual	HVAC, Shell, Plumbing, Appliances	NA	Specified $ amount per measure installed	10% air leakage reduction required to receive air sealing rebate	Minimum 5% of all projects
New Jersey's Clean Energy Program[ix]	Dual	HVAC, Shell, Plumbing	Market Price	Up to 50% of project cost w/ increasing cap by energy reduction level[11]	Energy savings requirements coupled with mandatory item installation[12]	100% of contractors first 10 projects, minimum 10% thereafter
Austin Energy[x]	Electric	HVAC, Shell,	Market Price	Specified $ amount per measure installed[13]	Mandatory duct sealing	100% review of projects receiving rebate

[10] 10-19% energy reduction: $850, 20-29% energy reduction: $1250, 30%+ energy reduction: $2000

[11] 5-19.9% energy reduction: $2000 rebate. 20-24.9% energy reduction: $3000 rebate. 25%+ energy reduction: $4000 rebate. No rebate amount to exceed 50% of total project cost

[12] For all rebate levels outlined above, customer must install air sealing, insulation, and must address health and safety issues to qualify.

[13] Rebate averages ~ $1600 and 25% of improvement project cost – https://savings.austinenergy.com/

Utility/ Program	Fuel Types Covered	Measures Offered	Assessment Incentive	Incentive Amounts	Savings Requirement	% Receiving QA/QC
BG&E Maryland[xi]	Dual	HVAC, Shell	$300 (75%) instant rebate on assessment	Specified $ amount per measure installed, with cap[14]	10% air leakage reduction required to receive air sealing rebate	7-10% of audits by vendor – additional post-project QA/QC as well
Pepco Maryland and DC[xii]	Dual	HVAC, Shell, Appliances, Plumbing	$300 (75%) instant rebate on assessment	Specified $ amount per measure installed, with cap[15]	NA	7-10% of audits
SMECO Maryland[xiii]	Electric	HVAC, Shell	$300 (75%) instant rebate on assessment	Specified $ amount per measure installed, with cap	NA	NA

QA/QC Approaches and Practices

All the programs reviewed include some level of QA/QC as a part of their program model. Only one conducts the QA/QC visits directly (Austin Energy), while the rest rely on their implementation contractor to conduct the QA/QC. No utilities interviewed use a third-party QA/QC provider like the Massachusetts PAs.

While there were different levels and approaches to how QA/QC is handled, all the reviewed programs conduct QA/QC on roughly 10%-15% of completed projects, except Austin Energy, which reviews all projects before a rebate is paid. Austin is a smaller municipal utility and an outlier in terms of QA/QC approach in that the utility staff themselves verify all measures before paying a rebate. For this reason, Austin Energy is excluded from further discussion in this section. No utilities require the level currently being conducted in Massachusetts, even among those that use the same implementation firms to deliver programs.

There are two common program issues that result from errors in a contractor's proposed scope of work: installed measures not adhering to program guidelines (i.e., offering rebates for replacing equipment that does not qualify) and discrepancies between realization rates from third-party evaluator observations and the contractor reported conditions. To address this, Energy Upgrade California® and one East Coast statewide program conduct pre-project QC of project proposals. The East Coast State-Wide program conducts "desk-audits" on 100% of project proposals before measures are installed: the projects scope of work is reviewed for accuracy of inputs and modeling, to ensure that measures qualify for rebates and that savings estimates will be accurate. They are currently in the process of fully automating this process. Additionally, Southern California Edison (SCE, of Energy Upgrade California®) conducts a small percentage of on-site pre-inspections, and found that contractors significantly over-reported duct leakage rates at nearly one out of five sites, which resulted in overestimating program savings.[16] Their view is that by more closely scrutinizing a

[14] Shell: 50% of cost up to $2000 per measure paid to contractor or customer. HVAC: varies by measure, paid to contractor. Changing rebate amount to be based on performance increases – awaiting commission approval

[15] Weatherization: 50% up to $2000. Duct sealing: 50% up to $2500. Duct Sealing and Weatherization up to $2500. Appliances and HVAC can earn up to $1800 in additional rebates. $4300 total cap.

[16] 2015 Impact Evaluation of CA Retrofit Programs, pg. 36.

project's scope of work beforehand, they can reduce customer complaints centered around expected energy savings and rebate amounts, and in turn can lower program costs.

Like HES, several programs use a tiered approach to QA/QC, whereby newer contractors are subject to more frequent inspections. As these contractors complete more projects and meet certain benchmarks, such as number of projects without any QA/QC issues, the level of QA/QC diminishes. Conversely, the QA/QC rate increases when issues are consistently identified, and remain at a higher level until the program is certain that contractor is consistently meeting expectations. If there are consistent patterns of failure, that contractor risks removal from the program. Examples of this approach include:

- **NJ Clean Energy:** 100% inspection rate on a contractor's first 10 jobs, with percentage dropping for subsequent jobs in inverse proportion to the level of contractor performance.
- **Energy Upgrade CA®:** 60% inspection rate on a contractor's first five jobs, dropping to 20% of the next 20 jobs after three successful verifications, and then random verification from then on.
- **East Coast state wide:** 100% of a contractor's first 3-5 assessments are shadowed by program staff to ensure accurate program delivery. Beyond this, 100% of the first 3-5 completed projects that receive program incentives are inspected post-installation. This falls to 10%-15% post-installation inspection, and eventually to roughly 5% of jobs for contractors who demonstrate proficiency over a 6-month period.
- **Georgia Power:** 100% inspection rate on a contractor's first 10 jobs, with percentage dropping for subsequent jobs.
- **Focus on Energy:** QA/QCs 10% of projects and noted it is expensive. Thus, they are just starting to look at how to utilize SmartMeters to do more virtual QA/QC in the future (reviewing usage and comparing that against what was anticipated, and identifying problems from there).

None of the secondary research indicated that there was concern over volume of QA/QC being inadequate to capture systemic problems with new or established contractors. All those interviewed share QA/QC findings with the affected contractor and all use trends in QA/QC findings to determine training content for ongoing contractor trainings.

Utilities also view customer satisfaction and the identification of training opportunities for their contractors as important components of their QA/QC processes. All programs complete some type of customer satisfaction survey as part of their home retrofit programs. All utilities interviewed indicated that each individual response is captured in a database. ComEd goes a step further and conducts longitudinal tracking of its customers' satisfaction with the program over time. All interviewed utilities indicate a very high level of customer satisfaction with their programs. All interviewed utilities also noted that they use the QA/QC findings to identify areas where contractors need more training. The number of contractor trainings annually varied, but in most cases the utilities offer quarterly in-person trainings for participating contractors. These trainings vary, from general refreshers on program policies, procedures and expectations, to tailored sessions directed towards specific contractor team's strengths and weaknesses.[17]

[17] The East Coast State-Wide program recently added a new database to track all QA/QC notes, allowing them to identify trends at the contractor level, and offer personalized trainings.

A question that was not explored as a part of this work is whether these programs, which have far less QA/QC volume, see more discrepancy between ex ante and ex post savings compared to Massachusetts. A smaller delta between the reported (*ex ante*) and verified (*ex post*) savings in Massachusetts could indicate that the PAs are receiving a direct benefit of by having greater volumes of QA/QC than any of the other programs studied. The evaluation team plans to explore this question further as part of Task 3, the qualitative and quantitative QA/QC analysis.

Cost-Effectiveness

For programs in which cost-effectiveness (CE) numbers were available, the majority (6/10)[18] were deemed cost-effective using their test of choice (in most cases, the Total Resource Cost test). While 6 of 10 is a majority, it is slight. Across the board, the programs explored in this research as well as those studied in the past work struggle with maintaining or meeting cost-effectiveness for a myriad of reasons. We identify those reasons here, and provide solutions where applicable in the following pages:

- Low avoided costs (especially natural gas costs).
- Increases in codes or standards that lead to lower per-unit savings for certain measures and/or have made measures no longer cost-effective to include in programs.
- Temperate climates and/or several recent years where there were several milder than expected peak season which has led to declining savings and/or low savings for measures that can be cost-effective in other markets.
- A lack of new or emerging technologies that might serve as some significant new source of electric savings for home retrofit programs from the cost-effectiveness perspective.
- A struggle to get the measures with highest savings potential installed over those that are easier for participating contractors to sell (e.g., lots of furnaces, not enough insulation).
- The hypothesis amount program staff that the easy-to-reach customer or likely-to-act customer has already participated, which makes future acquisitions costlier.
- The lost opportunity to get those customers who took partial action and then fall away from the program to come back in and complete the additional work.

Inputs into Cost-Effectiveness Screening

There was little information available on what benefits other than energy benefits are being counted by other programs in their cost-effectiveness analysis. Pepco indicated that there was some effort underway to better quantify health and safety benefits although the details were unavailable. All count the water benefits for direct install measures that reduce flow.

Role of Direct Install Measures and Impact on Cost-Effectiveness

One question asked by the PAs during the planning process for this work was whether other utilities were concerned about changing standards in lighting affecting the cost-effectiveness of direct install

[18] CE > 1: East Coast State-Wide, ComEd, Georgia Power, SMECO, Focus on Energy, Consumers Energy HPwES.
CE < 1: Energy Upgrade CA®, New Jersey Clean Energy, BGE, Pepco, Consumers Energy HEA.

programs. In interviews with the Maryland utilities, the feedback was that while there was concern in early 2016 that the move to a costlier LED product might affect their ability to cost-effectively deliver DI, the dramatic drop in price over the course of the year staved off that concern. This was the same feedback we received from all other utilities interviewed that include LEDs as a direct install measure in their walk-through assessment programs. Of those asked, all noted that this may change when new lighting standards kick in during 2020. Some of the design innovations discussed below are being piloted now to preempt future declines in savings from lighting.

All utilities that offer the walk-through assessment model report this model is cost-effective (where cost-effectiveness data is available) although as noted eariler Focus on Energy canceled the walk-through because they found it was not cost-effective. The team did not get detail on what might have been driving that issue. Also, dual fuel programs reported higher cost-effectiveness results than single-fuel programs. The one single-fuel utility we interviewed recently ended direct install because it could no longer pass a cost-effectiveness threshold. None of the other utilities interviewed expressed an imminent concern about the cost-effectiveness of the direct install component of their offers. In fact, Focus on Energy noted that the cost-effectiveness of the comprehensive audit dropped from a 3.0 to 2.4 when they removed the DI portion of the audit.

Design and Innovation for Cost-Effectiveness

Several programs we reviewed are implementing new approaches or piloting new program components. In all cases, the desired outcome of these changes could be directly tied back to program effectiveness and, in most cases, directly to cost-effectiveness:

- **Targeted Messaging Strategies:** Programs are starting to feel like the HPwES customer is getting harder to reach and goals are harder to achieve. In a few cases, those that feel this is an issue are investing more in new messaging, targeting strategies, and/or by offering new bundles of direct install measures to try to entice more participation. Pepco, for example, is looking at how to reposition their direct install marketing as not just free measures but a free smart home.
- **Communication of Recommendations and Flexible Timing for Improvements:** The cost of a home retrofit remains one of the primary barriers to customer participation. In many program models the customer has a limited window of time post audit to complete the work to be eligible for an incentive. Two innovations have been designed to address this issue.
    - The first is measure prioritization. In Maryland, all the utilities now require the contractor list the recommended measures in order of savings they will achieve. This lets customers identify what measures will maximize savings for their investment more easily and makes sure contractors are not overly focused on promoting their solution over the best solution (e.g., an HVAC contractor focusing on the furnace when the greatest savings potential is insulation).
    - The second is staging. In this approach, the utility allows customers more time (maybe years) to stage the improvements over time based on a plan that is customized to the homeowners needs and budget. This may feel counterintuitive to the comprehensive mantra programs have been pushing for many years now, but based on feedback from the DOE obtained through past research completed by this evaluation team, there is growing evidence that one and done is not as true for retrofit work as once thought. That is, many programs have operated under the idea that you only have one shot in the home

but today based in part of findings from the Better Buildings evaluation efforts[19] there is evidence that letting customers stage work overtime works. Considering this, the DOE has begun working on staging guidance for home retrofit programs.

- **Utilization of SmartMeter:** Focus on Energy is exploring how to use SmartMeter data to augment QA/QC and reduce those costs and/or to better embed evaluation, measurement, and verification in its whole home programs. It is early in exploring these options.

Several of the utilities that we spoke to noted that the savings return on investment for customers is not motivating. Customers, especially gas only customers, do not see enough savings to motivate their participation. In response, some programs are making efforts to increase customer understanding of both the energy and dollar savings of their programs and the potential non-energy benefits. Georgia Power has started shifting messaging away from cost and energy savings and toward other associated benefits, namely the environment, safety, and comfort. Other utilities have taken the following steps:

- Created more user-friendly web platforms that expand on all the benefits of retrofit work including comfort and safety (Xcel and Energy Upgrade Ca®);
- Refocused marketing materials detailing the additional non-energy benefits of a whole home approach (Austin Energy);
- Increased contractor training (Consumers Energy) and administered direct customer outreach (East Coast State-Wide), focusing on a more realistic representation of the potential dollar savings.

The premise is that increased levels of customer understanding around all benefits—including bill savings—prior to measured installation will result in more realistic expectations and fewer back end customer complaints, which while occurring with a low prevalence (less than 1% per East Coast State-Wide), can still require a significant amount of time and resources to address.

Incentive structure served as an area of focus for the Maryland utilities which believe their move to a performance-based incentive system will help increase program cost-effectiveness by making the incentive payment more proportional to the savings achieved. They also noted that they felt the change to a performance based path will allow project with proportionally larger savings to get incentives that are more proportional to the project cost. In the past, caps on incentives meant that for some projects with very high savings potential, the incentives covered so little of the cost that they were not motivating participation.

Finally, other changes or innovations designed to enhance the programs noted by interviewees included transitioning to tablet-based audits, training trade allies and contractors to cross sell other programs while they are in the home, offering a home energy score as part of the audit process, and leveraging trade ally working groups to help improve program design and garner buy-in for program changes.

[i] https://www.consumersenergy.com/~/media/CE/Documents/Energy%20Efficiency/home-performance-with-energy-star-incentives.ashx?la=en

[ii] http://residential.georgiapower.com/rebates/

[iii] https://www.comed.com/WaysToSave/ForYourHome/Pages/WeatherizationRebates.aspx

[19] https://energy.gov/eere/better-buildings-neighborhood-program/accomplishments#reports

[iv] https://www.midamericanenergy.com/ia-res-forms.aspx

[v] https://focusonenergy.com/residential/efficient-homes/home-performance-energy-star

[vi] https://www.smud.org/en/residential/save-energy/rebates-incentives-financing/HPP/

[vii] https://www.pge.com/en_US/residential/save-energy-money/savings-programs/home-upgrade/home-upgrade-faq/home-upgrade-faq.page

[viii] https://efficiencyunited.com/residential/xcel-energy/home-performance

[ix] http://www.njcleanenergy.com/files/file/Residential%20Programs/HP/FY2017/FY17%20HPwES_FactSheet%20-%20BPU%201092%205_Jul_16.pdf

[x] http://savings.austinenergy.com/wps/portal/rebates/residential/offerings/home-improvements/hpwes-rebate/

[xi] http://www.bgesmartenergy.com/sites/default/files/public/BGE_HPwES_Incentive_Table_Full.pdf

[xii] https://homeenergysavings.pepco.com/home-performance-with-energy-star-program/overview/rebates

[xiii] https://www.smeco.coop/save-energy-and-money/home-performance/for-homeowners/rebates/rebate-list

PORTFOLIO H. MYSTERY SHOPPING REPORT (TASK 5)

NAVIGANT

ILLUME cadeo bellomy research LEXICON ENERGY CONSULTING INCORPORATED

Mystery Shopping Findings (RES 35)

Prepared for:

The Electric and Gas Program Administrators of Massachusetts

Part of the Residential Evaluation Program Area

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1. INTRODUCTION

Every customer's journey through Home Energy Services (HES) begins—and in some cases, ends—with a home energy assessment (HEA). During the HEA, a lead vendor (LV) energy specialist or home performance contractor (HPC) provides homeowners with instant savings measures (e.g., LED lighting or smart power strips) and identifies larger efficiency opportunities such as weatherization or heating and cooling equipment upgrades. Therefore, customers view the energy specialists and HPCs as the face of HES. How the energy specialist or HPC conducts the HEA, presents the initiative's materials, and engages the customer on a personal level has a direct and important influence on how the customer perceives HES as well as the likelihood that the customer decides to install a recommended measure.

Mystery shopping is an effective way to embed an evaluator in the program and experience the HEA alongside the customer. In this task, the evaluation team participated in 13 HEAs alongside five different customers across four program administrators (PA). Four of the five customers participated in three HEAs each: the first HEA with an LV followed by two HEAs with HPCs.[1] One of the customers, located in Berkshire, participated in just one HEA with an LV as there were no active HPCs.

The key research questions the evaluation team sought to answer through these mystery shopping visits included the following:

- Are there structural or procedural changes to the current delivery of HES that would increase the initiative's overall effectiveness (i.e., enrolling customers and generating residential energy savings)?
- Are there opportunities to make HEAs more effective and efficient? These opportunities could include collecting more information prior to the assessment, using different data collection software or hardware tools, tailoring the HEA approach or level of effort based on a specific customer's interests or needs, or reducing the total number of requirements while in the home.
- What are the most effective practices currently employed by LV energy specialists and HPC energy specialists in terms of engaging customers, communicating the eligible efficiency measures, and encouraging action?
- Are the recently revised HEA materials more effective at encouraging customers to install recommended measures? Are further improvements possible?
- How well is HES integrating with the PAs' other residential initiatives to meet customers' overall efficiency needs?
- Are all applicable processes, measures, and standard HES offerings being presented to the customer for both LV and HPC energy specialists? Conversely, is anything being presented to the customers outside of the scope of HES (i.e., solar, roof replacements, window replacements, etc.)?

Investigating these research questions throughout the mystery shopping visits allowed the team to:

- **Identify effective energy specialist practices:** Document techniques that some energy specialists use. For example, specific methods for engaging the customer or particular language

[1] Each HEA was conducted with a different HPC as selected by the evaluation team. The methodology for HPC selection is detailed later in the methodology section.

used to explain the importance of an efficiency opportunity that resonates with customers and makes them more likely to take action.

- **Compare customer and energy specialist experiences:** Through post-HEA interviews, the evaluation team directly compared the customer and energy specialist perceptions of how the HEA was conducted.
- **Compare delivery channels:** Observing how an LV energy specialist and multiple HPCs completed an HEA at the same home and engaged with the same customer allowed the evaluation team to directly compare the specific strategies employed when faced with similar situations.

2. METHODOLOGY

2.1 Participant Selection

To identify specific homes to participate in the study, the evaluation team worked closely with the PAs. Leveraging social networks, the PAs recruited acquaintances that lived in older homes (at least 15 years old) and were willing to participate in multiple audits. The team also considered both LV representation and the number of local HPCs when selecting the sample of mystery shopping homes. By selecting Eversource, National Grid, Berkshire Gas, and Columbia Gas customers, the evaluation team was able to observe HEAs by all three current HES LVs, as well as customers in the western, central, and eastern portions of the state.

At the time of the mystery shopping, Berkshire Gas (the only PA using CET as its LV) did not have any active HPCs. Therefore, the team only completed one LV visit for the Berkshire Gas customer. All other customers received three visits: one from the LV and two from different HPCs.

Table 1. Summary of Mystery Shopping Homes

Town, County	PA	LV	Total HEAs (LVs and HPCs)
Needham, Norfolk County	Eversource	CLEAResult	3
Roslindale, Suffolk County	National Grid	CLEAResult	3
Stoughton, Norfolk County*	National Grid	CLEAResult	3
Pittsfield, Berkshire County	Berkshire Gas	CET	1
Stoughton, Norfolk County	Columbia Gas	RISE	3

*Heats with oil

The LV conducted the first visit for each home. For the second and third visits, the evaluation team targeted the most active HPCs serving the county. The team reviewed the total number of HEAs per HPC—using the HEA counts per HPC from 2016—and assigned activity levels accordingly. HPCs fell into one of three activity categories: high, medium, or low. High HPCs were those that fell into the top third of total HPCs completed in 2016. Medium and low HPCs were in the middle and lowest third, respectively. HPCs listed as N/A were not included in the dataset for 2016 HPC activity. Most HPCs the team utilized for mystery shopping were high activity HPCs. All HPCs utilized are listed in Table 2. The evaluation team worked closely with both the participating customers and relevant LV to schedule the second and third HEAs with the targeted HPCs.

After completing each HEA, the evaluation team member present during the HEA conducted two brief interviews: one with the homeowner and one with the LV/HPC. These interviews allowed the team to document how both the homeowner and the LV/HPC felt the HEA went, motivations for including/not including various measures or portions of the HEA, etc. The evaluation team member present during the HEA conducted the homeowner interview immediately following the HEA. Interviews with LVs/HPCs were conducted by phone anywhere from one hour to one week following the HEA.[2]

[2] The team was unable to reach one HPC for an interview.

Table 2. Mystery Shopped HPCs and Activity Level

HPC	Total HEAs in 2016	Activity Level
Home Works Energy	8,233	High
Revise Energy	661	
Able Restoration	526	
Energy Monster	495	
Endless Energy	469	
Healthy Homes Energy	175	Medium
A. A. Arden	82	Low
NEEECO	N/A	N/A

2.2 Mystery Shopping Implementation

Each mystery shopping home followed the same process, which is outlined below.

1. The customer completed the first HEA with an LV energy specialist. A member of the evaluation team attended and observed the HEA.
2. Immediately following the first HEA, the attending evaluation team member interviewed the customer about the experience. The same evaluation team member also interviewed the energy specialist within a week of the HEA to gain their perspective. Additionally, the evaluation team member returned the home to pre-audit condition (e.g., removing any instant savings measures) prior to leaving the customer's home to ensure that the home was in the same condition for each HEA.
3. Following the first HEA, the evaluation team notified the relevant LV that the home was mystery shopped and worked with that LV to reinstate the home's eligibility for additional HEAs by HPCs.[3]
4. The evaluation team contacted the customer and worked with them to schedule a second HEA with an HPC of the evaluation team's choosing. As detailed above, the evaluation team selected the most active HPC working with the relevant LV.
5. Repeated steps 1-3 for the second HEA, except with the first HPC instead of the LV energy specialist.[4]
6. The evaluation team contacted the customer and worked with them to schedule a third HEA with a second HPC. Again, the evaluation team selected the most active HPC working with the relevant LV.
7. Repeated steps 1-3 for the third HEA, except with the second HPC.
8. The evaluation team provided compensation to the customer, LV, and HPC as specified in the mystery shopping implementation plan.

