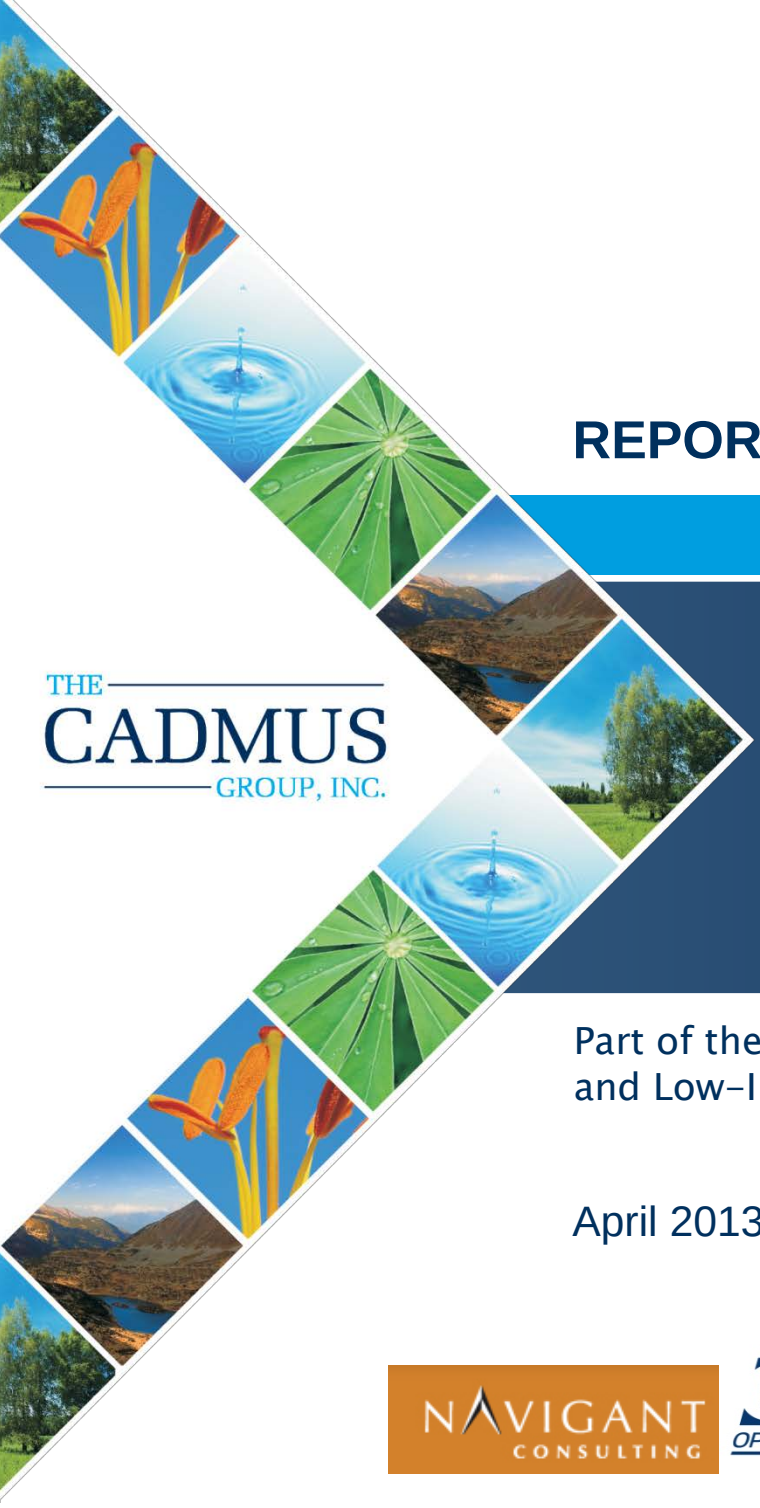

THE CADMUS GROUP, INC.