[3] Typically, a home would only receive one HEA through HES and be ineligible for another HEA for a period of time. Therefore, in order for three mystery shopping HEAs to occur at the same home within the span of three months, the LV needed to artificially clear records of previous HEAs.
[4] The evaluation team only conducted one HEA for the Berkshire home because there were no active HPCs.

3. KEY FINDINGS

After observing 13 HEAs at five different homes, the evaluation team organized key findings into the following four categories:

1. Instant savings measures (ISMs)
2. Recommended measures
3. Language/strategy
4. Logistics

In addition to these overarching key findings, the team also created individual customer profiles for each of the participating customers, which are provided in Sections 6 through 10. The profiles offer a succinct summary of the customer, their home, their HEA experiences, and the ISMs and recommendations they received after each HEA. Collectively, the overarching findings and customer-specific profiles document the team's mystery shopping findings.

3.1 Instant Savings Measures

There was significant variation in the ISMs installed during the HEAs conducted in each home. The evaluation team found that LVs and HPCs prioritized LEDs relative to showerheads and faucet aerators. Table 3 summarizes the installation of ISMs for both LVs and HPCs. In interviews, both LVs and HPCs confirmed that they generally prioritize LEDs because they are easy to install relative to other ISMs.

However, both LVs and HPCs also noted that installing LEDs can take up a lot of their time while in the home and that it is difficult to keep homeowners engaged during this time. The mystery shoppers, energy specialists, and homeowners collectively agreed (during post-HEA interviews) that this issue lessened when two energy specialists conducted the HEA. This is because one energy specialist can continue to engage the customer directly while the other focuses on installing LEDs. In interviews following all three HEAs, one homeowner who had had an HEA where two auditors were present noted that the two-auditor model was more effective in keeping her engaged throughout the audit. Relatedly, multiple energy specialists mentioned that they believed having two auditors conduct an HEA would allow for a higher degree of thoroughness and more seamless customer engagement.

Despite the fact that LVs and HPCs prioritized LEDs, the quantity of bulbs replaced in a given home varied across energy specialists. For example, one homeowner noted his disappointment that only one energy specialist had thought to replace the bulbs on the exterior of his home in addition to the interior. Factors contributing to inconsistencies in the number of LEDs installed at a given home include the language used to discuss the measure (more below), whether there were two energy specialists conducting the HEA, and the experience level and thoroughness of individual energy specialists.

Table 3. ISM Installation Summary

Home	Visit	LEDs	Showerheads	Faucet Aerators	Smart Power Strip*	Thermostats^
Home #1	LV	24	0	0	1	N/A
	HPC 1	18	0	0	0	N/A
	HPC 2	23	0	0	2	0
Home #2	LV	64	0	0	2	N/A
	HPC 1	51	0	0	2	N/A
	HPC 2	50	0	1	1	0
Home #3	LV	12	0	0	1	0
Home #4	LV	0	0	2	2	N/A
	HPC 1	25	1	1	2	N/A
	HPC 2	0	0	0	2	0
Home #5	LV	39	0	0	0	N/A
	HPC 1	10	0	0	1	N/A
	HPC 2	0	0	0	1	0

*Smart power strips were uniformly left by energy specialists for self-install, consistent with program guidance.

^Per evaluator guidance, homeowners were told not to accept installation of thermostats until their last HEA.

In contrast to LEDs, LVs and HPCs did not consistently offer water-saving devices. Multiple energy specialists noted that they typically will not even offer showerheads to homeowners if their current showerheads are handheld or custom because they assume homeowners would not want them replaced. Similarly, multiple energy specialists reported that they did not mention faucet aerators to homeowners if they saw that the aerators offered by HES did not match the color or style of a homeowner's faucet. In other cases, the aerators simply were not compatible.

Additionally, the team found that the language used by energy specialists relating to ISMs greatly influenced homeowner perception of the measures and their decisions on whether to accept the ISMs. Table 4 outlines some examples of approaches taken by energy specialists in offering ISMs along with the observed homeowner responses. While the approach an energy specialist uses to sell a given ISM is impactful, there are many other factors that influence the customer's eventual decision about whether to install the ISM.

Table 4. Effect of Energy Specialist Language

Energy Specialist Approach		Homeowner Response
Informs homeowner that he plans to replace inefficient light bulbs with efficient ones; this proactive strategy gives homeowner the impression that this measure is a no brainer	→	Accepted measure
Passively asks homeowner if she wants some LEDs	→	Declined measure
When discussing showerheads, mentioned that some customers do not like the reduced pressure of the low-flow showerheads	→	Declined measure

Program guidance related to the smart power strip instant savings measure instructs that power strips should be left with homeowners to self-install, making it a relatively easy measure for energy specialists to provide. Accordingly, the majority of LVs and HPCs provided one or two smart power strips to the homeowner during an HEA. Time spent discussing power strip installation and use was typically limited (1-5 minutes), but most energy specialists provided some instruction on how to install and use the power strips. Approximately half of the energy specialists provided specific recommendations as to where the homeowner should install the power strips (i.e., in the office, TV room, etc.). One LV forgot to leave any smart power strips and one HPC did not have any smart power strips with him. The LV and HPC both indicated during their post-HEA interviews that not providing the customer with power strips was an oversight.

As shown in the previous table, no LV or HPCs installed a standard programmable or Wi-Fi thermostat during the five HEAs at which customers were allowed to accept the ISM. While a handful of energy specialists mentioned thermostats, none placed significant emphasis on the measure during any of the 13 observed HEAs.

Table 5 below provides additional context for this finding. Despite applicability of the thermostat measure, energy specialists did not typically discuss them. As discussed later in Section 3.4 and 4.4, time constraints were cited as a major contributor to the lack of emphasis placed on the thermostat measure. Additionally, one HPC mentioned that his company does not stock Wi-Fi thermostats, so he cannot offer them. During his post-HEA interview, a LV noted that he only mentions the Wi-Fi thermostat rebate if he suspects the customer will be interested, which he said is typically the case with younger customers.

Table 5. Thermostat Details

Home	Visit	Existing Thermostat(s)	Offered Programmable Thermostat	Mentioned Programmable Wi-Fi
Home #1*	LV	Manual	No	No
	HPC 1		Yes (left with customer at her request)[5]	No
	HPC 2		No	No
Home #2**	LV	Programmable	-	Yes
	HPC 1		-	No
	HPC 2		-	No
Home #3	LV	Programmable	-	Yes
Home #4	LV	Manual	No	No
	HPC 1		No	No
	HPC 2		No	No
Home #5	LV	Programmable	-	No
	HPC 1		-	No
	HPC 2		-	No

*Customer already had a Wi-Fi thermostat in main zone of home; manual thermostat for basement zone
**Home had several zones; all but one had Wi-Fi thermostat; remaining zones had programmable

3.2 Recommended Measures

LVs and HPCs both emphasized weatherization measures in their recommendations to homeowners. However, for a given home, the exact recommendations offered typically varied across HEAs. Again, further detail relating to the exact recommendations made during each HEA is included in the Participant Profiles Sections 6 to 10.

Inconsistencies in recommended measures across HEAs may have been due to differences in tools or techniques used by energy specialists to identify areas in need of insulation. For example, at one home, the LV used an infrared camera and visual checks to determine that the home did not need insulation in the second-floor walls, but that it did need insulation in the basement and first floor walls.[6] At the same home, one HPC checked for signs of insulation around electrical outlets and drilled a small hole in a second-floor wall. In doing so, the HPC found evidence of insulation in the basement and no insulation in the second-floor exterior wall. This HPC recommended—contrary to the LV—that the customer install insulation in the first and second floor walls.

Another possible reason for inconsistencies in the recommended measures could be the difference in understanding of HES eligibility requirements among energy specialists. At one home, the LV indicated

[5] Per PA HES implementation managers, energy specialists are permitted to leave behind uninstalled programmable thermostats.
[6] Per PA HES implementation managers, energy specialists are not required to use infrared cameras and should typically use them to confirm the findings of their physical check for wall insulation.

that the specific insulation and air sealing measures needed were not eligible through HES, while both HPCs recommended the measures.

The evaluation team also observed that LVs and HPCs alike were sensitive to a homeowner's willingness to take on the upfront costs of efficiency improvements. Across the board, energy specialists noted that an important component of their interactions with a homeowner is getting a sense of what he/she is willing to invest upfront, so they can appropriately prioritize or strategize recommendations. Energy specialists generally noted that they present all applicable measures identified during the HEA to homeowners. This is consistent with the initiative's guidance. However, the energy specialists noted – and the evaluation team observed – that the energy specialists tend to emphasize specific recommended measures based on a combination of their perceptions of homeowner willingness to install that measure, as well as the measure's cost-effectiveness. The variation in recommended measures across energy specialists for a given home suggests that their perceptions of homeowners' openness to certain measures and the value they believe each measure will provide are inconsistent.

Only one HPC, without prompting from the evaluation team, mentioned the tactic of splitting insulation work across multiple years such that the homeowner can apply for multiple incentives. One other LV, again without prompting, explicitly shared that he does not split recommended measures across years because the PAs discourage it and because the probability of a homeowner taking action decreases over time.

HPC: "My general approach is showing customer everything and then tailoring based on what people can or are willing to pay rather than presenting only the measures I think they might be able to afford."
LV: "*I prioritize based on what customers seem willing to do. Seemed like the homeowners were 'strong maybes' (as opposed to 'definite') on insulation—so that's why I also emphasized the water heater upgrade."*

Relatedly, all but one energy specialist proactively discussed the HEAT loan with homeowners as a mechanism for defraying upfront costs and allowing them to install the recommended weatherization projects and heating system upgrades. The amount of time devoted to discussion of the HEAT loan depended on the nature of the energy specialist's recommendations. In general, the HEAT loan was discussed by energy specialists for less than one to five minutes, with the discussion taking place after energy specialists had presented their findings and recommendations to homeowners. Energy specialists did not explicitly incorporate the HEAT loan into discussions of payback related to specific recommended measures, nor did they demonstrate the effect the use of the HEAT loan would have the homeowners' monthly cash flows.

3.3 Language/Strategy

Homeowners were responsive to language about cost-effectiveness and payback, both in the context of ISMs and recommended measures. At most HEAs, in addition to discussion of comfort benefits and upfront costs, LVs and HPCs framed their discussions of ISMs and recommendations in terms of cost-effectiveness and payback periods, although with varying degrees of emphasis. During the team's post-HEA interviews, homeowners often mentioned that they found the energy specialist's discussion of recommendations in the context of cost-effectiveness and payback to be useful or persuasive. However, the same interviews with homeowners also revealed that homeowners often had a clearer sense of upfront costs than of savings over time (e.g., payback). This disconnect suggests that energy specialists

should place even more emphasis on cost-effectiveness and payback during their discussions with customers. The interviewed homeowners confirmed that they would have liked more emphasis on these important topics from energy specialists.

For example, in discussions with one homeowner following the completion of all three HEAs at his home, the homeowner indicated he was leaning toward the recommendations of the second HPC who prioritized no-cost air sealing measures along with some discrete areas of insulation rather than the LV's recommendations, which included a larger insulation project. However, the homeowner then indicated that he wished he had a better sense of the cost-effectiveness of the HPC's measures so that he could compare the recommendations on the basis of savings over time.

At the end of each HEA, all but three energy specialists provided the homeowner with a physical report print-out showing each recommended measure's estimated cost, rebate, net cost, estimated annual savings and payback.[7] However, the team's interviews with homeowners occurred directly following HEAs—before homeowners had an opportunity to review the recommended measure report in detail.

3.4 Logistics

HEAs observed by the evaluation team typically lasted for 2 to 3 hours. The duration of the HEAs strongly correlated to the specifics of the home (i.e., how much work the home needed), as well as the fact that most energy specialists are scheduled to conduct two HEAs per day. The amount of time spent conducting HEAs also varied across individual energy specialists for a given home. For example, one HPC[8] spent just 1.5 hours in a home while the other two energy specialists spent 3 to 3.5 hours conducting the HEA in the same home.

[7] One LV did not generate a report since he did not make any recommendations to the homeowner. One HPC who had made minimal recommendations at home, also did not leave a report. This HPC did not respond to requests for a follow-up interview. Another HPC made verbal recommendations to a homeowner but said he would email her the report later.
[8] This HPC could not be reached for a follow-up interview.

Table 6. Time Spent and Recommendations Made During HEAs

Home	Visit	Number of Energy Specialists	Duration (hours)	Time Spent on Recommendations (min)	Summary of Recommendations
Home #1	LV	1	2.5	25	- Exterior wall insulation - Air sealing/weatherstripping - Steam boiler upgrade
	HPC 1	1	2.5	20	- Air sealing/weatherstripping
	HPC 2	2	3.5	25	- Exterior wall insulation - Air sealing/weatherstripping - Steam boiler upgrade
Home #2	LV	1	3	35	- Attic insulation - Attic air sealing - Water heating system upgrade
	HPC 1	1	1.5	10	- Boiler cleaning
	HPC 2	1	3.5	20	- Attic insulation - Attic air sealing
Home #3	LV	1	1.25	N/A	N/A
Home #4	LV	1	2	20	- Spray foam insulation for basement
	HPC 1	2	2	30	- Air sealing in basement - Weatherization (insulation removal, insulate rim joist and attic floor, install roof vent) - Exterior door weather-stripping and door sweep
	HPC 2	1	1.75	20	- Insulate rim joist - Insulation and thermal barrier for basement crawlspace
Home #5	LV	2	2	25	- Air sealing - Attic access cover - Common wall and basement sill insulation
	HPC 1	1	2	25	- Air sealing - Attic insulation - Attic access cover - Knee wall insulation
	HPC 2	1	0.75	10	- Air sealing - Attic insulation - Attic access cover - Knee wall insulation

During interviews, both LVs and HPCs mentioned that time constraints often affect their ability to cover everything for a given house, especially for homes that require a large number of LEDs to be installed or a lot of upgrades. Additionally, one HPC noted that some HPCs (not his company) follow a three HEA per day model, which can add to the time pressure. Time constraints sometimes cause energy specialists to move through certain components of the HEA quickly or not cover them at all.

The thermostat ISM was particularly affected by time constraints. Multiple energy specialists noted that installing thermostats—whether programmable or Wi-Fi—is time-consuming and takes away from their ability to serve the customer in other ways. Consequently, the energy specialists sometimes do not even offer them. As shown in the ISMs section above, not a single programmable or Wi-Fi thermostat was installed during the final five HEAs observed by the mystery shoppers.[9] Two homeowners noted being interested in having a programmable or Wi-Fi thermostat installed (both were homes with multiple zones and at least one zone already controlled by a programmable or Wi-Fi thermostat), but could not get them installed because the final HPC did not offer the measure.

[9] To facilitate multiple visits to the home without subsequent energy specialists noticing initiative measures, homeowners were told not to accept a thermostat for installation until the last HEA.

4. WATCH LIST FINDINGS

This section details the watch list findings. During the evaluation planning process, the PAs and the Energy Efficiency Advisory Council (EEAC) provided the evaluation team with a list of specific elements to watch for during the mystery shopping HEAs. These included items like whether the energy specialist replaced any CFLs with LEDs and if they mentioned the moderate income new offer.

Sections 5-9 provide customer-specific profiles. These profiles are part of the evaluation team's detailed findings. As mentioned, the team created a profile for each customer that participated in the study. Each profile offers a condensed summary of the participating home's characteristics (e.g., space/water heating fuel, size, age), the customer (e.g., was the customer engaged throughout the audits? Did they have knowledge of energy efficiency?), and the HEA (e.g., total ISMs installed by each energy specialist).

The following sections summarize the findings regarding items the PAs and EEAC specifically asked the evaluation team to watch for, segmented by category. The team tracked these items separately using the onsite data collection tool provided in Appendix A.

4.1 Lighting

Table 7 presents the team's lighting-related findings.

Table 7. Watch List Summary: Lighting

Did the Energy Specialist…	LV	HPC	Overall[10]
Replace CFLs with LEDs?	Yes: 0 No: 5	Yes: 0 No: 8	Yes: 0 No: 13
Install the LEDs or leave them with the customer?	Installed: 4 Left: 0	Installed: 6 Left: 0	Installed: 10 Left: 0
Take the replaced bulbs or leave them with the customer?	Took: 0 Left: 4	Took: 0 Left: 6	Took: 0 Left: 10

Lighting ISMs were the most common measure installed throughout the mystery shopping locations. Five LVs installed 149 LEDs, and eight HPCs installed 177 LEDs throughout customer homes. LEDs replaced halogen and incandescent a-lamps, reflectors, candelabras, and MR-16 type lamps.

At the conclusion of each mystery shopping HEA (i.e., a unique visit to a home by a new energy specialist), the evaluating mystery shopper would retrieve each of the installed ISMs and place them in a discrete location on the homeowner's property until the conclusion of the study.

As shown in Table 5, there were no instances where an LV or HPC replaced a CFL with an LED. Additionally, all LVs and HPCs installed the LED ISMs rather than leaving them with the customer to self-install. Both of these outcomes are consistent with the initiative's requirements. After one customer

[10] Note: Totals may not always be equal to the total number of HPCs (8) and LVs (5), as there were instances where no participation occurred. For example, if a customer declined LEDs, the totals would not reflect that particular energy specialist.

declined to have LEDs installed, the LV indicated that if they were to change their mind, they could install the LEDs later during the (same) HEA. In all cases where incandescent or other less efficient lighting was replaced with LEDs, all LVs and HPCs left behind the replaced inefficient lamps.

A customer's willingness and acceptance of ISMs appeared to be influenced by the energy specialist's approach. For example, one LV installed candelabra LEDs in a customer's dining room chandelier without discussing with the customer prior. Afterwards, the customer requested that the LV remove the LEDs as she did not feel they matched the aesthetic style of her decor. The LV did not remove the LEDs and suggested that the customer could test out the LEDs and replace them with the removed incandescent lamps later if she decided she did not like their appearance (i.e., color, general aesthetics, etc.). In the post-HEA interview, the customer indicated that she would have removed the LED ISMs herself regardless of energy savings. An HPC for this same customer first requested permission to install the LED ISMs before proceeding with the installation. The homeowner initially declined, stating that she did not "like the look" of the LED lamps. In response, the HPC suggested he could install one or two as an example, and if the homeowner did not like the resulting light, he would remove them. The homeowner agreed and the HPC eventually installed LEDs in all 10 sockets.

4.2 Pre-Weatherization Barriers

Table 8 presents the watch list summary for pre-weatherization barriers. In certain instances, pre-weatherization barriers may prevent the installation of recommended measures. Pre-weatherization barriers include the following:

- Presence or evidence of knob and tube wiring
- High carbon monoxide detected in mechanical systems such as boilers, furnaces, or water heaters
- Presence of asbestos or other health or safety issues

Table 8. Watch List Summary: Pre-Weatherization

Did the Energy Specialist…	LV	HPC	Overall[11]
Were there any pre-weatherization barriers?	Yes: 0 No: 5	Yes: 2 No: 6	Yes: 2 No: 6
[IF Yes] Was the customer notified of the pre-weatherization barrier offers?	N/A	Yes	N/A

For one customer, two HPCs found evidence of knob and tube wiring, while the LV did not indicate to the homeowner the presence of know and tube wiring. The evidence observed by the mystery shopping evaluator included porcelain knob insulators and cut electric wiring in the basement ceiling joists. Both HPCs notified the customer of the knob and tube wiring. The homeowner was unsure if all of the knob and tube wiring had been decommissioned. Both HPCs indicated that before any weatherization measures were installed, a qualified electrician would need to certify that the knob and tube wiring was

[11] Note: Totals may not always be equal to the total number of HPCs (8) and LVs (5), as there were instances where no participation occurred. For example, if a customer declined LEDs, the totals would not reflect that particular energy specialist.

inactive and properly decommissioned. Both HPCs provided the homeowner with contact information for a qualified electrician—both worked for their respective organizations—and indicated that Mass Save would cover the cost the electrician certifying that the wiring was decommissioned.[12]

4.3 Cost-Effectiveness and Payback Periods

Table 9 presents the watch list summary for cost-effectiveness. Through onsite observations and interviews with homeowners, the evaluators found homeowners were responsive to language about cost-effectiveness and payback, which at times was underutilized by the energy specialists. All LVs discussed cost-effectiveness and/or payback periods with customers; four HPCs discussed cost-effectiveness and/or payback periods with homeowners, while four did not.

Table 9. Watch List Summary: Cost-Effectiveness

Did the Energy Specialist…	LV	HPC	Overall[13]
Discuss cost-effectiveness or payback periods?	Yes: 5 No: 0	Yes: 4 No: 4	Yes: 9 No: 4

In cases where LVs and HPCs framed recommendations in terms of cost-effectiveness and payback periods, customers indicated that this was beneficial to their understanding of total cost versus out of pocket costs. In certain instances, discussions with homeowners relating to what measures they planned to implement sometimes revealed that homeowners came away from the HEA with a clearer sense of upfront costs than savings over time.

4.4 Other Areas of Interest

Table 10 provides a watch list summary of other areas of interest to the PAs; these include enhanced incentives for moderate income customers, wireless thermostat incentives, and the HEAT loan.

[12] If the electrician determined the knob and tube wiring was active, the customer could potentially use the expanded HEAT Loan to replace and decommission it; that process is not covered through HES.

[13] Note: Totals may not always be equal to the total number of HPCs (8) and LVs (5), as there were instances where no participation occurred. For example, if a customer declined LEDs, the totals would not reflect that particular energy specialist.

Table 10. Watch List Summary: Other Areas of Interest

Did the Energy Specialist…	LV	HPC	Overall[14]
Mention the moderate income enhanced incentives?	Yes: 0 No: 5	Yes: 0 No: 8	Yes: 0 No: 13
Mention the wireless thermostat installation incentive?	Yes: 2 No: 3	Yes: 0 No: 8	Yes: 2 No: 11
Mention the HEAT Loan?	Yes: 5 No: 0	Yes: 8 No: 0	Yes: 13 No: 0

None of the LVs or HPCs mentioned the enhanced incentive for moderate income customers to any of the mystery shopping customers. (The evaluation team determined, previously, that none of the customers would have qualified for the moderate income incentives.)

In reference to the wireless thermostat incentive, two of five LVs mentioned the wireless thermostat measure to homeowners. None of the eight HPCs mentioned it to homeowners.

In one post-HEA interview with an LV, the energy specialist indicated that they did not like installing the Honeywell Lyric, stating: “There are a lot of restrictions with the Honeywell Lyric—there are typically a lot of issues with installing the thermostat. It takes a lot of time to install.” When asked if there are any changes to the program that they feel would increase the effectiveness of HEAs, the LV responded that “the new Lyric was a bad choice.” Regardless of one LV’s opinion on the wireless thermostat offered by the initiative, the fact that eight HPCs either forgot to mention the wireless thermostat measure—or chose not to mention it—reveals concerns about the viability of the measure as currently delivered.

All five LVs and seven of the eight HPCs mentioned the HEAT loan to customers with varying degrees of emphasis depending on the nature of the energy specialist’s recommendations. As mentioned in Section 3, energy specialists paid particular attention to crafting and presenting recommendations that homeowners would be likely to implement. Accordingly, energy specialists understood and conveyed the value of the HEAT loan to homeowners.

[14] Note: Totals may not always be equal to the total number of HPCs (8) and LVs (5), as there were instances where no participation occurred. For example, if a customer declined LEDs, the totals would not reflect that particular energy specialist.

5. FEEDBACK FROM PROGRAM ACTORS

At the conclusion of each HEA, the evaluation team interviewed the participating customer and energy specialist to gather their perspective regarding three primary questions related to the HEA:

(1) What worked well?

(2) What didn't work well?

(3) What are the opportunities for improvement?

The suggestions for improvement were provided by interviewees and reflect their opinion following each HEA. The evaluation team will offer formal recommendations in this research study's final report once the team has completed all RES 35 evaluation tasks.

5.1 Homeowners

What Worked Well

- **Tailored Discussion of Costs and Savings.** Homeowners liked when energy specialists presented them with detailed project costs, including line item summaries of what the cost would be with and without the incentive provided by the PAs.
- **Having Two Auditors Present.** Homeowners were receptive to having two energy specialists present for their HEA, as this was seen as more efficient, particularly as it related to the installation of ISMs.

What Does Not Work Well

- **Inconsistency of ISMs Offered.** The inconsistent offering of ISMs between HEAs was viewed negatively by homeowners.
- **Installation of ISMs Without Consent.** Homeowners provided negative feedback when an energy specialist would install ISMs without their prior consent.

Areas for Improvement

- **Emphasize Cost-Effectiveness.** Homeowners responded positively to energy specialists that provided detail on the cost-effectiveness and payback periods of recommended measures.

5.2 Energy Specialists

What Worked Well

- **Understanding the Needs of the Homeowner.** LVs and HPCs indicated that understanding the priorities of the homeowner is needed for a successful HEA.
- **Engaged Homeowners.** LVs and HPCs indicated that having engaged homeowners that are present throughout the HEA and shadow them is preferential to having disengaged homeowners.

What Does Not Work Well

- **Unannounced CRI QA/QC Visits.** On one occasion, a CRI QC visit occurred at the same time as the mystery shopping experience. The LV indicated that these CRI visits often make homeowners uncomfortable, since their role in the HEA is not always clearly communicated to the homeowner. Regardless, energy specialists noticed that having an additional stranger in their home can adversely impact the customer.
- **Software Limitations.** HPCs noted that software limitations can restrict their ability to provide customers with detailed reports. For example, one customer had a pre-weatherization barrier present (i.e., knob and tube wiring). The HPC indicated that, because there was a pre-weatherization barrier, they were not able to provide the homeowner with a complete report immediately following the HEA. Another HPC indicated that, in addition to generating a report using the HES-approved software, they also provide the customer with a report generated using their company's proprietary software. This HPC indicated that their company software has less restrictions and can provide additional detail that the customer may find informative.

Areas for Improvement

- **Time Constraints.** Consistently, LVs indicated that time constraints while conducting an HEA were an issue. The software required to generate the customer's report requires a high level of detail of the home specifications (e.g., heating and cooling equipment capacity and efficiency, existing insulation levels). The time required to enter this level of detail reduces the time that the energy specialist can meet with the customer and/or focus on other aspects of the HEA.
- **Guidance on Measure Prioritization.** Related to time constraints, energy specialists indicated they would appreciate additional guidance from the PAs on how to prioritize ISMs and recommended measures, as well as the various offers that the PAs introduce via HEAs.
- **Customization of Materials to Customer.** The energy specialist typically presented the customer with a previously prepared folder containing HES-related materials. When reviewing the contents with the customer, the energy specialist would often note that certain materials were not relevant to the homeowner. Some energy specialists felt that allowing for the customization of program materials may allow customers to focus on material that is relevant to their specific needs.
- **Improve Energy Modeling Software.** HPCs noted flaws including frequent bugs and said the software is not intuitive or user-friendly. Additionally, HPCs expressed concern about the accuracy of the software. As noted previously, one HPC uses his own company's software in addition to HES-approved software.
- **Allow Access to Audit Scheduling.** Two HPCs expressed the desire to gain control of audit scheduling. One HPC noted that since his company is dependent on LVs for scheduling purposes, if his company has a cancellation, they cannot usually fill the time slot.
- **Consistency in ISMs and Rebate Types/Amounts.** Some HPCs noted that the program offerings change too frequently and that they would like there to be more consistency in ISMs and rebate types/amounts offered between PAs.

6. PARTICIPANT PROFILE NO. 1: ROSLINDALE/NATIONAL GRID

HOME

100+ years old
3 bedroom/2 bath
2 stories plus finished attic and partially finished basement

- Holes covered over with plaster in second floor exterior wall indicated insulation work of some kind had been done
- Steam boiler serves most of the house, with a forced hot air furnace serving the basement only; both furnaces ~30 years old
- 6-year old gas storage water heater
- The homeowners recently bought the house and are conducting ongoing renovations
- Home already has double-pane windows

CUSTOMER

Homeowner
Two adults and two small children
One adult stays home as caretaker, the other works in finance

- One homeowner present during all three HEAs; second homeowner was never present
- Interested in reducing utility bill and draftiness of home
- Not knowledgeable about energy efficiency and not engaged with energy specialists

6.1 Instant Savings Measures

ISMs were inconsistently installed by the three energy specialists.

Type	LV	HPC 1	HPC 2
LED Lighting	24	18	23
Faucet Aerator	0	0	0
Low-Flow Showerhead	0	0	0
Smart Power Strip	1	0	2

Details:

- **The LV,** at the start of the HEA, mentioned that he planned to install LEDs. He checked light bulbs on all floors, including the attic and basement, installing 24 LEDs total. The LV did not mention water-saving devices during the HEA. In the interview following the HEA, the LV reported that the aerators offered by the program would not have fit the homeowner's faucets (he said this is "a growing trend"), so he did not mention them. The homeowner had handheld showerheads, so the LV assumed the homeowner would not want them replaced. The LV did not offer the homeowner a programmable or Wi-Fi thermostat for her basement zone.
- **HPC 1** installed 18 LEDs. In follow-up feedback, the HPC explained that he did not leave a power strip because he did not have any with him. He noted that the program faucet aerators were not the right fit so he did not mention them. Similarly, he did not mention the low-flow showerheads because the home's showerheads were "fancy," and he assumed the homeowner would not want them replaced. The HPC also left the homeowner with a programmable thermostat for her home's basement zone (the homeowner requested that he not install—per mystery shopping guidance).

- **HPC 2 consisted of two auditors. One auditor was in training.** The auditor in training installed LEDs, while the other auditor continued to engage the homeowner with a demonstration and discussion of his insulation findings. The auditors offered the homeowner both showerheads and faucet aerators, but the customer declined both. In a follow-up interview, the lead auditor indicated that showerheads are the second most popular ISM (second to LEDs). Faucet aerators are less frequently installed because the aerators offered by the program often do not match faucet types in the home, especially in kitchens. Although the home would have qualified for a programmable or Wi-Fi thermostat for the basement zone, the lead auditor mentioned that he often does not prioritize thermostats because they take a long time to install and sometimes require a repeat visit.

6.2 Recommended Measures

The most common recommended measure was to improve the weatherization of the home, although the exact method (insulation and/or air sealing) and location varied.

Recommended Measure	LV	HPC 1	HPC 2
Insulation	✓		✓
Air Sealing/Weatherstripping	✓	✓	✓
Steam Boiler Upgrade	✓		✓

Details:

- Both the LV and HPC 2 prioritized exterior wall insulation; however, their findings relating to what exterior walls required insulation were inconsistent.
    - The LV used visual inspection and an infrared camera to investigate insulation. He determined that insulation had already been added to the second floor, but there was no insulation in the basement and first floor. He drilled a small hole in the first-floor wall to figure out how much room there is for insulation. Due to the type of exterior siding, he recommended that insulation be blown in from inside.
    - In addition to visual checks, HPC 2 checked around electrical outlets and drilled a small hole into the second-floor wall. In doing this, the HPC found that the first and second floors did not have insulation (the evidence of prior insulation work in the second-floor wall was associated with insulation work related to the attic floor). HPC recommended insulation be added from outside of the home. He recommended splitting this work up to get the insulation rebate twice.
- The LV and HPC 2 recommended a steam boiler upgrade, as the boiler was determined to be approximately 30 years old.
- HPC 1 and HPC 2 recommended a door sweep and exterior door weatherstripping.
- HPC 1 also recommended weatherstripping the bulkhead and improving the thermal barrier for the attic crawlspaces.
- In response to the homeowner's interest, both the LV and HPC 1 discussed ductless mini-splits, along with available incentives, with the consumer.

7. PARTICIPANT PROFILE NO. 2: STOUGHTON/NATIONAL GRID

HOME

32 years old
3 bedroom/3 bath; 2 stories with fully finished basement and attic crawlspace
Oil boiler space and tankless water heating with electric backup

- Home already has double-pane windows
- 10-year old oil boiler
- Gas line nearby

CUSTOMER

Homeowner
Two adults and two teenage children
Both adults work; one works from home periodically

- Both homeowners present during the first HEA; only one present during the second two HEAs
- Interested in reducing heat loss and draftiness
- The homeowner who was present during all three HEAs works at Edison Electric and is knowledgeable about energy efficiency
- Actively engaged throughout HEAs, usually shadowing energy specialists and asking technical questions

7.1 Instant Savings Measures

ISMs were inconsistently installed by the three energy specialists.

Type	LV	HPC 1	HPC 2
LED Lighting	64	51	50
Faucet Aerator	0	0	1
Low-Flow Showerhead	0	0	0
Smart Power Strip	2	2	1

Details:

- **LV was a manager-level auditor filling in for the auditor who was originally scheduled to conduct the audit.** He replaced 64 incandescent bulbs with LEDs throughout the house, including home exterior. He also offered showerheads—the customer took one but did not have the measure installed.[15] Faucet aerators were the wrong size, so the LV did not offer them to the homeowner. The LV mentioned the Wi-Fi thermostat incentive to the homeowner (homeowner declined, as instructed).
- **HPC 1** installed 51 LEDs. The HPC did not look outside to see whether any lights needed replacing on the exterior of the home. The HPC was not available for a follow-up interview to clarify his reasons for not mentioning water-saving measures or the Wi-Fi thermostat rebate.

[15] Per PA HES implementation managers, energy specialists can leave behind uninstalled showerheads and aerators. In these instances, the energy specialists bear the cost of the measure and should not include it in their tracking records.

- **HPC 2** installed 50 LEDs. The HPC did not look outside to see whether any lights needed replacing on the exterior of the home. The HPC left the homeowner with a showerhead (upon request). He mentioned the program offers free programmable thermostats but did not mention the Wi-Fi thermostat incentive.

7.2 Recommended Measures

The most common recommended measure was to improve the weatherization of the home's attic space, although the exact recommendations differed.

Recommended Measure	LV	HPC 1	HPC 2
Attic Insulation	✓		✓
Attic Air Sealing	✓		✓
Water Heating System Upgrade	✓		
Boiler Cleaning		✓	

Details:

- The LV emphasized added insulation in the attic (additional 6 inches) as well as air sealing measures in the attic.
- Although his final recommendation consisted only of a boiler cleaning, during the audit HPC 1 mentioned the need for a tent cover over the attic opening and an eventual upgrade to the heating system.
- HPC 2 focused primarily on air sealing measures in the attic, including air sealing around a large plumbing chase, skylight, and an interior attic wall.
- The LV was the only auditor to recommend a water heater upgrade—specifically to switch the existing tankless water heater with backup electric to an indirect or on-demand system.
- The LV was also the only auditor to explore the benefits of switching from oil to gas or propane space and water heating.

8. PARTICIPANT PROFILE NO. 3: PITTSFIELD/BERKSHIRE GAS

HOME

16 years old
Received only one HEA (LV)
3 bedroom/3 bath; 1 story with a basement and attic
Gas space heating and indirect hot water tank

- Home already has double-pane windows
- As determined by the LV, home had been retrofitted for insulation and air sealing since construction
- Owners had recently converted from oil to gas heating

CUSTOMER

Homeowner
Two adults
One retired, one working

- During the HEA, only one of the homeowners was present
- Actively engaged throughout HEA and seemed to enjoy learning and sharing his own experiences with the LV
- Homeowner indicated they may sell the house in a few years—they wanted the HEA to save money and to confirm their home did not have any red flags in terms of efficiency and safety

8.1 Instant Savings Measures

Type	LV
LED Lighting	12
Faucet Aerator	0
Low-Flow Showerhead	0
Smart Power Strip	1

Details:

- **The LV mentioned that he would replace inefficient light bulbs with efficient ones.** He replaced 12 incandescent bulbs located on the main floor with LEDs. He asked the homeowner if he wanted bulbs in the basement replaced as well and the homeowner declined. In the interview following the HEA, the LV noted that the aerators offered by the program would not have fit the homeowner's faucets, so he did not mention them. The LV offered the homeowner one showerhead, but the homeowner declined. The other two showers had "fancier" (i.e., rain type) showerheads, so the LV assumed the homeowner would not want them replaced.

8.2 Recommended Measures

For this home, the LV did not recommend any measures. The home was relatively new (2001), and there was evidence the home's insulation and air sealing had been retrofitted since the home was built. Additionally, the space and water heating systems were new.

9. PARTICIPANT PROFILE NO. 4: NEEDHAM/EVERSOURCE

HOME

100+ years old
6 bedroom/2 bath; 2,000 SF
Gas space and water heating

- Recently (<10 years) renovated with double-pane windows
- Energy specialist identified ceiling and wall insulation using thermal imaging cameras and through visual verification
- Mechanical systems, including a forced air furnace and hot water heating equipment, located in unfinished basement

CUSTOMER

Homeowner
Two adults and three children
Work in finance; one from home

- Both homeowners present during all three HEAs; one was not an active participant but answered questions when necessary
- Interested in reducing drafts
- Generally knowledgeable about energy efficiency
- Actively engaged throughout HEAs, usually shadowing energy specialists

9.1 Instant Savings Measures

ISMs were inconsistently installed by the three energy specialists.

Type	LV	HPC 1	HPC 2
LED Lighting	0	25	0
Faucet Aerator	2	1	0
Low-Flow Showerhead	0	1	0
Smart Power Strip	2	2	2

Details:

- The **LV** asked the homeowner if she was interested in LEDs. The homeowner declined, stating she had already installed LEDs in some fixtures. Rather than proactively seek out the remaining inefficient lamps, the LV moved on with the HEA and told her that he could install LEDs later if she changed her mind.
- **HPC 1** consisted of two auditors. One auditor conducted the overall audit of the home and the other focused his attention on ISMs and the safety aspects of the audit. Before starting, they asked the homeowner if it would be okay if they installed some ISMs. The homeowner agreed and indicated that some bulbs were already LED.
- **HPC 2** did not offer any LED lighting measures, noting in the follow-up interview that the customer already had CFL bulbs installed. The evaluator noted that there were opportunities for additional incandescent/LED replacements.

9.2 Recommended Measures

The most common recommended measure was to improve the weatherization of the home, although the exact method—attic and basement air sealing, insulation removal, exterior door weatherstripping—varied.

Recommended Measure	LV	HPC 1	HPC 2
Weatherization	✓	✓	✓
Air Sealing		✓	
Upgrade Furnace (eventually)	✓	✓	✓

Details:

- Both HPCs recommended the same set of weatherization measures: insulating the rim joist and insulating and adding a thermal barrier to the crawlspace in the basement.
- The LV did not provide the customer with any recommendations regarding weatherization measures. They did note, however, that the home may benefit from having spray foam insulation installed in the basement to improve the thermal envelope of the home. The LV indicated that this measure is not covered by Mass Save.
- The LV and both HPCs recommended that the participant take advantage of the Mass Save program to replace their furnace. The energy specialists all informed the customers about both the PAs' early retirement incentive and the standard, replace-on-failure incentive. However, none of the energy specialists indicated there was an immediate need to act, as the unit was approximately 15-20 years old, in reasonable condition, and the home had other improvement opportunities. Further, the homeowner did not appear eager to replace the heating equipment.

10. PARTICIPANT PROFILE NO. 5: STOUGHTON/COLUMBIA GAS

HOME

23 years old
3 bedroom/3 bath; 1,900 SF
Gas space and water heating

- Recently (<5 years) renovated with double-pane windows
- Recently updated home appliances and bathrooms (new shower heads and aerators)
- Recently retrofitted furnace and air conditioner; recently installed on-demand gas water heater
- Homeowners are starting a major renovation project in the next month and indicated that they would likely hold off on participating in the program immediately

CUSTOMER

Homeowner
Two adults and three children
Work in dentistry

- One homeowner present during all three HEAs; one was infrequently present at times but answered questions when necessary
- Interested in reducing utility bill—in particular energy
- Generally knowledgeable about energy efficiency and already taken steps to reduce consumption
- Actively engaged throughout HEAs, usually shadowing energy specialists

10.1 Instant Savings Measures

ISMs were inconsistently installed by the three energy specialists.

Type	LV	HPC 1	HPC 2
LED Lighting	39	10	0
Faucet Aerator	0	0	0
Low-Flow Showerhead	0	0	0
Smart Power Strip	0	1	1

Details:

- **LV consisted of two auditors.** While one auditor was inspecting the basement with the homeowner, the other started installing LEDs without asking the homeowner's permission. The homeowner asked the LV to remove the LEDs and re-install incandescents prior to leaving the HEA. The LV declined, stating that the homeowner could replace the LEDs later and they would leave the removed lamps behind. The LV forgot to give the homeowner a smart power strip.
- **HPC 1** installed 10 LEDs. The HPC requested permission to install LED ISMs before proceeding with the installation. The homeowner first declined. The HPC suggested he install one or two as an example and if the homeowner did not like the resulting light, he would remove them. The homeowner agreed. The homeowner declined to have any faucet aerators or showerheads installed.

- **HPC 2** did not install any LED measures. Although they were offered, the homeowner declined (similar to HPC 1). The HPC did not install any faucet aerators or showerheads.

10.2 Recommended Measures

The most common recommended measure was to improve the weatherization of the home, although the exact method and location—attic and basement air sealing, insulation removal—varied.

Recommended Measure	LV	HPC 1	HPC 2
Weatherization	✓	✓	✓
Air Sealing	✓	✓	✓
Attic Hatch Thermadome	✓	✓	✓
Basement Sill Insulation	✓		

Details:

- The LV and HPCs indicated that the new code for attic insulation is 14 inches and that the existing 9 inches could be improved upon.
- Both the HPCs and the LV provided consistent recommendations for weatherization and air sealing measures to the customer, including improving air sealing in the attic and knee walls.
- Both HPCs and the LV recommended improving the customer's attic air infiltration through the installation of an attic hatch thermadome.
- Only the LV recommended that the customer install fiberglass insulation to the perimeter of the basement ceiling at the house sill.

APPENDIX A. MYSTERY SHOPPING: HEA DATA COLLECTION TOOL

Please provide the following information:

LV or HPC Company Name:

_____

Energy Specialist/HPC Name:

_____

Energy Specialist/HPC Arrival Time:

_____

Energy Specialist/HPC Departure Time:

_____

Mystery Shopping Location:

_____

Your Name:

_____

Date:

_____

Instructions

Please complete this data collection tool **immediately** after each HEA. Use the following scale for applicable questions regarding how the Energy Specialist/HPC conducted certain aspects of the HEA:

1 – Poor
2 – Fair
3 – Good
4 – Excellent

If you need more room to sufficiently capture your thoughts, or have additional observations, add pages to this tool.

Please start by answering the following questions:

- Did the Energy Specialist/HPC begin the assessment by talking to the customer about **their interests and priorities?**

  _____

  _____

- How effective was the Energy Specialist/HPC at **engaging the customer** throughout the assessment?
  Please circle: **1 2 3 4**

Why do you say that?

_____

_____

- How effective was the Energy Specialist/HPC at **maximizing the savings** potential associated with the instant savings measures? Please circle: **1 2 3 4**

  Why do you say that?

_____

_____

- Which measures/recommendations did the Energy Specialist/HPC **emphasize** when reporting his/her findings? What was their rationale for focusing on these measures/recommendations?

_____

_____

- How clearly did the Energy Specialist/HPC **explain next steps** the customer would need to take after the assessment? Please circle: **1 2 3 4**

  Why do you say that?

_____

_____

- How do you rate the Energy Specialist/HPC's ability to **motivate the customer** to install the recommended measures? Please circle: **1 2 3 4**

  Why do you say that?

_____

_____

- Did Energy Specialist/HPC use any **specific language** you found particularly effective during the assessment or while communicating their recommendations? If so, what language did they use?

_____

_____

- Are there any **changes** (e.g., rearranging the order of the HEA, opportunities for increased homeowner engagement, different tools/software, etc.) that would have **increased the overall effectiveness** of the assessment? If so, why do you say that?

  _____

  _____

- What were you **most impressed** with during the Energy Specialist/HPC's assessment? Why do you say that?

  _____

  _____

- What were you **least impressed** with during the Energy Specialist/HPC's assessment? Why do you say that?

  _____

  _____

Use the following table to record all installed instant savings measures for post-HEA removal.