REPORT

2012 Home Energy Services Pre-Weatherization Initiative Evaluation

Part of the Massachusetts Residential Retrofit and Low-Income Program Area Evaluation

April 2013

NAVIGANT CONSULTING | ODC OPINION DYNAMICS CORPORATION | Itron | ers

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1. INTRODUCTION

This report summarizes an evaluation of the 2012 Home Energy Services (HES) Pre-Weatherization Initiative (initiative) that was offered by the electric and gas program administrators (PAs) of Massachusetts. Cadmus, Opinion Dynamics, Navigant Consulting, Itron, and Energy and Resource Solutions, collectively referred to as the Evaluation Team, conducted the evaluation.

In March 2012, the PAs asked the Evaluation Team to evaluate the initiative, set to launch in May 2012 (and last through August 2012). The PAs designed the initiative to provide customers with an additional incentive to help reduce their financial burden for addressing common pre-weatherization repairs that are required prior to installing certain HES measures. Facilitating the removal of these barriers both minimizes health and safety risks—by ensuring that homes meet Building Performance Institute standards—and allows more customers to install energy-efficiency measures recommended from their home energy assessment.

The Evaluation Team focused its efforts on evaluating the effectiveness of the additional incentive in meeting the initiative's stated goal, as well as on assessing the delivery of the initiative itself.

The Team evaluated this initiative in two phases:

1. ***Phase 1:*** included interviews with HES PA program managers and lead vendors; analysis of initiative participation data through July 2012; and surveys with participant and non-participant NSTAR, National Grid, and Berkshire Gas customers.[1]
2. ***Phase 2***: included follow-up inquiries with PAs; surveys with participants and non-participants from all PAs; and additional analysis of both complete initiative data and historic HES data, at the end of September 2012, and in March 2013.

[1] These three PAs offered their customers a 30-day deadline to complete the initiative requirements. The remaining PAs offered their customers a 90-day deadline to complete the initiative requirements; therefore, their participant data were not available for the Phase 1 interim memo. Table 2 details each PAs deadline for participation.

2. INITIATIVE OVERVIEW

With the initiative, the PAs offered an additional financial incentive to HES customers who faced barriers to installing certain assessment-recommended weatherization measures. Customers received the incentive if they cleared the barriers within a specified number of days from receiving the recommendations.

The Evaluation Team surveyed[2] a sample of initiative participants and a sample of initiative non-participants. Initiative participants are customers who cleared or were clearing their pre-weatherization barriers at the time of the surveys, and were eligible to receive the traditional HES Program incentives, as well as the extra incentive for clearing the barrier. Non-participants are those who were offered the initiative but did not clear their pre-weatherization barrier, and were therefore not eligible to receive extra incentives. Although the initiative participants had taken steps to clear the barrier and become eligible to install weatherization measures, not all of them have moved forward with the HES Program by installing all or any of those recommended measures.

The initiative's financial incentive, which the PAs offered in addition to the current HES Program offerings, covered three common barriers to installing program-recommended measures:

1. Evidence of knob and tube wiring;
2. General combustion safety; and
3. Improper dryer venting.

Table 1 shows the barrier incentive levels, risks presented by the barriers, weatherization measures influenced by the barriers, and the actions required to clear the barriers.

Table 1. Initiative Barriers

Barrier	Incentive*	Risk of Barrier	Weatherization Measures Influenced	Actions Necessary to Clear Barrier
Evidence of knob and tube wiring	Up to $250	Fire hazard	Insulation	Inspect wiring to determine if inactive. If knob and tube wiring is live, it must be deactivated before insulation can be installed.
General combustion safety	Up to $300	Airborne particulates or carbon monoxide	Air sealing, insulation	Inspect and tune-up/repair the HVAC system to eliminate high carbon monoxide levels.
Improper dryer venting**	Up to $250	Fire hazard	Air sealing, insulation	Install, repair, or replace dryer venting.