Instant Savings Measure	Number Installed	Location(s)
Efficient Lighting		
Advanced Power Strip		
Showerheads		
Faucet Aerators		
Thermostat		

List the recommendations the Energy Specialist/HPC gave, in order of stated importance/emphasis:

1. _____
2. _____
3. _____
4. _____
5. _____

THINGS TO WATCH FOR:

1. Did the Energy Specialist/HPC replace CFLs with LEDs? **Yes No N/A**
2. Did the Energy Specialist/HPC install the LEDs or just leave them with the customer? _____
3. Did the Energy Specialist/HPC take the bulbs that they replaced or did they leave them with the customer? _____
4. Were there any pre-weatherization barriers? **Yes No If Yes, what?** _____
5. [IF YES] was the customer notified of the pre-weatherization barrier offers? _____
6. Did the Energy Specialist/HPC discuss cost-effectiveness or payback periods? **Yes No**
7. [IF APPLICABLE] Did the Energy Specialist/HPC provide the customer with a weatherization contract while onsite, either hard copy or via e-mail? **Yes, hard copy Yes, e-mail No N/A**
8. Did the Energy Specialist reference the moderate income enhanced incentives? **Yes No N/A**
9. Did the Energy Specialist reference the wireless thermostat installation incentive? **Yes No N/A**
10. Did the Energy Specialist review the HEAT Loan? **Yes No**
11. [IF YES] Do you feel the homeowner thoroughly understood the Energy Specialist's explanation of the HEAT Loan and eligible measures? Why or why not?
12. Did the Energy Specialist/HPC address customer interests and priorities that are outside the scope of what Mass Save offers? **Yes No N/A**
13. [IF YES] What interests/priorities came up and how did the ES/HPC address them? _____
14. Did the Energy Specialist/HPC recommend any other measures that are not part of HES or another PA initiative? **Yes No**
15. [IF YES] Which measures and why? _____

Home Energy Assessment Checklist

Activity	Did Energy Specialist Complete Activity?[16]			Estimated Time Spent on Activity (Minutes)			Rating			
How well did the Energy Specialist/HPC determine the customer's needs and interests?										
Customer Interview	Yes	No	N/A	1-4	5-10	10+	1	2	3	4
How well did the Energy Specialist/HPC explain the purpose of the assessment and its impact on energy consumption?										
Refrigerator Assessment	Yes	No	N/A	1-4	5-10	10+	1	2	3	4
Heating Assessment	Yes	No	N/A	1-4	5-10	10+	1	2	3	4
DHW Assessment	Yes	No	N/A	1-4	5-10	10+	1	2	3	4
Cooling System Assessment	Yes	No	N/A	1-4	5-10	10+	1	2	3	4
Window Assessment	Yes	No	N/A	1-4	5-10	10+	1	2	3	4
Insulation Assessment – *Basement/crawlspace*	Yes	No	N/A	1-4	5-10	10+	1	2	3	4
Insulation Assessment – *Exterior walls and closed cavities*	Yes	No	N/A	1-4	5-10	10+	1	2	3	4
Insulation Assessment – *Attic*	Yes	No	N/A	1-4	5-10	10+	1	2	3	4
Insulation Assessment – *Infrared Camera Scan*	Yes	No	N/A	1-4	5-10	10+	1	2	3	4
Air Sealing Potential Assessment	Yes	No	N/A	1-4	5-10	10+	1	2	3	4
Outside Assessment of the Home	Yes	No	N/A	1-4	5-10	10+	1	2	3	4
Identify Health/Safety – *Moisture*	Yes	No	N/A	1-4	5-10	10+	1	2	3	4
Identify Health/Safety– *Knob and Tube Wiring*	Yes	No	N/A	1-4	5-10	10+	1	2	3	4
Identify Health/Safety – *Asbestos*	Yes	No	N/A	1-4	5-10	10+	1	2	3	4
Identify Health/Safety – *Combustion*	Yes	No	N/A	1-4	5-10	10+	1	2	3	4
Identify Health/Safety – *Other*	Yes	No	N/A	1-4	5-10	10+	1	2	3	4
How effective was the Energy Specialist/HPC at conveying the value of the instant savings measures?										
Instant Measure – *Efficient Lighting*	Yes	No	N/A	1-4	5-10	10+	1	2	3	4
Instant Measure – *Advanced Power Strips*	Yes	No	N/A	1-4	5-10	10+	1	2	3	4
Instant Measure – *Water-Saving Device*	Yes	No	N/A	1-4	5-10	10+	1	2	3	4
Instant Measures – *Thermostat*	Yes	No	N/A	1-4	5-10	10+	1	2	3	4
How effective was the Energy Specialist/HPC at communicating the overall results of the HEA?										
Creation of Reports and Contract	Yes	No	N/A	5-10	11-20	20+	1	2	3	4
How effective was the Energy Specialist/HPC at encouraging the homeowner to take the recommended steps?										
Presentation of Sale and Recommended work with Incentives	Yes	No	N/A	5-10	11-20	20+	1	2	3	4

**If a home does not qualify for certain activity, please circle N/A.*

PORTFOLIO I. ADDITIONAL PARTICIPANT SURVEY FINDINGS (TASK 6)

Introduction

This document includes the analysis weights used to calculate participant survey results, as well as survey results themselves. The team did not include the responses to questions with too few respondents. The team also includes statewide results, delivery channel-specific results (e.g., LV/HPC), and participant type-specific results (HEA Only/Major Measure) when the results differed. When results did not differ, the team only provided statewide (or "overall") results.

Completed Surveys and Analysis Weights

The tables below provide a summary of the total number of HES customers by PA, delivery channel, and participation type during the analysis period, the number of each surveyed, and the corresponding set of analysis weights used in the evaluation team's analysis.

Table 1. Participation by PA, Delivery Channel, and Participation Type

	LV		HPC		
PA	HEA Only	Major Measure	HEA Only	Major Measure	Total
Berkshire Gas	1,771	480	20	8	2,279
Cape Light Compact	5,775	4,271	311	531	10,888
Columbia Gas	8,206	4,352	9,172	4,839	26,569
Eversource	29,094	13,728	12,402	5,272	60,496
Liberty Gas	1,437	484	0	0	1,921
National Grid	58,096	27,473	25,573	9,787	120,929
Unitil	605	301	493	321	1,720
Total	**104,984**	**51,089**	**47,971**	**20,758**	**224,802**

Table 2. Completed Surveys by PA, Delivery Channel, and Participation Type

	LV		HPC		
PA	HEA Only	Major Measure	HEA Only	Major Measure	Total
Berkshire Gas	10	2	0	2	14
Cape Light Compact	47	29	2	0	78
Columbia Gas	52	13	72	18	155
Eversource	91	34	27	37	189
Liberty Gas	15	1	0	0	16
National Grid	147	41	58	62	308
Unitil	28	5	6	1	40
Total	**390**	**125**	**165**	**120**	**800**

Table 3. Analysis Weights by PA, Delivery Channel, and Participation Type

	LV		HPC	
PA	HEA Only	Major Measure	HEA Only	Major Measure
Berkshire Gas	0.63	0.85		0.01
Cape Light Compact	0.44	0.52	0.55	
Columbia Gas	0.56	1.19	0.45	0.96
Eversource	1.14	1.44	1.63	0.51
Liberty Gas	0.34	1.72		
National Grid	1.41	2.38	1.57	0.56
Unitil	0.08	0.21	0.29	1.14

Additional Surveys Results

The following results are organized by survey topic area and linked to the final customer survey via the provided question number and associated skip logic.

About the HEA

Table 4. How did you first learn about the assessment? (Q2)

Response	Overall
Bill insert	9%
Mailing/marketing materials (not including bill insert)	6%
Email	1%
Internet Advertisement/online search	7%
Visited MassSave.com	1%
Social media	3%
Radio (unspecified)	3%
Movie theatre	0%
Newspaper/Magazine	0%
Ad on public transportation	0%
Billboard	0%
Door-to-door	2%
Home performance contractor	2%
Heating and cooling contractor	1%
Insulation contractor	1%
Word of mouth, including from friend or family	26%
Events (farmers market, community event, expo, trade shows)	3%
Community action agency	1%
Other	22%
Don’t know	11%
Refused	0%
Respondents	**798**

Table 5. How important was the fact that the assessment was provided at no-cost to you in your decision to schedule it? (Q4)

Response	Overall
Very important	83%
Somewhat important	13%
Neither important nor unimportant	1%
Not very important	2%
Not at all important	0%
(DO NOT READ) Don't know	1%
(DO NOT READ) Refused	0%
Respondents	**798**

Table 6. Did you visit MassSave.com prior to signing up for your assessment? (Q5)

		Participant Type		Delivery Channel	
Response	Overall	HEA Only	Major Measure	HPC	LV
Yes	52%	48%	61%	41%	57%
No	34%	36%	29%	42%	31%
Don't know	14%	15%	9%	17%	12%
Refused	0%	0%	0%	0%	0%
Respondents	**798**	**544**	**254**	**243**	**555**

Table 7. Did you take the online home energy assessment (Q6 - ASKED IF Q5=1)

		Delivery Channel	
Response	Overall	HPC	LV
Yes	41%	36%	43%
No	29%	40%	26%
Don't know	29%	25%	31%
Refused	0%	0%	0%
Respondents	**418**	**100**	**318**

Table 8. Did the online assessment lead you to request in-home energy assessment? (Q8 - ASKED IF Q6=1)

		Delivery Channel	
Response	**Overall**	**HPC**	**LV**
Yes	78%	70%	80%
No	13%	19%	12%
Don't know	9%	10%	8%
Refused	0%	0%	0%
Respondents	**173**	**36**	**137**

Table 9. Did your Energy Specialist recommend that you visit a special webpage on MassSave.com with informational videos about program measures and services for customers that just had an assessment? (Q10)

		Delivery Channel	
Response	**Overall**	**HPC**	**LV**
Yes	31%	23%	34%
No	35%	47%	29%
Don't know	35%	29%	37%
Refused	0%	0%	0%
Respondents	**798**	**243**	**555**

Table 10. Did you visit the special webpage following your assessment? (Q11 - ASKED IF Q10=1)

Response	**Overall**
Yes	55%
No	31%
Don't Know	13%
Refused	0%
Respondents	**244**

Table 11. How useful did you find the information and videos on that page? (Q12 – ASKED IF Q11=1)

		Participant Type	
Response	**Overall**	**HEA Only**	**Major Measure**
Very useful	34%	28%	49%
Somewhat useful	51%	59%	33%
Neither useful nor not useful	11%	12%	9%
Not very useful	1%	0%	3%
Not at all useful	2%	0%	6%
(DO NOT READ) Don't know	1%	2%	0%
(DO NOT READ) Refused	0%	0%	0%
Respondents	**135**	**93**	**42**

Table 12. Which of the following factors were most influential in your decision to install [RANDMEASURE]? (Q20 - ASK IF PARTTYPE = MAJOR MEASURE OR Q17 = 1)

		Delivery Channel	
Response	**Overall**	**HPC**	**LV**
The Mass Save/[PA] incentives	50%	47%	52%
The online home energy assessment	2%	2%	2%
The findings of your home energy assessment	11%	11%	11%
The advice of the Energy Specialist that completed your assessment	16%	23%	13%
The advice of friends and/or family	2%	2%	3%
Information you found on MassSave.com	1%	0%	1%
Information you found on another website	1%	2%	1%
The HEAT loan	0%	0%	0%
Something else	11%	9%	12%
Don't know	3%	2%	3%
Refused	2%	2%	1%
Respondents	**368**	**106**	**262**

Table 13. Do you plan to install any of the equipment recommended through the assessment? (Q21 - ASKED IF PARTTYPE = HEA and Q17 = 2)

		Delivery Channel	
Response	**Overall**	**HPC**	**LV**
Yes	52%	41%	58%
No	33%	40%	29%
Don't know	14%	18%	11%
Refused	1%	0%	2%
Respondents	**118**	**43**	**75**

Table 14. Approximately, when do you think you will install it? (Q23 – ASKED IF Q21=1)

Response	Overall
Already Started	6%
In the next 6 months	25%
In the next 6 to 12 months	20%
Over a year from now	23%
(DO NOT READ) Don't know	23%
(DO NOT READ) Refused	3%
Respondents	**57**

Instant Saving Measures

Table 15. According to the program records, your Energy Specialist replaced some of your inefficient light bulbs with efficient bulbs. It is program policy that Energy Specialists should leave old bulbs at your home. Have you reinstalled any of the old bulbs they left behind? (Q26 - ASKED IF LIGHTING = YES)

Response	Overall
Yes, a few of them	12%
Yes, a lot of them	1%
Yes, all of them	2%
No/ None of them	82%
Don't Know	2%
Refused	0%
Respondents	**697**

Table 16. Did the Energy Specialist replace any existing CFLs you had with new LEDs? (Q27)

Response	Overall
Yes	62%
No	25%
Don't Know	13%
Refused	0%
Respondents	**697**

Table 17. Did the Energy Specialist explain how the smart strips work? (Q29)

Response	Overall
Yes	79%
No	13%
Don't Know	8%
Refused	0%
Respondents	**636**

Table 18. Have you installed the smart strip? (Q30 – ASKED IF [STRIPNUM] OR CORRECTED COUNT = 1)

Response	Overall
Yes	85%
No	12%
Don't Know	4%
Refused	0%
Respondents	**172**

Table 19. Where did you install it? (Q31 – ASKED IF Q30=1)

Response	Overall
As part of a home office	24%
As part of a home entertainment system	41%
Somewhere else in my home (Please specify: Where else in your home did you install it?)	34%
Somewhere outside my home, like an office or second home (Please specify: Where outside your home did you install it?)	0%
Don't Know	1%
Refused	0%
Respondents	**145**

Table 20. Were you able to plug electronics into outlets in a way that you felt would save energy? (Q32 - ASKED IF Q30 = 1)

Response	Overall
Yes	72%
No	10%
Don't Know	18%
Refused	0%
Respondents	**145**

Table 21. Have you installed all, some, or none of the [STRIPNUM OR CORRRECTED COUNT] smart strips you received? (Q34 – ASKED IF [STRIPNUM OR CORRECTED COUNT > 1)

Response	Overall
Yes, all of them	55%
Yes, some of them	34%
None	10%
Don't Know	2%
Refused	1%
Respondents	**436**

Table 22. Did you know that the program installed wi-fi enabled thermostats prior to your assessment? Wi-fi enabled thermostats are thermostats you can control remotely using your phone or a website. (Q38)

		Delivery Channel	
Response	Overall	HPC	LV
Yes	38%	28%	42%
No	56%	67%	52%
Don't know	5%	5%	6%
Refused	0%	0%	0%
Respondents	**798**	**243**	**555**

Table 23. Did the prospect of receiving a wi-fi enabled thermostat factor into your decision to sign up for an assessment? (Q39 – ASKED IF Q38 = 1)

		Delivery Channel	
Response	**Overall**	**HPC**	**LV**
Yes	18%	7%	21%
No	79%	88%	76%
Don't know	3%	5%	3%
Refused	0%	0%	0%
Respondents	**303**	**69**	**234**

Table 24. Was one or more of your thermostats wi-fi enabled? (Q41)

Response	Overall
Yes	16%
No	71%
Don't Know	13%
Refused	0%
Respondents	**155**

Table 25. How would you rate your satisfaction with your thermostat(s)? Would you say (Q42)

Response	Overall
Very satisfied	52%
Somewhat satisfied	28%
Neither satisfied nor unsatisfied	10%
Not very satisfied	1%
Not at all satisfied	5%
(DO NOT READ) Don't Know	5%
(DO NOT READ) Refused	0%
Respondents	**155**

Table 26. Did your Energy Specialist mention wi-fi enabled thermostats during your assessment? (Q46)

		Participant Type		Delivery Channel	
Response	**Overall**	**HEA Only**	**Major Measure**	**HPC**	**LV**
Yes	34%	31%	40%	27%	36%
No	36%	36%	35%	47%	31%
Don't know	30%	33%	25%	26%	32%
Refused	0%	0%	0%	0%	0%
Respondents	**608**	**407**	**201**	**174**	**434**

Table 27. How would you rate your interest in wi-fi enabled thermostat(s)? (Q47)

Response	**Overall**
Very interested	38%
Somewhat interested	21%
Neither interested nor uninterested	6%
Not very interested	14%
Not at all interested	19%
(DO NOT READ) Don't Know	2%
(DO NOT READ) Refused	0%
Respondents	**608**

Heat Loan

Table 28. Prior to your assessment, were you aware that [PA] works with qualified lenders to offer no interest loans for energy efficiency improvements? [PA] refers to this offer as the HEAT loan. (Q49 – SKIPPED IF Q1 = 9)

		Participant Type		Delivery Channel	
Response	**Overall**	**HEA Only**	**Major Measure**	**HPC**	**LV**
Yes	60%	62%	57%	55%	63%
No	37%	35%	41%	42%	35%
Don't know	2%	3%	2%	4%	2%
Refused	0%	0%	0%	0%	0%
Respondents	**786**	**533**	**253**	**241**	**545**

Table 29. Did your Energy Specialist mention the HEAT loan during your assessment? (Q50 – SKIPPED IF Q1 = 9)

		Delivery Channel	
Response	**Overall**	**HPC**	**LV**
Yes	63%	54%	68%
No	15%	20%	12%
Don't know	22%	26%	20%
Refused	0%	0%	0%
Respondents	**786**	**241**	**545**

Table 30. How much time did the Energy Specialist take in talking to you about the HEAT Loan? Just a brief mention, a few minutes, or a more in-depth detailed discussion about the options. (Q51 – ASKED IF G50 = 1)

		Delivery Channel	
Response	**Overall**	**HPC**	**LV**
Just a brief mention	15%	20%	13%
A few minutes	50%	51%	50%
An in-depth detailed discussion about the options	27%	19%	29%
Don't know	8%	9%	8%
Refused	0%	0%	6%
Respondents	**498**	**130**	**368**

Table 31. I understand that you worked with [LV] to become authorized to seek a HEAT loan from a participating lender. Did you end up securing a HEAT loan with a lender? (Q52)

Response	**Overall**
Yes	78%
No	20%
Don't Know	2%
Refused	0%
Respondents	**99**

Table 32. What did you use the HEAT loan to do? (Q53 – ASK IF Q52 = 1)

Response	Overall
Install an efficient heating system	49%
Install an efficient cooling system	9%
Install an efficient hot water system	4%
Other	37%
Don't Know	0%
Refused	0%
Respondents	**77**

Moderate Income New Offer

Table 33. Prior to your assessment, were you aware that [PA] offers enhanced incentives for income qualifying households? Specifically, [PA] offers a $400 clothes washer rebate, a $200 refrigerator rebate, and 90% (for LIBERTY or UNITIL, 100% for BERKSHIRE GAS or COLUMBIA GAS, and no cost for CAPE LIGHT COMPACT, EVERSOURCE, or NATIONAL GRID) of insulation costs up to $3,000. These are higher incentives than offered to customers that are not income eligible. (Q57)

		Delivery Channel	
Response	Overall	HPC	LV
Yes	40%	29%	44%
No	52%	63%	47%
Don't know	8%	7%	8%
Refused	0%	0%	0%
Respondents	**798**	**243**	**555**

Table 34. Did your Energy Specialist mention the enhanced incentives after your assessment? (Q58)

		Delivery Channel	
Response	Overall	HPC	LV
Yes	34%	29%	36%
No	27%	33%	25%
Don't know	38%	37%	39%
Refused	0%	0%	0%
Respondents	**798**	**243**	**555**

Table 35. The exact income threshold to qualify for the enhanced incentives depends on the number of people in your home and requires completing an income verification process. For example, a family of four, it's approximately $87,000 in gross household income per year. For a

someone living alone, it's approximately $45,000. Based on this information, does it seem like you could potentially be eligible for the enhanced incentives? (Q59)

		Participant Type	
Response	**Overall**	**HEA Only**	**Major Measure**
Yes	20%	22%	16%
No	70%	68%	74%
Don't know	8%	9%	7%
Refused	2%	1%	3%
Respondents	**797**	**543**	**254**

Table 36. To qualify for the higher rebates through the Income Eligible offer you would need to complete a free income verification process over the phone. Did you go through the income verification process to attempt to qualify for the enhanced incentives? (Q60)

		Delivery Channel	
Response	**Overall**	**HPC**	**LV**
Yes	6%	2%	8%
No	88%	94%	85%
Don't know	6%	4%	7%
Refused	0%	0%	0%
Respondents	**158**	**45**	**113**

Table 37. Would qualifying for the enhanced incentives influence your decision to install any of the measures recommended by your Energy Specialist? (Q64 - ASKED IF PARTTYPE= HEA ONLY AND Q62 = 3, 4 or 5)

Response	**Overall**
Yes	79%
No	9%
Don't Know	11%
Refused	0%
Respondents	**69**

QA/QC

Table 38. When did the inspection take place? (Q101 - ASKED IF PARTTYPE = MAJOR MEASURE)

Response	Overall
After the assessment but before all work was completed	13%
After all work was completed	82%
Don't Know	5%
Refused	0%
Respondents	**99**

Table 39. Were you informed that someone from [LV] would be visiting before they arrived? (Q102)

Response	Overall
Yes	95%
No	5%
Don't Know	0%
Refused	0%
Respondents	**101**

Table 40. Did the staff from [LV] also clearly explain why they were visiting? (Q103 - ASKED IF Q102 = 1)

Response	Overall
Yes	99%
No	0%
Don't Know	1%
Refused	0%
Respondents	**97**

Table 41. Did [LV] quality control staff communicate with you during the inspection process? (Q104)

Response	Overall
Yes	85%
No	3%
Don't Know	12%
Refused	0%
Respondents	**101**

Table 42. Were those issues fixed? (Q109 – ASKED IF Q107 = 1)

Response	Overall
Yes	86%
No	10%
Don't Know	4%
Refused	0%
Respondents	**32**

Table 43. Overall, was with your experience with [LV]'s quality control for the Mass Save Home Energy Services Program positive, negative, or neutral? (Q110)

Response	Overall
Positive	87%
Negative	0%
Neutral	11%
Don't Know	1%
Refused	1%
Respondents	**101**

Table 44. When did the inspection take place? (Q113)

Response	Overall
During the assessment	3%
After the assessment but before all work was completed	36%
After all work was completed	58%
Don't Know	3%
Refused	0%
Respondents	**16**

Table 45. Were you informed that someone from CRI would be visiting before they arrived? (Q114)

Response	Overall
Yes	90%
No	10%
Don't Know	0%
Refused	0%
Respondents	**16**

Table 46. Did the staff from CRI clearly explain why they were visiting? (Q115 - ASKED IF Q114 = 1)

Response	Overall
Yes	96%
No	0%
Don't Know	4%
Refused	0%
Respondents	**15**

Table 47. Did CRI quality control staff communicate with you during the inspection process? (Q116)

Response	Overall
Yes	87%
No	7%
Don't Know	6%
Refused	0%
Respondents	**16**

Table 48. Overall, was your experience with the CRI, the state-wide, quality control inspector for Mass Save Home Energy Services Program positive, negative, or neutral? (Q122)

Response	Overall
Positive	87%
Negative	4%
Neutral	10%
Don't Know	0%
Refused	0%
Respondents	**16**

Table 49. In total, how many times did someone visit your home as part of your participation in the Mass Save Home Energy Services program? Please include the assessment and any follow-up activities that may have taken place. (Q125)

		Participant Type	
Response	Overall	HEA Only	Major Measure
0	0%	0%	0%
1	42%	59%	5%
2	25%	21%	33%
3	19%	10%	38%
4	10%	6%	17%
5	2%	1%	4%
More than 5	2%	1%	3%
Respondents	**761**	**521**	**240**

PORTFOLIO J. KEY PERFORMANCE INDICATOR FINDINGS MEMO (TASK 8)

Memorandum

To: Massachusetts Program Administrators and Energy Efficiency Advisory Council

From: Doug Bruchs and Fred Schaefer, Cadeo

Date: November 28, 2017

Re: HES Process Evaluation (RES 35): Key Performance Indicator Findings Memo (Task 8)

This memo details the key performance indicators (KPIs) that the evaluation team calculated as part of Home Energy Services (HES) process evaluation (RES 35).

The RES 35 KPI analysis builds upon a previous KPI analysis completed in June 2015[1] and offers insight into changes in initiative performance over time. The current KPI analysis also includes several new KPIs that were not part of the previous study and reflect changes in how the Program Administrators (PAs) deliver HES.

A. Methodology

The previous KPI analysis focused on HES customers that received a home energy assessment (HEA) between July 2011 and June 2014. Consequently, the evaluation team focused the current analysis on customers that received an HEA between July 2014 and the end of 2016.

Terminology

The evaluation team uses several important terms throughout the memo:

- **Customer.** An individual or household, identified by their unique account number, who receives an HEA.
- **Participant.** An individual or household, identified by their unique account number, that installs at least one recommended HES measure (as defined below) following an HEA. HES participants are a subset of HES customers.
- **Instant Savings Measures (ISMs).** ISMs are the measures directly installed by Energy Specialists during the HEA or, in the case of smart strips and sometimes programmable/Wi-Fi thermostats, are left behind for the customer to install.
- **Recommended Measures.** During the HEA, Energy Specialists identify and recommend more significant energy efficient improvements that the customer can undertake following the HEA. ISMs and recommended measures are mutually exclusive—any measure that is not an

[1] http://ma-eeac.org/wordpress/wp-content/uploads/HES-and-HEAT-Loan-Program-Assessment-Final-Report.pdf

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ISM is a recommended measure. The PAs offer incentives for some of these recommended efficiency opportunities through HES, while incentivizing others through complementary residential offerings like Cool Smart and the High Efficiency Heating and Water Heating (HEHE) initiatives.[2]

- **Major Measures.** Not all recommended measures offer similar savings potential. Some recommend measures—insulation for example—save considerably more on average than other recommended measures, like pipe wrap. In recognition of these differences, the evaluation team classified a subset of the recommended measures as *Major* measures and, like the previous study, used several of the KPIs to directly assess the rate at which customers are installing these important recommended measures.

Table 1 details the measure type that the evaluation team assigned to each HES measure. It also includes the relevant fuel types incentivized through HES.

Table 1. HES Measure Types

Measure	Measure Type	Relevant Fuel Types*
Faucet Aerator	ISM	All
LED Bulb	ISM	E
LED Bulb (EISA Exempt)	ISM	E
LED Bulb (Reflectors)	ISM	E
LED Recessed Trim Kits	ISM	E
Low-Flow Showerhead	ISM	All
Programmable Thermostat	ISM	All
Smart Strip	ISM	E
Smart Strip, Tier 2	ISM	E
Wi-Fi Thermostat	ISM	All
Air Sealing	Recommended - Major	All
Duct Insulation	Recommended - Major	All
Duct Seal	Recommended - Major	All
Insulation	Recommended - Major	All
Clothes Washer (Early Retirement)	Recommended - Major**	All
Combo Condensing Boiler/Water Heater 90%	Recommended - Major**	O
Combo Condensing Boiler/Water Heater 95%	Recommended - Major**	O
Forced Hot Water Boiler (Early Retirement)	Recommended - Major**	NG, HO, O
Furnace (Early Retirement)	Recommended - Major**	NG, HO, O
Heating System Replacement (Boiler)	Recommended - Major**	HO, O
Heating System Replacement (Furnace)	Recommended - Major**	HO, O
Indirect Water Heater	Recommended - Major**	HO, O
On-Demand Water Heater	Recommended - Major**	O
Refrigerator	Recommended - Major**	E
Steam Boiler (Early Retirement)	Recommended - Major**	NG, HO, O
Boiler Reset Control	Recommended - Other	HO, O
Pipe Wrap (Heating)	Recommended - Other	NG, HO, O
Pipe Wrap (Water Heating)	Recommended - Other	All

*NG = Natural Gas, E = Electricity, HO = Heating Oil, and O = Other, typically propane

[2] The PAs recently transitioned Cool Smart into the Mass Save Heating & Cooling initiative.

**As discussed later in the Data Limitations section, these measures are not included in this document. The evaluation team does not currently have complete installation data for this subset of recommended major measures.

- **Cross-Program Participation.** As noted above, PAs incentivize some of the energy efficiency recommendations made at HEA through other residential programs. When a customer installs a high efficiency natural gas heating or water heating measure (through HEHE) and/or an efficient cooling system (through Cool Smart) after having an HEA, the evaluation team refers to that customer as a cross-program participant. This term and its related KPIs allow the evaluation team to assess how effective HEAs are at comprehensively addressing customer energy efficiency needs through the suite of programs that customers may access through HES.

Data Sources

The evaluation team drew upon a three data sources to complete the KPI analysis:

1. **Lead Vendor (LV) Data.** Detailed HES tracking data provided by each LV (over 20 total files covering 2014-2016)
2. **Cross-Program Data.** Standardized HES, HEHE, Cool Smart, and Behavioral participation data provided by DNV GL, the PA's Residential Data Management Team (RDMT) (two files covering 2014-2015)[3]
3. **Third-Party Quality Assurance (QA)/Quality Control (QC) Data.** QA/QC data provided by CRI[4] (10 files covering 2014-2016)

To complete the analysis, the evaluation team combined these data sources into an analysis database using either the surrogate customer identifiers created by the RDMT or the unique customer identifiers provided by the LVs.

Each of these sources provided unique, complex data designed to support initiative management and internal reporting, not external evaluation. To overcome these challenges, the evaluation team met—often several times—with the data providers, most notably the LVs. These discussions were imperative to the success of the KPI analysis and allowed the evaluation team to confidently combine, analyze, and compare data provided by different sources.

These discussions also identified data limitations that prevented the team from calculating several of the KPIs. Because it is easier to contextualize these data limitations and understand their implications on the KPIs after introducing the KPIs themselves, the evaluation team details each in the Data Limitations subsection.

KPIs Assessed

For the sake of longitudinal comparison, the evaluation team calculated 18 KPIs of the 20 originally identified and assessed as part of the previous study. The team excluded two KPIs from the previous study because they were no longer relevant given changes to HES delivery. The excluded KPIs are:

- **KPI 10: CFL Installations.** The previous study assessed CFL (KPI 10) and LED (KPI 11) installations separately. At the time, this distinction was useful because HES was in the

[3] The residential data management team has not yet gathered and processed 2016 initiative data.

[4] The PAs recently contracted with CMC to deliver third party QA/QA services. The change occurred in 2017, after the KPI study's July 2014-2016 analysis period.

process of transitioning from CFLs to LEDs and placing limits on the number of LEDs that an Energy Specialist could install during each HEA due to cost reasons. Since the previous study, HES has transitioned completely to LEDs. Consequently, the team dropped KPI 10 and renamed KPI 11 "CFL/LED Installations," which reflects the installation of CFLs and/or LEDs.

- **KPI 15: Instant Air Sealing Improvement Installations.** Energy Specialists are no longer completing air sealing as part of HEAs.

The evaluation team made several other smaller adjustments to the previous KPIs. For example, the team expanded the scope of KPI 14 (Thermostat Installations) to include Wi-Fi thermostats, which were not part of HES at the time of the previous KPI study.

Just as recent changes to HES made KPI 10 and 15 irrelevant, the continuous evolution of HES required the team to add several new KPIs to capture more recent initiative elements. The team, in concert with the PAs and Energy Efficiency Advisory Council consultants, identified the new KPIs during interviews with the PAs (RES 35 Task 1), LV and home performance contractors (HPCs) (RES 35 Task 2), and a review of the HES QA/QC process (RES 35 Task 3). Specifically, the team added five new KPIs. In general, the new KPIs will provide additional insight into new elements of the initiative (e.g., participation in the enhanced incentives for moderate income customers and renters) and into customer participation in the PAs' multifaceted QA/QC process.

To facilitate comparison between the previous and current KPI studies, the evaluation team minimized changes to the numbering convention used for the previous study. However, the elimination of two KPIs, the addition of five new KPIs, and a desire to group similar KPIs numerically resulted in some reshuffling.

Table 2 provides a list of all the KPIs, includes a brief description of each, and indicates whether the KPI is new as of the RES 35 evaluation.

Table 2. KPI Summary

KPI	Name	Description	New in RES 35
1	HES Initiative Participation	Percentage of customers participating through each delivery channel.	No
2	HEAT Loan Participation	Percentage of customers authorized[5] by their LV to seek a PA and/or Department of Energy Resources (DOER) HEAT loan[6] from a participating lender.	Modified
3	Participation Type	Percentage of customer installing only ISMs, major measures, or no measures.	No
4	Installed Savings	Percentage of recommended savings that are installed.	No
5	Participants Installing Insulation, Air Sealing, or Both	Percentage of customers installing insulation, air sealing, or both.	No

[5] The LV data includes whether a specific customer was authorized to seek a HEAT loan from a participating lender, but not whether the customer eventually was approved for and secured the loan. Thus, the evaluation team refers to customers as being HEAT loan authorized rather than HEAT loan participants.

[6] In addition to the PAs' long-standing HEAT loan offer, the Massachusetts DOER recently began offering an expanded HEAT loan that covers deeper energy retrofits and multi-unit single-family properties as well as offering grants to remove common pre-weatherization barriers. More information is available online: http://www.masssave.com/residential/expanded-heat-loan

KPI	Name	Description	New in RES 35
6	Proportion of Participants Receiving Air Sealing	Percentage of customers receiving a recommendation for air sealing, as well as the percentage of those customers that have their home sealed.	No
7	Proportion of Participants Receiving Insulation	Percentage of customers receiving a recommendation for insulation, as well as the percentage of those customers that install insulation. Shown for attic, basement, and wall insulation separately and for insulation overall.	No
8	Proportion of Participants Receiving HES-Heating and Water Heating Systems	Percentage of customers receiving a recommendation and installing an HES incentivized heating and water heating systems.	No
9	Lag Time	The distribution of customers by number of days between assessment and installation. Shown for air sealing and insulation.	No
11	Lamp (LED and CFL) Installations	The percentage of customers receiving at least one LED and the average numbers of bulbs installed per home.	Modified
12	Aerator Installations	The percentage of customers receiving at least one aerator and the average numbers of aerators installed per home.	No
13	Showerhead Installations	The percentage of customers receiving at least one showerhead and the average numbers of showerheads installed per home.	No
14	Thermostat Installations	The percentage of customers receiving at least one thermostat and the average numbers of thermostats installed per home. Calculated for both programmable and Wi-Fi thermostats.	Modified
15	Smart Strip Installations	The percentage of customers receiving at least one smart strip and the average numbers of smart strips installed per home.	Yes
16	Cross-Program Participation	The percentage of HES customers also participating in HEHE, Cool Smart, or both.	No
17	HEHE Cross-Program Participation	The distribution of installations across each HEHE measure type by delivery channel.	No
18	COOL SMART Cross-Program Participation by Measure	The distribution of installations across each COOL SMART measure type by delivery channel.	No
19	Square Footage	The distribution of dwellings by square footage.	No
20	Dwelling Age	The distribution of dwellings by age.	No
21	Moderate Income Offer	The number of customers that received enhanced incentives through the moderate income offer, including the percentage that installed insulation, an efficient appliance, or both.	Yes
22	Renter/Landlord Offer	The number of customers that received enhanced incentives through the renter/landlord offer, including the percentage that installed insulation, an efficient appliance, or both.	Yes
23	LV QA/QC	The percentage of customers that received at least one QA/QC visit from an HES LV.	Yes
24	Third-Party QA/QC	The percentage of customers that received at least one QA/QC visit from the PA's third-party QA/QC contractor, CRI.	Yes

Segments

In addition to calculating each KPI at the statewide level, the evaluation team also calculated each KPI for the following customer sub-segments:

- PA
- Delivery Channel (LV/HPC)
- LV (CLEAResult/RISE/CET)
- HEAT Loan (Authorized customers/all other customers)
- Building Type (Single-Family Detached/2-4 Units)
- Ownership Type (Owner-Occupied/Rental)

However, in many instances, the sample sizes for specific segments were too small to produce reliable results. With a few exceptions, the results presented in the memo are statewide, PA-specific, and LV-specific.

Filters

The most common filter excludes customers that had their HEA after July 2016. The team excluded those customers from these KPIs to allow customers at least 6 months after their HEA to install any recommended measures. This filter ensures that these KPIs are not biased due to customers who had not yet had enough time to act on their HEA recommendations.

Data Limitations

As noted previously, the evaluation team had extensive data-centric discussions with the LVs and CRI. Through these discussions, the team determined that it is not possible to report findings for several KPIs.

The team encountered the following data limitations:

- **Lack of Installed Data for Select Recommended Measures:** While the LVs could provide information for all the measures recommended at each HEA, they were unable to provide corresponding installation records for a subset of recommended measures—most notably early retirement heating and water heating systems, clothes washers, and refrigerators. This is because the incentives—and, therefore, the installation records—associated with those measures are processed by Energy Federation, Inc (EFI), not the LVs. The evaluation team is working with EFI to gather this information and anticipates having it in time to include it in the final report. In the meantime, the evaluation team excluded KPI 8 (Proportion of Participants Receiving HES-Heating and Water Heating Systems). The team also removed the estimated savings associated with the measures processed by EFI from KPI 4 (Installed Savings) to ensure the numerator (installed savings) and denominator (recommended savings) are comparable.
- **Inability to Tie LV and CRI Data.** The evaluation team is waiting on the RDMT to add the unique customer identifiers that will allow the team to tie LV and CRI data together. Until the RDMT finishes processing the CRI data, which should happen by the end of October, the team cannot calculate KPI 24 (Third-Party QA/QC).

Other Caveats

The data limitations outlined above prevented the evaluation team from including certain KPIs in this memo entirely. In other instances, the evaluation team identified differences in how LVs tracked data that is important to understand—especially when comparing the LV- and PA-specific findings for certain KPIs.

The team noted subtle differences in how LVs tracked data throughout the findings section, but readers should be attentive to one universal difference. Specifically, the evaluation team determined that the data provided by CET did not reflect all HEA recommendations, unlike CLEAResult and RISE. More specifically, the CET data did not include recommended measures for contracts that were immediately signed when offered at the HEA. The CET data also did not include proposed work for homes where the Energy Specialist identified pre-weatherization barriers. The omission of this subset of recommended measures means that the CET-specific conversion rates are overstated relative to the other two LVs—most notably for KPIs 4, 6, and 7 (Installed Savings, Air Sealing, and Weatherization).

B. Findings

This section outlines findings for 17 of the 22 KPIs shown in Table 2. As noted above, it was not possible to calculate five KPIs due to various data limitations.

For each KPI, the evaluation team offers results three ways: statewide, by LV, and by PA. In some cases, the team included additional segments such as delivery channel if the results were meaningfully different.

The evaluation team also used a standardized format to convey all the relevant background for each KPI, including the following:

- Description
- Purpose
- Calculation Method (i.e., what is in the numerator and what is in the denominator)
- Filters (if relevant)
- Additional Information (i.e., information that readers should consider when assessing the results)

Following this, the evaluation team offers a succinct analysis of the results and, when relevant, a comparison of the current and previous study's results; the team also includes an explanation of when and why the results diverge, if applicable.

KPI 1: HES Initiative Participation

Background

- **Description:** Percentage of customers participating through each delivery channel
- **Purpose:** Understand trends in overall HES participation, as well as participation by delivery channel, over time
- **Calculation Numerator:** Number of customers by delivery channel
- **Calculation Denominator:** Number of total customers

Findings

Per initiative tracking data provided by all three HES LVs, over 220,000 unique customers in Massachusetts had an HEA completed between July 2014 and the end of 2016. More than one-third

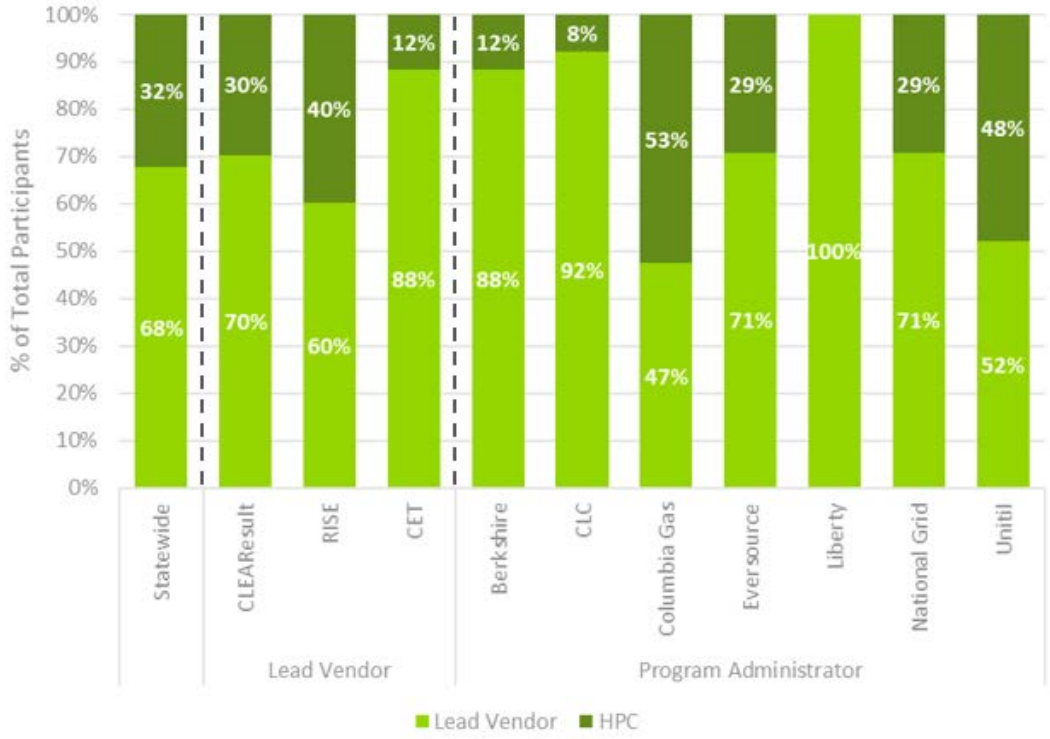
of these households were National Grid customers, followed by Eversource, Columbia Gas, and Cape Light Compact (CLC).

Table 3. KPI 1 – HES Initiative Participation (July 2014-December 2016)

Segment		LV	HPC	Total
PA	Berkshire	2,251	28	**2,279**
	CLC	10,046	842	**10,888**
	Columbia Gas	12,558	14,011	**26,569**
	Eversource	42,822	17,674	**60,496**
	Liberty	1,921	0	**1,921**
	National Grid	85,569	35,360	**120,929**
	Unitil	906	814	**1,720**
LV	CLEAResult	125,902	53,034	**178,936**
	RISE	27,920	15,667	**43,587**
	CET	2,251	28	**2,279**
Statewide		**156,073**	**68,729**	**224,802**

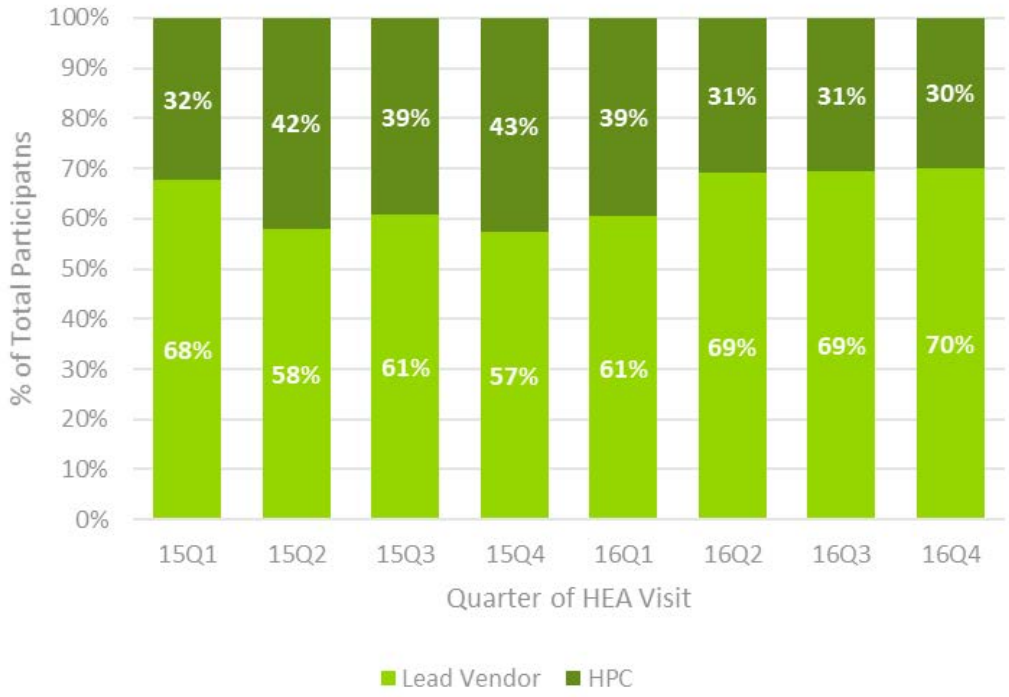
Statewide a little more than two-thirds of these customers received their HEA from an LV. As shown in Figure 1, the balance of LV and HPC customers varied by LV and by PA, often based on the number of HPCs active within a given part of the state. The statewide split between delivery channels (68% LV/32% HPC) is essentially unchanged since the previous study (67% LV/33% HPC).

Figure 1. KPI 1 – HES Initiative Participation



When viewing the results by quarter (Figure 2), it is apparent that fewer customers are receiving their HEAs from HPCs in 2016 than in 2015.

Figure 2. Delivery Channel Participation by Quarter



KPI 2: HEAT Loan Participation

Background

- **Description:** Percentage of customers authorized by their LV to seek a PA HEAT loan from a participating lender
- **Purpose:** Understand the rate at which customers installing major measures used a HEAT loan
- **Calculation:**
  - Numerator: Number of authorized HEAT loans
  - Denominator 1: Number of total customers (Figure 3)
  - Denominator 2: Number of customers that installed a major measure (Figure 4)
- **Additional Information:** Both the PA HEAT loans are administered through a customer's electricity provider

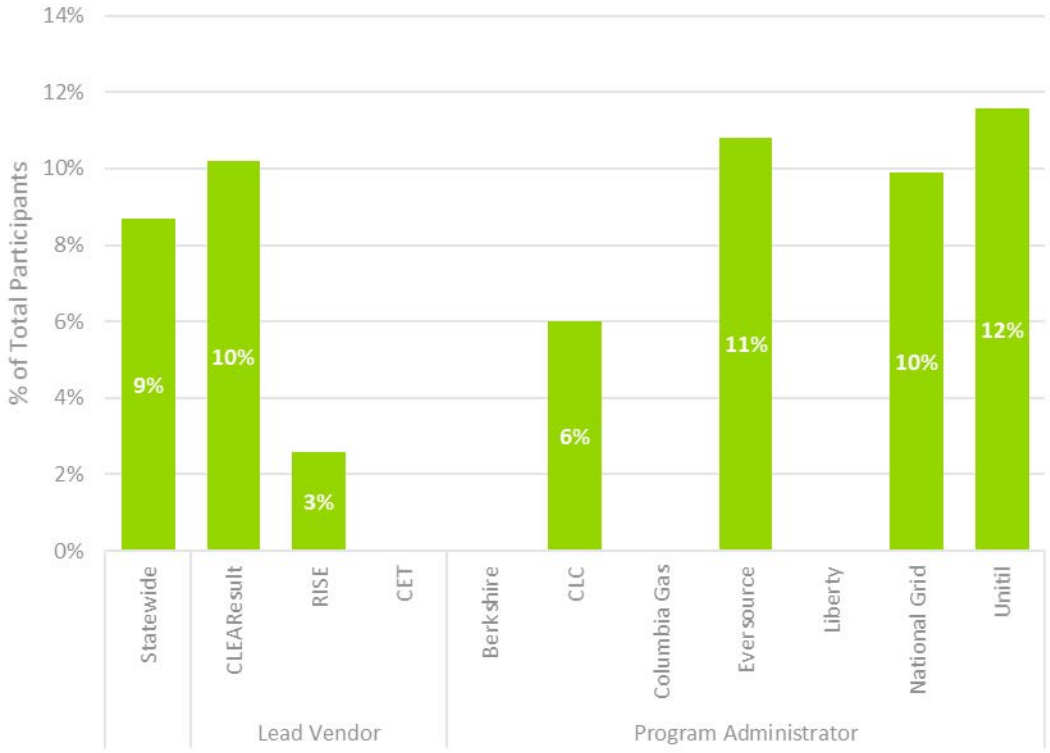
Findings

As shown in Figure 3, 8% of HES customers received authorization from their LV to seek a PA HEAT loan for financial assistance.

The overall rate of authorization is lower than that found through the previous KPI study (9%). However, the decline in loan authorization may be a function of incomplete data, an issue the evaluation team continues to explore with the LVs, not a decline in actual HEAT loan authorization rates. For example, the data provided to the evaluation team by the LV indicates that 7,233 customers in 2016—statewide—were authorized to seek one or both types of financing. This value is almost 20% less than the corresponding value on MassSaveData.com (8,767). In fact, if the

evaluation team recalculates KPI 2 using the MassSaveData.com authorization count as the numerator, the result is 11.5%, an increase from the previous study.

Figure 3. KPI 2 – PA HEAT Loan Authorization*

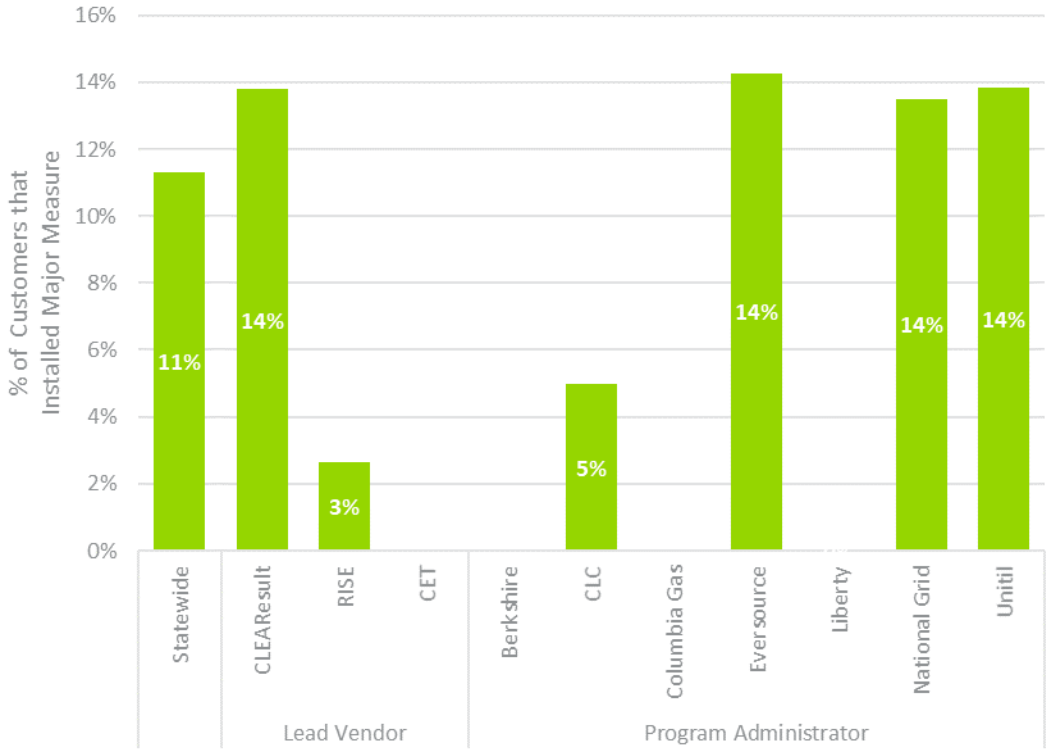


*KPI 2 is not relevant for the natural gas only PAs (Berkshire Gas, Columbia Gas, and Liberty) as the HEAT loan is delivered through customer's electric PA. Since CET implements HES on behalf of only Berkshire Gas, this means that KPI is not relevant for CET either.

Using the data currently available, the evaluation team found a meaningful difference in PA HEAT loan authorization rates between delivery channels. Specifically, customers receiving their HEA from an LV were twice (10.4%) as likely to have been authorized for the PA HEAT loan as customers served by an HPC (4.9%). The disparity by delivery channel is not new; the previous KPI study found nearly identical delivery channel-specific findings: 10% authorization rates for LV customers and 5% for HPC customers.

When the evaluation team changed the KPI's denominator from all HES customers to HES participants (i.e., HES customers that installed a major recommended measure), the rate of HEAT loan authorization increased to 11%. Similar to Figure 3, this value is lower than the previous KPI assessment (14%).

Figure 4. KPI 2 – HEAT Loan Authorization
(HES Participants: Customers that Installed Major Measure)



*KPI 2 is not relevant for the natural gas only PAs (Berkshire Gas, Columbia Gas, and Liberty) as the HEAT loan is delivered through customer's electric PA. Since CET implements HES on behalf of only Berkshire Gas, this means that KPI is not relevant for CET either.

KPI 3: Participation Type

Background

- **Description:** Percentage of customers installing only ISMs, major measures, or no measures
- **Purpose:** Understand the rate at which HES customers receive various initiative measures and act on HEA recommendations
- **Calculation:**
  - Numerators: Customers with ISMs only, with major measures, or audit only
  - Denominator: Number of customers
- **Filters:** Exclude last 6 months of participation (July 2016-December 2016)

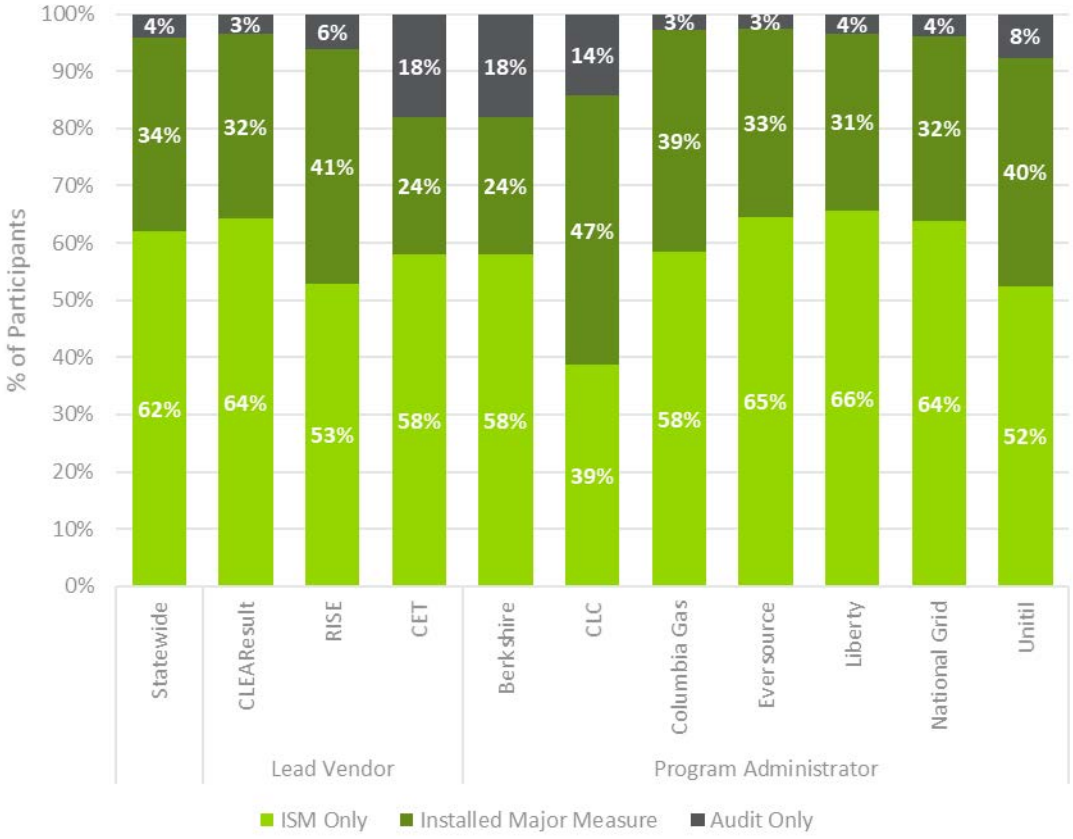
Findings

Statewide slightly more than one-third of all HES customers (34%) installed an HES incentivized major measure. This rate is slightly higher than, but generally similar to, the rate (32%) determined through the previous KPI study.

The evaluation team observed higher major measure participation rates for CLC and, relatedly, for RISE. The statewide rate largely mirrors that of National Grid and Eversource customers given their high participation counts.

The team did not find a material difference in participation rates by delivery channel. It did, however, observe a difference by the ownership type segment. Not surprisingly, the team found that owner-occupied households installed a major measure 34.5% of the time, while rental properties installed major measures only 23.5% of the time.

Figure 5. KPI 3 – Participation Type



KPI 4: Installed Savings

Background

- **Description:** Percentage of recommended savings that are installed
- **Purpose:** Understand what percentage of the total recommended savings identified during HEAs PAs captured
- **Calculation:**
  - Numerator: Total installed MBtu savings, calculated as part of the HEA
  - Denominator 1: Total recommended MBtu savings, calculated as part of the HEA, including ISMs and major measures (Figure 6 – light green)
  - Denominator 2: Total recommended MBtu savings, calculated as part of the HEA, for major measures only (Figure 6 – dark green)
- **Filters:** Exclude last 6 months of participation (July 2016-December 2016)

- **Caveats:**
  - *CET:* Rate is biased (high) due to the process by which recommended measures were recorded; refer to the Data Limitations section for further detail
  - *CLEAResult and RISE:* Excluded equipment measures for which installation data resides at EFI

Findings
Energy Specialists identify a range of efficiency opportunities during an HEA. Some of these opportunities can be captured right away through ISMs, while others require the customer to act on larger HEA recommendations at a later time.

Consequently, the evaluation team assessed the percentage of total identified or recommended savings captured by HES customers using two perspectives. The first (the light green bars in Figure 6) reflects the portion of all savings opportunities—ISMs and recommended measures alike—captured. The second (the dark green bars) focuses on the portion of savings associated with recommended measures that HES customers captured.

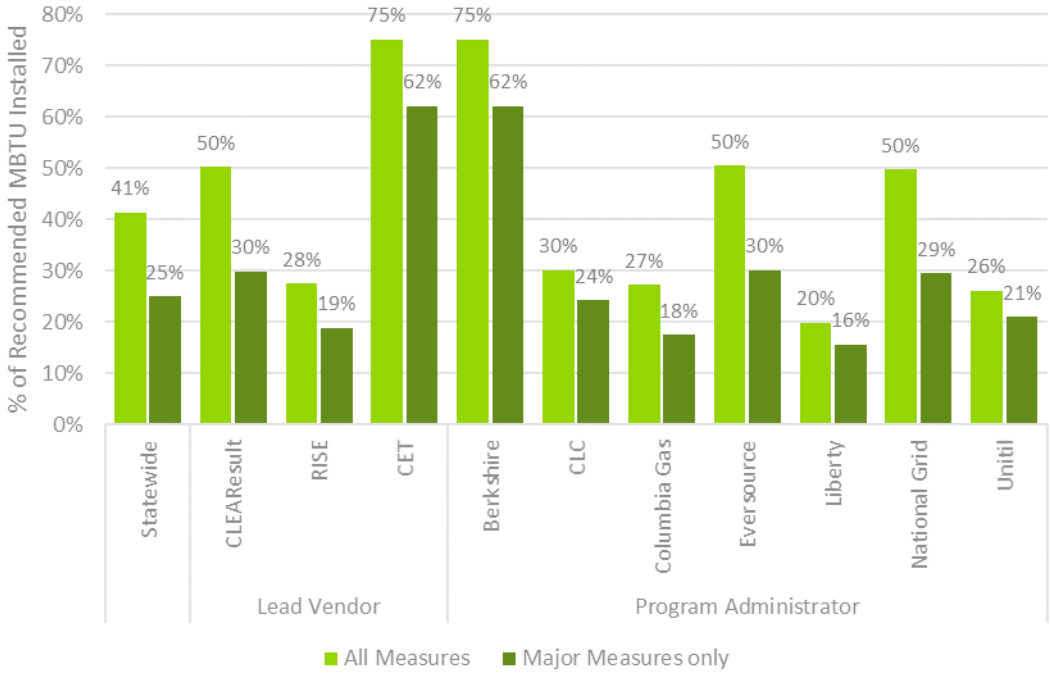
The evaluation team found the percentage of captured recommended measure savings was lower (25%) for recommended-only measures than when ISMs are included (41%). In the latter scenario, the recommended and captured savings associated with ISMs increases both the KPI's numerator and denominator (as the realization rate for ISMs is 100%), which results in a higher overall percentage of captured savings.

The team found a higher percentage of installed savings for CLEAResult—and, therefore, Eversource and National Grid—than for RISE and the PAs working with RISE. However, as shown under KPIs 5, 6, and 7, the lower rate of installed savings appears to be a function of RISE more frequently recommending air sealing and insulation as compared to CLEAResult. Because these major measures have lower installation rates, the higher percentages of air sealing and insulation recommendations drives down the overall percentage of installed savings relative to recommended savings.

As noted in the Other Caveats section above, the percentage of installed savings associated with CET and Berkshire are fundamentally different than the other LVs and PAs and cannot be directly compared.

At the statewide level, the evaluation team found no difference in installed savings by delivery channel (41% and 42% for LVs and HPCs, respectively). Related to KPI 3, the team again found a higher percentage of captured savings at known owner-occupied households than at rental properties (34%).

Figure 6. KPI 4 – Installed Savings (Percentage of Recommended MBtu)



KPI 5: Weatherization Installations

Background

- **Description:** Percentage of customers installing insulation, air sealing, or both
- **Purpose:** Understand the rate at which customers are installing the two core HES-recommended measures
- **Calculations:**
  - Numerator: Number of customers that installed insulation, air sealing, or both
  - Denominator: Total customers that had HEAs (not limited to only customers that had a recommendation for one or both measures – see KPIs 6 and 7 for that information)
- **Filters:** Excluded last 6 months of participation (July 2016-December 2016)

Findings

As shown in Figure 7, statewide one-third of all customers that completed an HEA installed air sealing, insulation, or both. Not surprisingly, most of these customers installed both complementary weatherization measures.

From the LV- and PA-specific perspective, the team found that RISE and, relatedly, CLC had higher rates. As shown below as part of KPIs 5 and 6, these higher installation rates are correlated with the higher recommendation rates for both measures. As with previous KPIs, reviewers should not directly compare CET and Berkshire to the other LVs and PAs due to differences in the provided data.

Figure 7. KPI 5 – Percentage of Customers that Installed Air Sealing, Insulation, or Both

KPIs 6-7: Air Sealing and Insulation Recommendations and Installs

Background

- **Description:** Percentage of customers receiving a recommendation for air sealing (KPI 6) and insulation (KPI 7), as well as the percentage of those customers that have their home sealed
- **Purpose:** Understand the rate at which Energy Specialists are recommending and getting customers to install the two more important HES measures
- **Calculations:**
    - Installation and recommendation rate (Figure 8, Figure 10)
        - Numerator: Number of customers that
            - Installed weatherization measure
            - Were recommended but did not install the weatherization measure
        - Denominator: Total customers

Installation rate (Figure 9, Regarding installations percentages (shown in Figure 11), the team did not find any difference by LV. While some PAs exhibited higher or low rates, notably CLC (53%) and Liberty (31%), most PAs had similar installation rates between 36-44%. The team also found that LVs were slightly more successful than HPCs (33% compared to 29%) getting customers to install insulation.

    - Figure 11)
        - Numerator: Number of participants that installed the weatherization measure

    - Denominator: Number of customers that were recommended the weatherization measure
- **Filters:** Excluded last 6 months of participation (July 2016-December 2016)

Findings

With regard to KPI 6, the evaluation team found that 66% of customers statewide that had an HEA were recommended to install air sealing (Figure 8). This represents a meaningful increase from the previous KPI study, which found 41% of HEA customers were recommended the measure.
Of the customers receiving an air sealing recommendation, the team found that 46% of those customers went on to install the measure (Figure 9). This again represents an increase in the installation rate: the previous study found – statewide – that only 21% of customer receiving an air sealing recommendation went on to install the measure.

As mentioned previously, RISE recommended air sealing more often than the statewide average (86% of the time). Despite the higher recommendation rate, RISE achieved a similar rate of success getting customers to install air sealing (45%) as CLEAResult (46%). These two factors—more frequent recommendations and similar conversion rates—are responsible for the greater proportion of RISE customers installing air sealing (as determined by KPI 5).

Figure 8. KPI 6 – Air Sealing Installation and Recommendation Rates (Percentage of Customers)

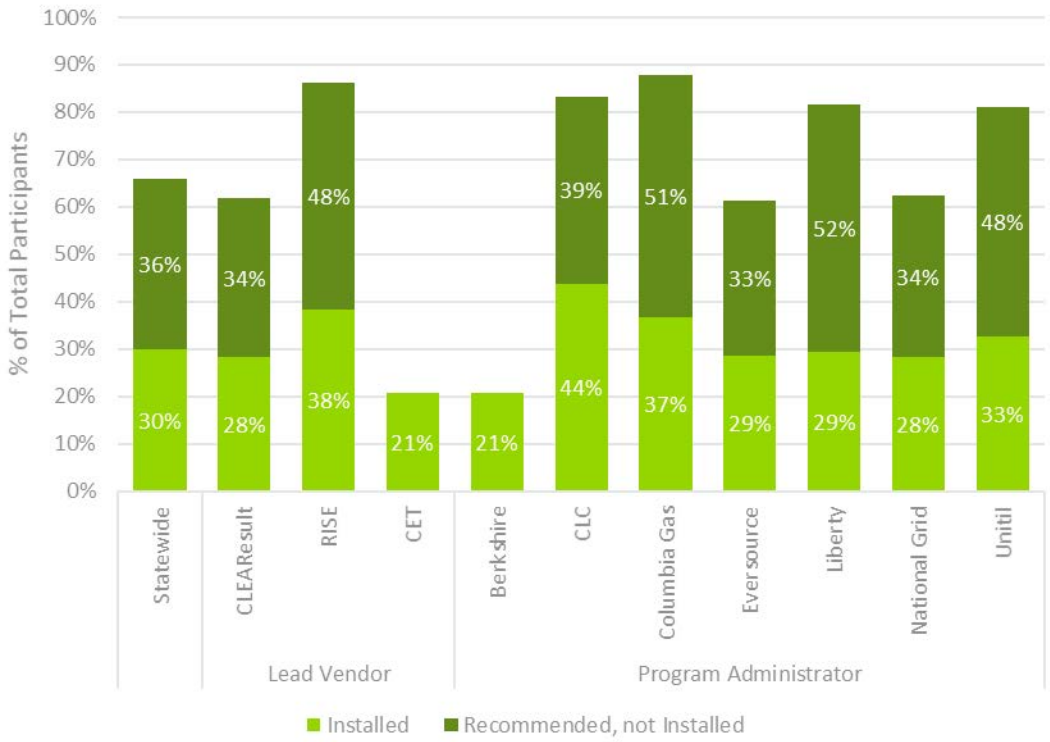
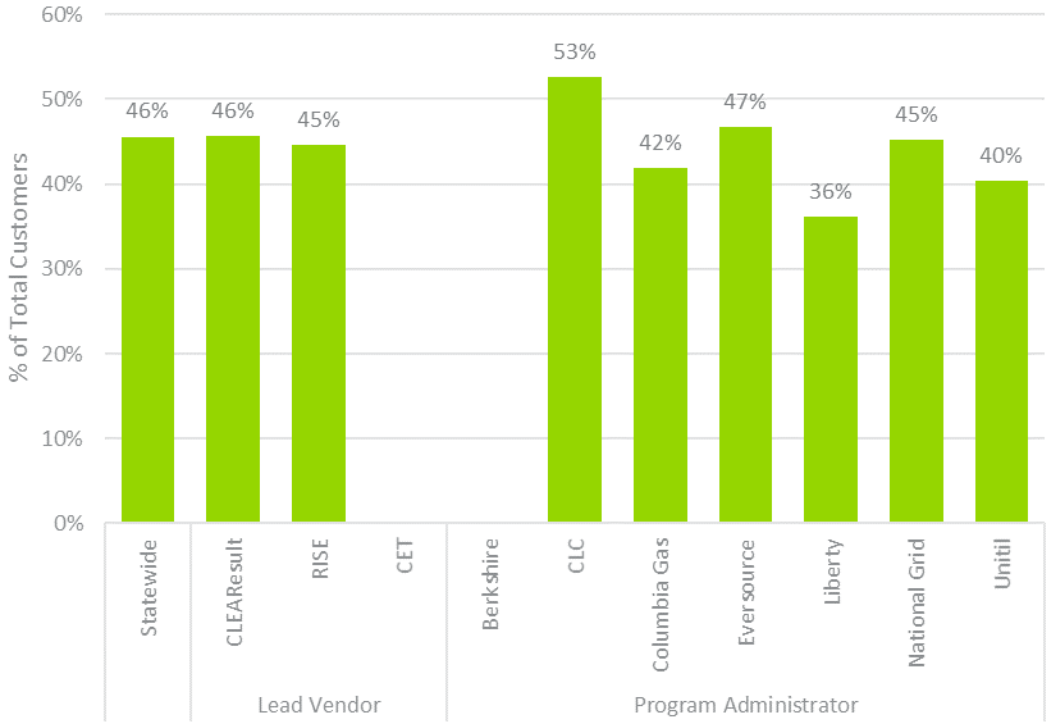


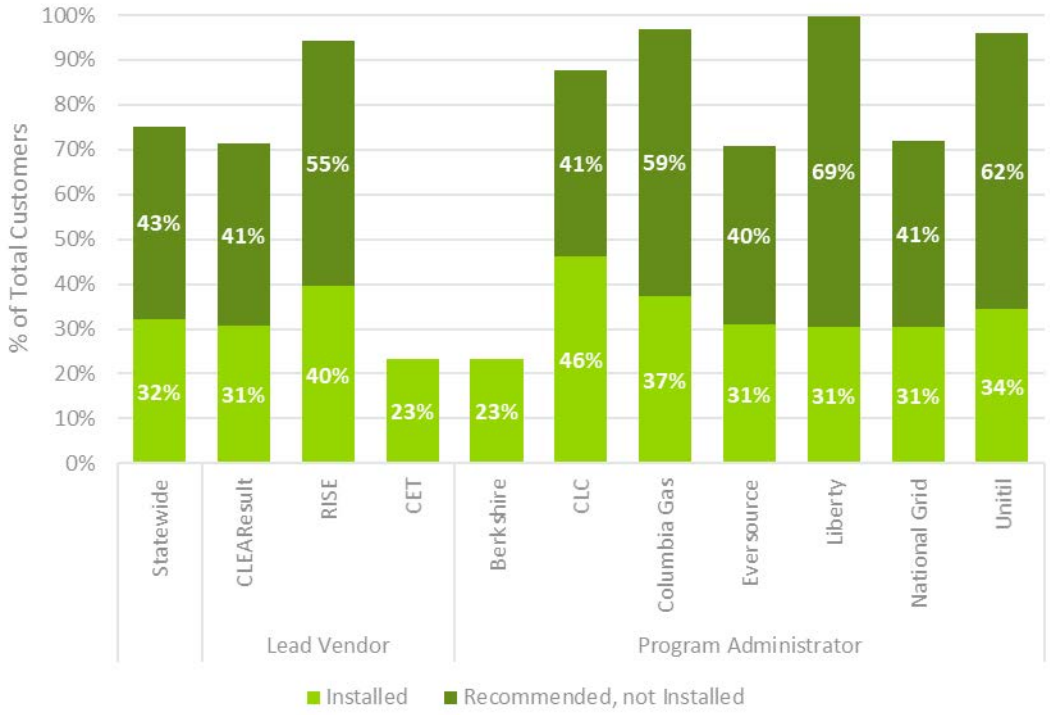
Figure 9. KPI 6 – Air Sealing Installation Rate (Percentage of Recommended)



The team observed similar trends (i.e., RISE recommending more frequently) for insulation (KPI 7) relative to air sealing (KPI 6).

As evident below in Figure 10, 75% of all customers that had an HEA in the state were recommended one or more insulation measures. The evaluation team did not observe differences in insulation recommendation rates by delivery channel, as both LVs and HPCs recommended air sealing and/or insulation 75% of the time. The team also did not see any material differences in recommendation rates between delivery channels for the three sub-categories of insulation (wall, floor, attic).

Figure 10. KPI 7 – Insulation Installation and Recommendation Rates (Percentage of Customers)



Regarding installations percentages (shown in Figure 11), the team did not find any difference by LV. While some PAs exhibited higher or low rates, notably CLC (53%) and Liberty (31%), most PAs had similar installation rates between 36-44%. The team also found that LVs were slightly more successful than HPCs (33% compared to 29%) getting customers to install insulation.

Figure 11. KPI 7 – Insulation Installation Rates (Percentage of Recommended)

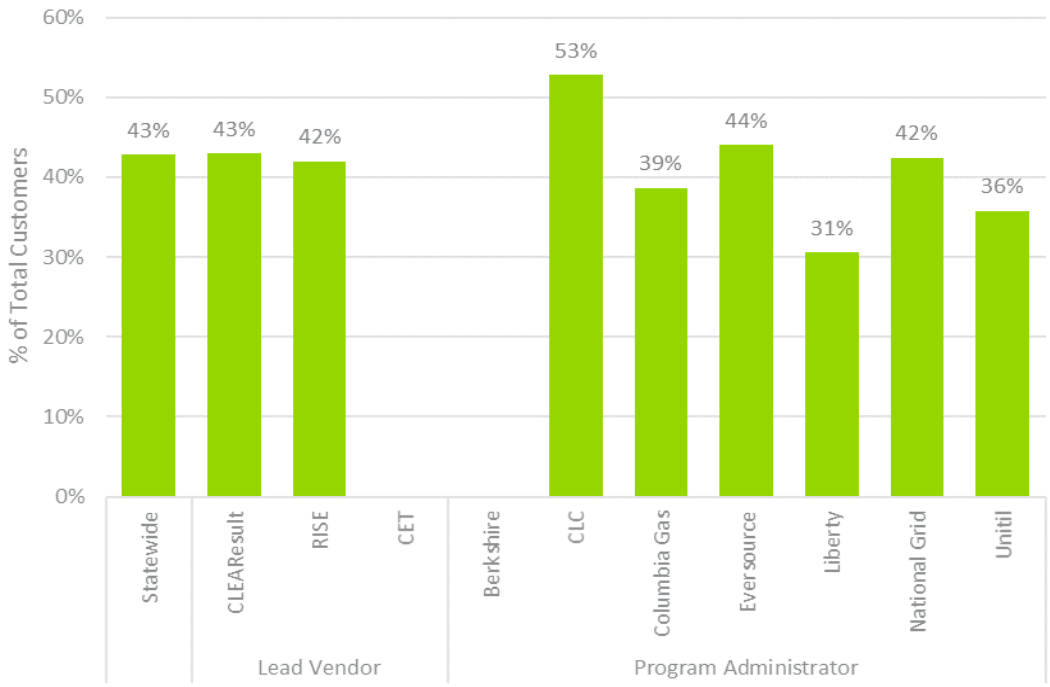


Table 4 provides a comparison of attic, basement, and wall insulation recommendation and installation rates between the current and previous KPI assessment. As evident in the table, LVs and HPCs alike are recommending insulation considerably more often than in the past (see "Recommendation Rates"). The higher recommendations rates have resulted in a lower percentage of recommended customers installing the measures ("Installation Rate (When Recommended") but an overall increase in the total percentage of customers going through HES installing attic and basement insulation. Unlike the other two types of insulation, HES customers are not installing wall insulation at higher rates than the previous KPI study. The exact reason for this is unknown, but may be related to the mature initiative serving more customers that need to mitigate knob and tube wiring than in the past.

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Table 4. KPI 7: Comparison of Insulation Recommendation and Installation Rates

	Recommendation Rate			Installation Rate (When Recommended)			Installation Rate (All Customers)		
Delivery Channel	**2012-June 2014**	**July 2014-2016**	**Difference**	**2012-June 2014**	**July 2014-2016**	**Difference**	**2012-June 2014**	**July 2014-2016**	**Difference**
Attic Insulation									
Statewide	35%	65%	30%	50%	43%	-7%	18%	28%	10%
LV	32%	65%	33%	56%	45%	-11%	18%	29%	11%
HPC	42%	67%	25%	40%	39%	-1%	17%	26%	9%
Basement Insulation									
Statewide	9%	28%	19%	47%	35%	-12%	4%	10%	6%
LV	7%	27%	20%	55%	37%	-18%	4%	10%	6%
HPC	12%	29%	17%	36%	32%	-4%	4%	9%	5%
Wall Insulation									
Statewide	22%	35%	13%	44%	27%	-17%	10%	3%	-7%
LV	17%	36%	19%	52%	29%	-23%	9%	11%	2%
HPC	34%	33%	-1%	35%	20%	-15%	12%	7%	-5%

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KPI 9: Lag Time

Background

- **Description:** The distribution of customers by number of days between their HEA and the installation of air sealing and insulation
- **Purpose:** Understand how long, on average, it takes customers to install a major measure following their HEA
- **Calculation:** Months between HEA date and installation date
- **Filter:** Includes only customers that installed air sealing and/or insulation following their HEA
- **Caveat:** Due to incomplete information regarding non-air sealing and insulation installation data, KPI reflects the timing of only those two HES measures

Findings

On average, HES participants installed air sealing and/or insulation approximately 3.4 months after their HEA. After that point, participation rates decline month after month. The team's analysis found that 89% of all installations occurred within 6 months of the HEA.

The evaluation team found only moderate differences in lag time between the various analysis segments. For example, HPC customers, on average, installed air sealing and/or insulation somewhat sooner than LV customers (3 months versus 4 months, respectively). This finding is consistent with the previous KPI study. This perhaps reflects the fact that HPCs themselves can schedule and install the insulation, while LV customers need to work separately with an independent installation contractor (IIC). Similarly, air sealing and/or insulation installations at rental properties, on average, occurred a month later than at owner-occupied homes. This may reflect the additional coordination and communication necessary when serving rental properties. Lastly, the team found that customers authorized for the HEAT loan installed air sealing and/or insulation, on average, 2 months later than those that did not seek PA and/or DOER financing assistance. The team believes the additional time for HEAT loan-authorized customers reflects the time necessary to seek and secure financing from a participating lender.

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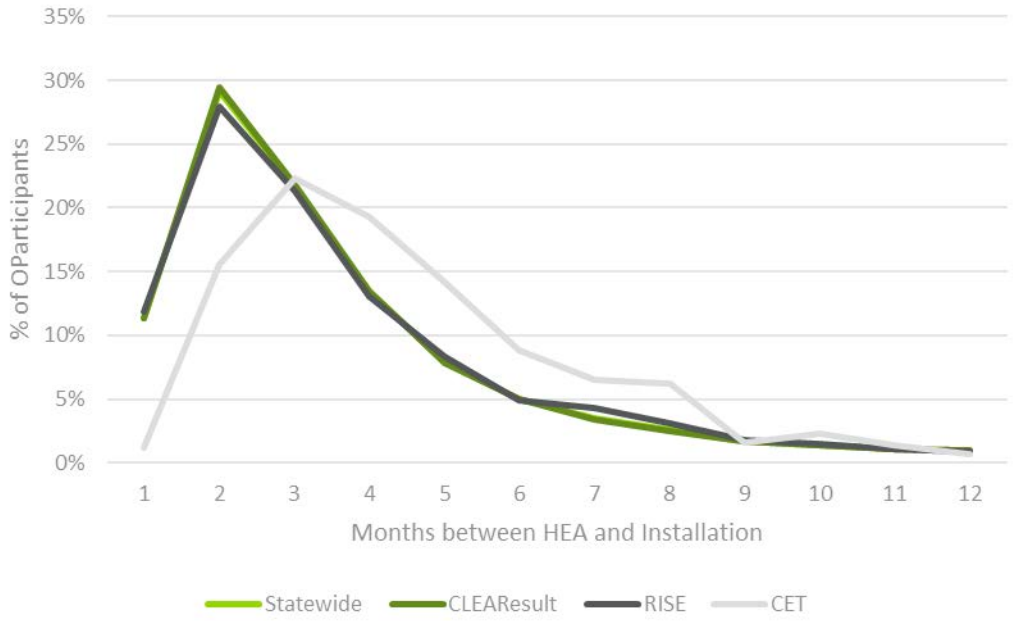
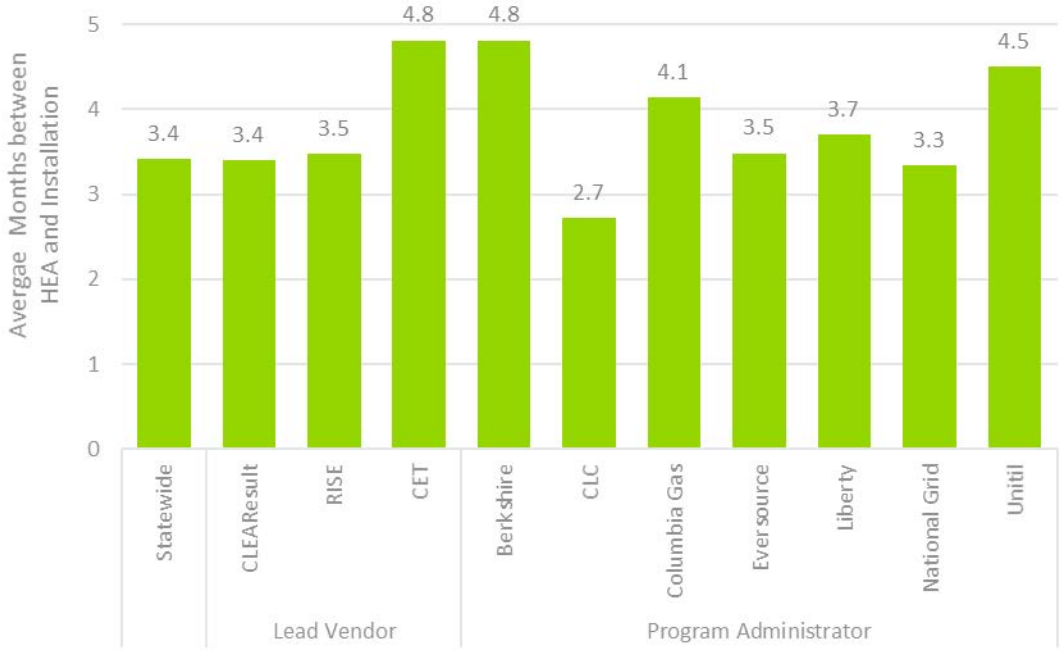
Figure 12. KPI 9 – Months Between HEA and Air Sealing and/or Insulation Installation



As shown in Figure 13, Berkshire Gas (4.8 months) and Unitil (4.5 months) customers took a little longer to act on their HEA recommendations. This is likely a function of the limited number staff working on HES relative to the larger PAs and LVs. In addition, the difference could also be a function of small sample sizes as Berkshire Gas, as well as Unitil, serve far fewer customers than their larger PA counterparts. The team found that CLC customers took the least amount of time—2.7 months, on average—to act on their air sealing and/or insulation recommendations.

Figure 13. KPI 9 – Average Number of Months Between HEA and Air Sealing and/or Insulation Installation



KPIs 11-15: ISMs

This subsection presents KPIs 11 through 15, which represent five different ISMs:

- KPI 11: Lamp (LED and CFL) installations
- KPI 12: Aerator installations
- KPI 13: Showerhead installations
- KPI 14: Thermostat installations
- KPI 15: Smart strip installations[7]

Background

- **Description:** The percentage of customers receiving at least one ISM (lamp, aerator, showerhead, thermostat, or smart strip) and the average number of each ISM installed per home
- **Purpose:** Understand the extent to which each ISM is installed and whether there are meaningful differences in installation practices between segments, such as delivery channel and ownership type
- **Calculation:**
    - Percentage of customers receiving at least one ISM (Figure 14-Figure 18, left y-axis)
        - Numerator: Total number of customers that had each ISM installed during their HEA
        - Denominator: Total number of customers receiving an HEA

[7] For simplicity and consistency, the team uses the word "installations" with regard to smart strips. In practice, however, smart strips are not installed during the HEA; LVs and HPCs leave them behind for customers to install a later time. It is important to note that some percentage of the left behind smart strips are never installed. (The impending RES 35 customer survey will estimate smart strip installation rates.)

- Average number of each ISM installed (Figure 14-Figure 18, right y-axis)
  - Numerator: Total number of installed ISMs
  - Denominator: Number of customers that had each ISM installed during their HEA

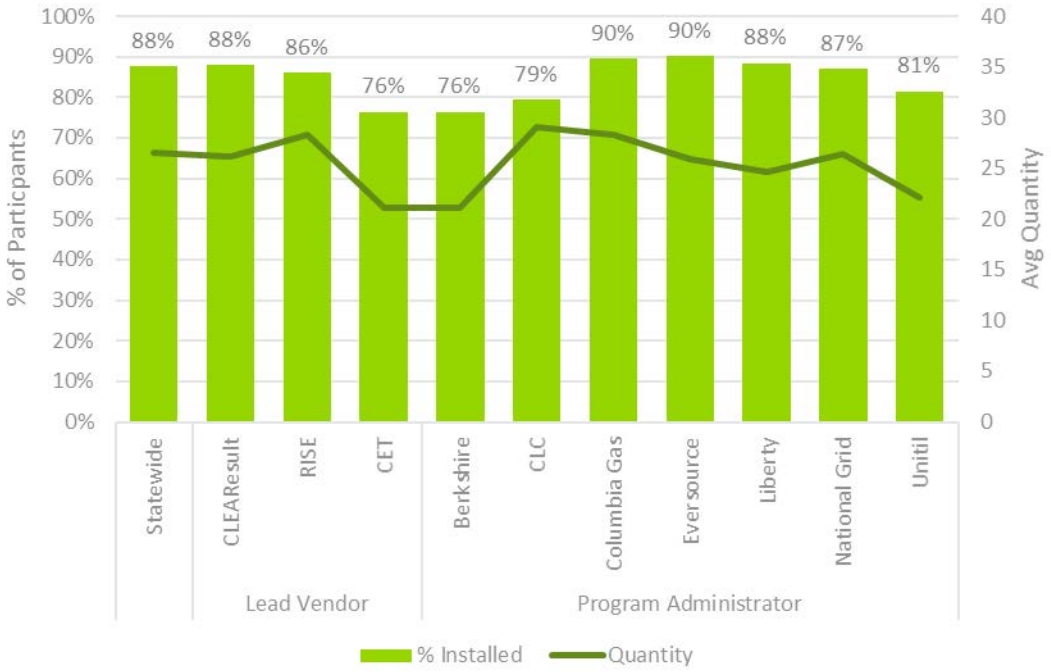
Findings

Statewide 88% of all HES customers had at least one lighting ISM directly installed during their HEA. This represents an increase from the previous KPI study, which found 76% of customers received at least one lighting measure. The difference could reflect a greater emphasis by Energy Specialists and HPC on capturing direct install lighting savings, the fact that LEDs, which HES installs now, are more popular than CFLs (installed previously), or both.

The proportion of customers receiving a lighting ISM as well as the average number of lamps installed (27 lamps) was relatively consistent across LVs and PAs. The exception, as shown below in Figure 14, is CET, where the evaluation team found a lower rate of installation and average number of lamps installed.

The average number of installed lamps (27 lamps) between July 2014 and the end of 2016 is meaningfully higher than the previous KPI study (19 lamps). Again, this increase could reflect changes in the initiative priorities, customers perception of LEDs, or both.

Figure 14. KPI 11 – Percentage of Customers Receiving Lighting ISM

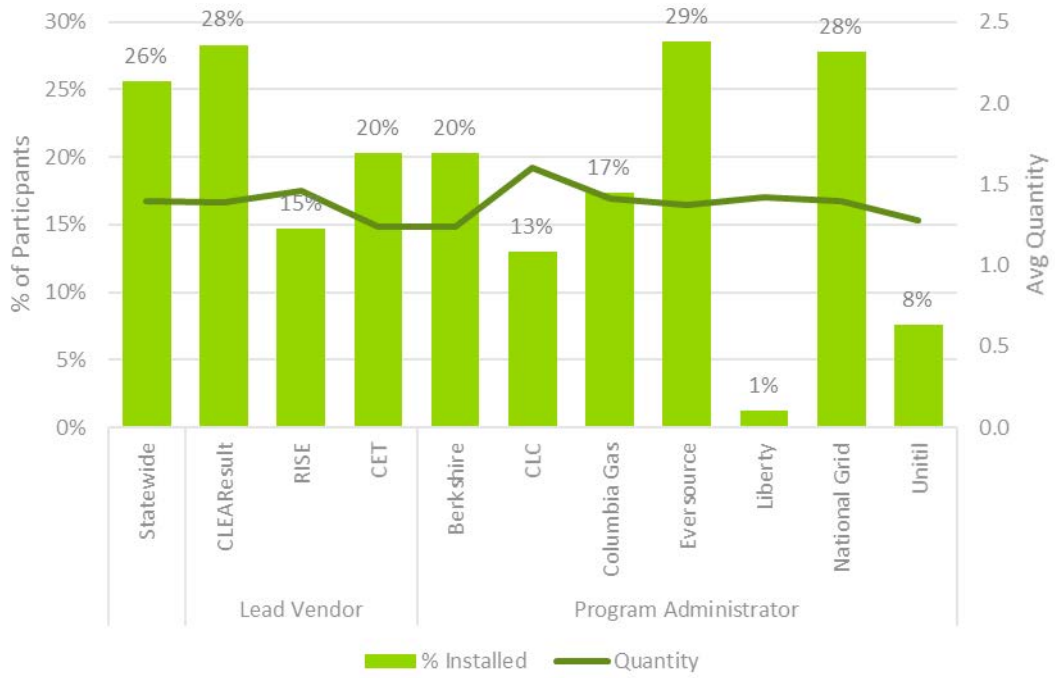


The team found greater variability for faucet aerators, as CLEAResult and CET (and the PAs they serve) installed the ISM in approximately 20% of homes, while RISE rarely installed them. However, statewide, the faucet aerator installation rate was higher than the previous study (13%).

Figure 15. KPI 12 – Percentage of Customers Receiving Faucet Aerator ISM

Regarding showerheads, the team again found that CLEAResult and CET installed the hot water ISM more often than RISE, although the disparity is far less pronounced. Similar to showerheads, the previous KPI study found fewer customers were receiving showerheads (19%) than the customers in this study that had their HEA more recently.

Figure 16. KPI 13 – Percentage of Customers Receiving Showerhead ISM

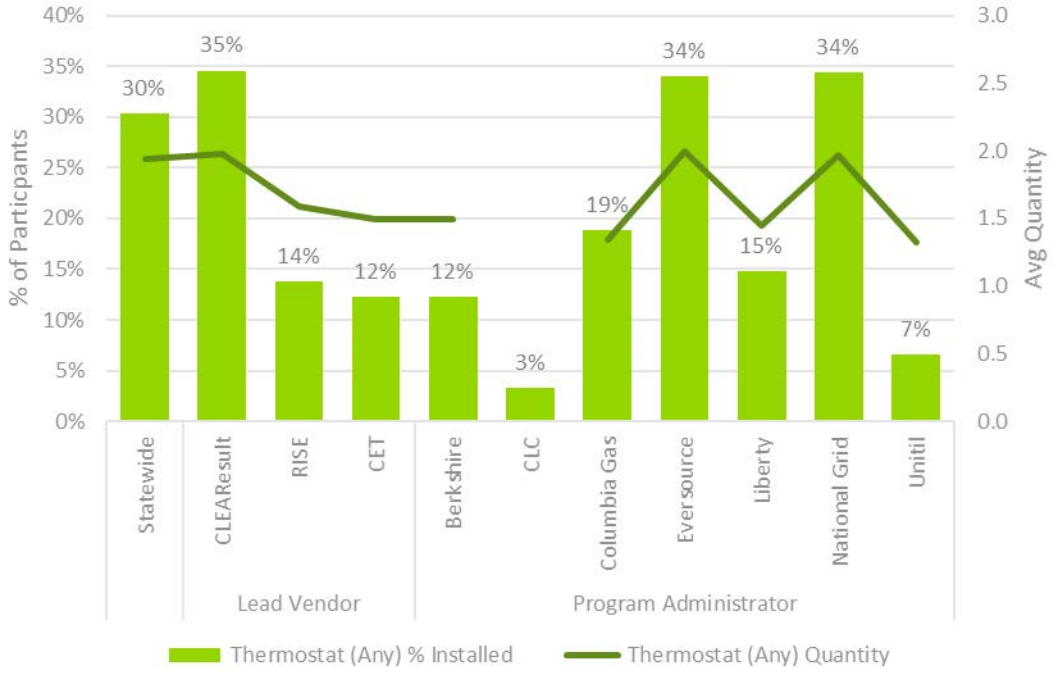


Statewide almost one-third of customers received a programmable and/or Wi-Fi thermostat. This is more than twice as many customers as found in the previous KPI study (15%).

As seen in Figure 17, CLEAResult installed and/or left behind thermostats more frequently than the other two LVs. They also averaged two thermostats per home receiving the ISM, whereas the other LVs and PAs were closer to one per home.

For KPI 14, the evaluation team excluded CLC from the average number of installed thermostats. The team observed that the average number of thermostat installations for CLC did not align with the other PAs due to a large number of dwellings with 10 or more thermostats recorded in the program tracking data.

Figure 17. KPI 14 – Percentage of Customers Receiving Thermostat ISM



Statewide almost four out of five HES customers received at least one smart strip. On average, Energy Specialists left behind (per HES guidelines) 1.5 smart strips with these customers. The team observed relatively low variability across LV and PAs, although CET—and, consequently, Berkshire Gas—had lower installation rates than the rest of the state. Smart strips were not offered at the time of the previous KPI study so it is not possible to assess change over time.

Figure 18. KPI 15 – Percentage of Customers Receiving Smart Strip ISM

The evaluation team assessed ISMs by delivery channel and found similar installation rates for lighting, aerators, and smart strips. However, the team found higher thermostats installation rates for HPCs than LVs (35% versus 28%, roughly 20% difference). The same was true for showerheads: 29% for HPCs compared to 24% for LVs.

The team also determined that customers in owner-occupied homes received, on average, 60% more lighting ISMs than renter-occupied homes (27 compared to 17). Part of this disparity is because the average owner-occupied home is 40% larger (~1,900 square feet) than the average renter-occupied home (~1,350 square feet).

Conversely, the evaluation team found that a higher percentage of renters (31%) received aerators than home owners (19%). There could be several drivers of this difference, including great opportunity in rental properties (i.e., fewer specialty fixtures). Renters also more often received showerheads and thermostats, although the disparity was not as great as with aerators.

KPIs 16-18: Cross-Participation in Residential Heating and Cooling Program

Background

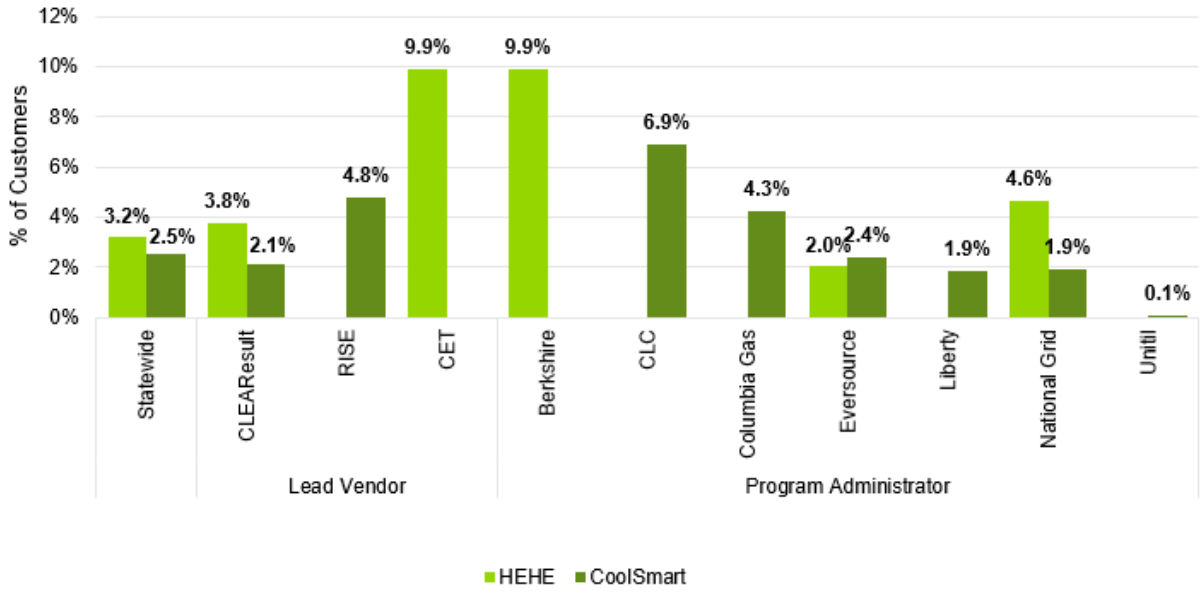
- **Description:** Percentage of customers that also installed a measure through the PAs' complementary Residential Heating and Cooling program
- **Purpose:** Understand the rate at which HES customer are comphrensively improving the efficiency of their homes beyond the measure incentivized through HES
- **Calculations:**
    - Numerator: Number of HES customers that received an incentive through the Residential Heating and Cooling program

  - Denominator: Total HES customers
- **Filters:** Excluded last 6 months of participation (July 2016-December 2016)

Findings
Statewide, the team determined that 5.7% of HES customers are cross-participants. This represents a modest increase from the previous KPI analysis result (5.3%), although the two values are unlikely to be statistically different.

Customers served by HPCs are also less likely to participate in the PAs' Residential Heating & Cooling Equipment initiative. The team's KPI analysis found—again, similar to the findings of the previous KPI study—a meaningful lower rate of cross-participation for HPC customers (3.9%) than customers assessed by energy specialists (6.5%). This may be a function of the fact that many HPCs are former IICs and more comfortable with insulation measures than with heating and cooling equipment. This relates to the finding immediately above; if customers served by HPCs are less likely to cross-participate then it follows that they would also be less likely to seek authorization for the HEAT loan since the out-of-pocket cost of insulation is much lower than heating and cooling equipment, even after accounting for PA incentives.

Figure 19. KPI 16, 17, 18 – Cross Participation



KPI 19-20: Dwelling Characteristics

This section presents KPIs 19 and 20, which represent home characteristics.

- KPI 19: Dwelling size, in square feet
- KPI 20: Dwelling age, in years

Background

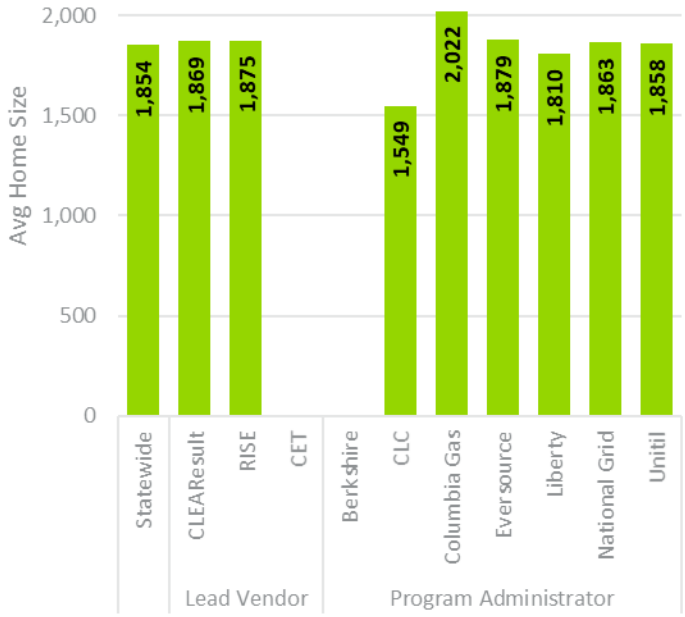
- **Description:** Distribution of dwelling size and age
- **Purpose:** Understand whether there are meaningful differences in the profile of homes served through HES by various segments, as building characteristics can be highly correlated with efficiency opportunities
- **Calculation:**
  - Average dwelling size, all participants (KPI 19)
  - Average dwelling age, all participants (KPI 20)

Findings

Statewide the average home receiving an HEA in Massachusetts is 1,854 square feet in size and 65 years old, meaning, on average, it was built around 1950.

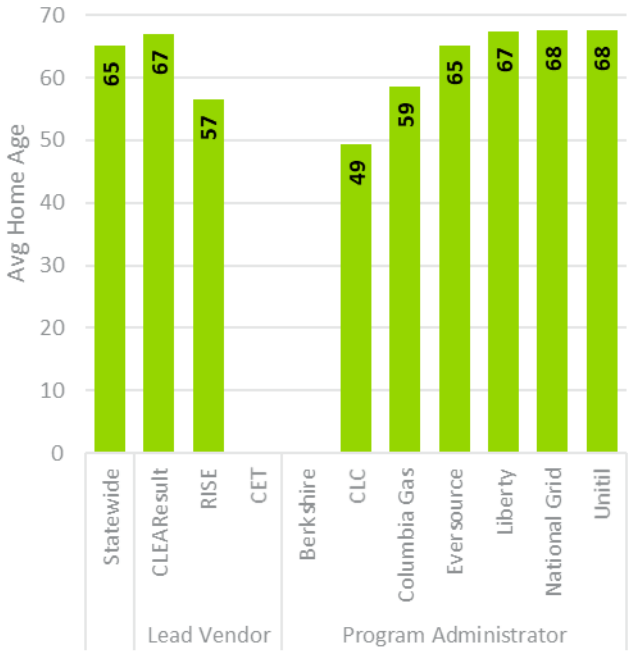
Differences by PA were relatively minimal, though the average home size for CLC (1,549) and Columbia Gas (2,022) were a noticeable deviation from the statewide average. CET was unable to readily provide home size data for Berkshire Gas customers.

Figure 20. KPI 19 – Average Dwelling Size (Square Feet)



Regarding average home age, CLC again differed from the statewide average: CLC homes averaged 49 years in age, while four of the other five PAs averaged 65 years or more in age. Again, CET was unable to readily provide home age data for Berkshire Gas customers.

Figure 21. KPI 20 – Average Dwelling Age (Years)



KPIs 21-22 New Offer Participation

Background

- **Description:** The number of customers that received enhanced incentives through the moderate income or the renter/landlord offer
- **Purpose:** Understand early uptake in the offers added in April 2016
- **Calculation:** Number of participants in moderate income program (KPI 21) and number of participants in renter-landlord program (KPI 22)

Findings

Because the new offers did not launch until the tail end of the July 2014-2016 KPI analysis period, the evaluation team could not complete a robust analysis of either offer. For example, the team did not assess participation by delivery channel given the small overall participation levels (Table 5).

As shown in Table 5, tracking data provided by the LVs collectively allowed the evaluation team to identify 207 customers that received the enhanced moderate income offer during the last 8 months of 2016. More than half of these were CLC customers, which is unsurprising because CLC offered the moderate income offer prior to it becoming part of the statewide initiative. As a result, CLC and its implementer RISE could more rapidly identify and income-qualify moderate income customers on the Cape.

Regarding participation in the new renter/landlord offer (KPI 22), the evaluation team identified 140 customers statewide, using detailed criteria as identified by data stewards at CLEAResult and RISE. (CET was unable to provide an indicator of renter/landlord new offer participation at this time).

Table 5. KPI 21 – Number of Moderate Income Participants (April-December 2016)

Segment		Total
PA	Berkshire	3
	CLC	112
	Columbia Gas	6
	Eversource	5
	Liberty	2
	National Grid	79
	Unitil	0
LV	CLEAResult	16
	RISE	188
	CET	3
Statewide		**207**

KPI 23: LV QA/QC Visits

Background

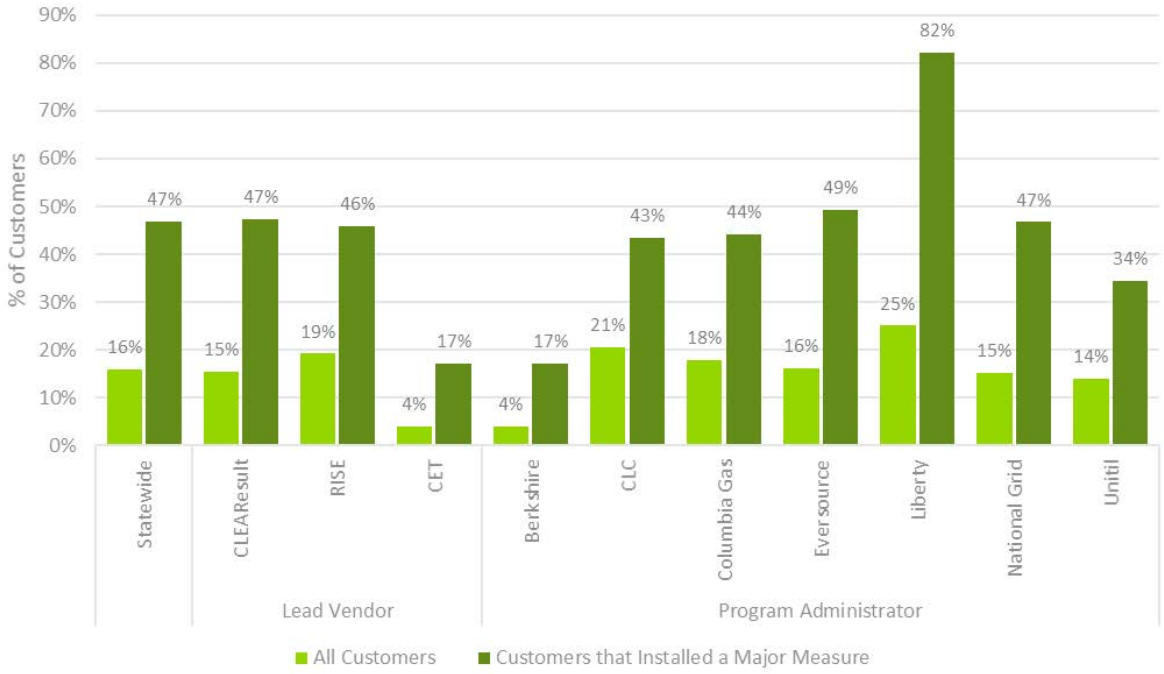
- **Description:** The percentage of customers that received at least one QA/QC visit from an HES LV
- **Purpose:** Understand how many HES customers are part of the LV-portion of the statewide QA/QC system
- **Calculation:**
  - Numerator: Number of customers with LV QA/QC visits
  - Denominator 1: Number of customers (Figure 22, light green)
  - Denominator 2: Number of customers that installed a major measure (Figure 22, dark green)
- **Filter:** Excluded last 6 months of participation (July 2016-December 2016)

Findings

Before discussing the LV QA/QC findings, it is important to note that LV QA/QC (KPI 23) is only one aspect of the PA's overall QA/QC system for HES. As noted earlier in the memo, the other aspect of the PA's QA/QC system - third-party visits conducted by CRI – are not included in this memo as the evaluation team only recently received the data associated with these visits. The team will include this CRI's QA/QC KPI (KPI 23) in the final report. In the interim, readers should, due to the complementary nature of the LV and CRI QA/QC practices, view the LV QA/QC findings presented below as a partial picture of the PA's overall QA/QC process.

According to the evaluation team's analysis of the provided LV data, 16% of all the customers that received an HEA also received some form of LV-driven QA/QC (light green bars in Figure 22). The provided data showed higher rates for Liberty and lower rates for Berkshire, although it is possible those rates are a function of the data each LV maintains electronically and provided to the team.

Figure 22. KPI 23 – LV QA/QC Visits



The denominator the team used for the darker green bars in Figure 22 reflects only the subset of HES customers that installed a major measure. As shown, nearly half of statewide customers that installed a major measure received a QA/QC visit from an LV. This does not include any visits from CRI, the state's third-party QA/QC contractor. A comparison of the two figures shows the relative levels of LV- and PA-specific QA/QV visits are similar regardless of the denominator.

PORTFOLIO K. ADDITIONAL QA/QC DETAILS

Table K-1. QA/QC Reports and Information Provided to Evaluation Team

What	Inspection Type	Who	Frequency	Report Format	Documents	How PAs Use Information
Project detail reports for failed or pass with notifications: Jobs that fail or pass but where feedback is provided (e.g., "contractor left the crawl space a mess…he does not want a follow up") are provided in near real time. (*Site-specific, detailed information)*	Tier 1 Tier 2 Tier 3	CMC	Weekly or biweekly	PDF	• Measures installed and quantity • Customer satisfaction ratings by question and overall • Recommended measures • Result of 11 missed opportunities metrics • Scores for up to 14 inspection elements assessed (e.g., roadblocks identified, combustion safety testing) • Notes qualitatively documenting information from inspection	• Identify areas for improvement • Communicate results to IIC/HPC and LV • Improve IIC/HPC and LV performance through meetings • Follow up with customers where appropriate • Allocate work to IICs (higher overall ratings receive more jobs)
Failed inspection reports: Provides the reason for failure with backup documentation. (*Site-specific, high level information)*	Final inspection	LVs	Weekly or as needed	PDF	• Reason for failure • Repair time • Photos of issue	• Provides documentation, proof, and direction
Listing report: Lists the results of all customers' QA/QC (Tier 1, Tier 2, and Tier 3) that month. (*Site-specific, summary information)*		CMC	Monthly	PDF, but may be available in Excel	• Result of each customer's inspection (pass/fail/pass with follow-up) • Final customer satisfaction scores for Tier 3 inspections • Number of missed opportunities • Vendor type (HPC/IIC) • Limited customer and project-specific details	• Easily review listing and summary of monthly inspection results

What	Inspection Type	Who	Frequency	Report Format	Documents	How PAs Use Information
Site report: Site-specific reports for all inspections completed that month. (*Site-specific, detailed information)*	Tier 1 Tier 2 Tier 3	CMC	Monthly	PDF	• Tier level • Measures recommended (Tier 1) or installed (Tier 2 or 3) and quantity • Customer satisfaction ratings by question and overall • Result of 11 missed opportunities metrics (yes or no) • Result of inspection of each installed measure (pass/fail) • Overall project grade (pass/fail/with notification)	• Identify areas for improvement • Follow up with customers where appropriate • Allocate work to IICs (higher overall ratings receive more jobs)
Invoice summary report: Summarizes the monthly results for each inspection tier. (*Aggregated, summary information with detailed results for Tier 1 metrics, satisfaction results, and missed opportunities)*	Tier 1 Tier 2 Tier 3	CMC	Monthly	PDF	• Total number of inspections for each tier and number of inspections that fell within the results categories (e.g., pass/fail/pass with notification) • For Tier 1 inspections, number of points achieved for each of the 14 metrics for the month • For Tier 2 and Tier 3 inspections, monthly results of customer satisfaction survey and missed opportunities by the specific questions or elements reviewed	• Understand where there may have been systematic satisfaction or missed opportunities from the month
Monthly summaries: Details, by project, customer satisfaction scores by the questions, and overall. Summarizes results for each customer's QA/QC. (*Except for satisfaction data, site-specific summary information.)*	Tier 1 Tier 2 Tier 3	CMC	Monthly	Excel	• Number of missed opportunities • Inspection result (e.g., pass/fail/pass with notification) • Customer satisfaction score • Notes qualitatively documenting information from inspection	• Customer survey results are integrated with contractor inspection scores • Financial incentives tied to the customer satisfaction scores • IICs with higher scores receive more jobs • LV/Abode review scores, identify issues, and work with vendors to improve scores • LV/Abode review open-ended responses to identify opportunities for improvement

What	Inspection Type	Who	Frequency	Report Format	Documents	How PAs Use Information
Work and customer service quality reports: Summarizes individual HPC and IICs' inspection results from a 3-month rolling period. (A*ggregated, summary information by specific performance metrics)*	Final inspection	CLEAResult	Monthly	PDF	• 3-month rolling averages of overall contractor, work quality, customer service, and document quality grades • Average scores by weatherization categories (e.g., insulation, air sealing) • Average scores by customer service and paperwork categories • Peer averages for comparison	• Information is shared with HPCs and IICs monthly • Help the program manage contractors that may not be meeting standards
HPC scorecard and KPI summary: Summarize HPCs' activity in the program measured against the PAs' approved KPI metrics. (A*ggregated, summary information by specific performance metrics)*	Final inspection CMC inspection results	CLEAResult	Quarterly	PDF	• Summary of performance against the PAs' KPI metrics • The KPI summary shows results across four quarters • Color-coded visuals show where performance on track or has issues	• Helps HPCs focus training for staff • Identifies areas for improvement within each HPC • Helps the program manage contractors that may not be meeting standards • Used to calculate and determine eligibility for performance incentives
IIC summary report: Summarizes all IIC weatherization work quality reports. (*Aggregated, summary information of IIC activity and performance)*	Final inspection CMC inspection results	CLEAResult	Quarterly	PDF, Excel option	• Average score and ranking • Average insulation scores and ranking • Average work quality score • Blended customer satisfaction score from CLEAResult and CMC inspections • Document quality score	• Systematically identify IICs that have performance issues or training needs • Used for work allocation

Developed by Navigant Consulting, Inc., Cadeo Group, Illume Advising, and Bellomy Research.

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