* Most PAs paid 75% of the actual cost to remove the barrier, up to the maximum incentive amount.

** Cape Light Compact did not include improper dryer venting as a pre-weatherization initiative measure, as this PA already addresses this barrier as part of their home energy assessments.

[2] Appendix C provides participant and non-participant surveys.

The PAs began offering the initiative incentives in May 2012, and customers had either 30 or 90 days (depending on their PA; Table 2) to decide whether to participate in the initiative and clear the barrier to receive the initiative incentive.

Table 2. PA-Specific Deadlines

30-Day Deadline	90-Day Deadline
National Grid	New England Gas
NSTAR	Columbia Gas
Berkshire Gas	Western Massachusetts Electric Company
	Cape Light Compact
	Unitil

The majority of lead vendors and PAs the Evaluation Team interviewed said they primarily offered the initiative to new assessment customers at the time of the audit. However, some PAs also had lead vendors reach out and offer the initiative to customers who previously had an audit and had not yet addressed the identified barriers (Table 3).

Table 3. Outreach Strategy by Program Administrator

PA	New Customer (Offered During Audit)	Prior Customer (Offered Through Call Back or Mailing)
National Grid	√	
NSTAR	√	√
Berkshire Gas	√	√
New England Gas	√	
Columbia Gas	√	
Western Massachusetts Electric Company	√	
Cape Light Compact	√	√
Unitil	√	√

Based on historic data (July 2011 - April 2012) provided by the PAs, 65% of homes had no barriers to installing any HES Program-recommended measures. Of the homes determined to have barriers, the most common barrier was combustion safety, found in 16% of homes. The next three most commonly identified barriers were the presence of asbestos (13%), the presence of knob and tube wiring (12%), and concerns about moisture levels (7%). Lead, improper dryer venting, and other miscellaneous and unspecified barriers made up the less than 1% of homes in the Other category shown in Table 4.[3]

[3] The initiative only covered those barrier listed in Table 1, and did not cover other issues such as asbestos, moisture level concerns, and structural issues.

Table 4. Percent Occurrence of All Barriers in HES Homes

Barrier	% of Audited Homes*
No Barrier	65%
Combustion Safety	16%
Asbestos	13%
Knob and Tube Wiring	12%
Moisture	7%
Structural	2%
Other	1%

* This column does not add to 100% since multiple barriers could occur in one home.

3. METHODOLOGY

The Team evaluated this initiative in two phases:

1. ***Phase 1:*** included interviews with HES PA program managers and lead vendors; analysis of initiative participation data through July 2012; and surveys with participant and non-participant NSTAR, National Grid, and Berkshire Gas customers.[4]
2. ***Phase 2:*** included follow-up inquiries with PAs; surveys with participants and non-participants from all PAs; and additional analysis of both complete initiative data and historic HES data, at the end of September 2012, and in March 2013.

PA and Lead Vendor Interviews

As shown in Table 5, the Evaluation Team interviewed[5] all eight PAs and a representative from each of the four lead vendors, seeking to determine:

- Processes for designing, marketing, and implementing the initiative; and
- The initiative's administrative structure and organization.

Table 5. Interviewed Lead Vendors and PAs

Lead Vendor	Program Administrator
Conservation Services Group	National Grid and NSTAR
Center for Eco Technology	Berkshire Gas
Honeywell	Columbia Gas, New England Gas, and Western Massachusetts Electric Company
Rise Engineering	Cape Light Compact
N/A	Unitil

During the interviews, the Evaluation Team addressed the following research topics:

- Roles and responsibilities of PA and lead vendor program managers;
- Initiative purpose and goals;
- Initiative design and package delivery;
- Customer interactions;
- Data collection and tracking methods; and
- Suggestions for improved program delivery.

[4] These three PAs offered their customers a 30-day deadline to complete the initiative requirements. The remaining PAs offered their customers a 90-day deadline to complete the initiative requirements; therefore, their participant data were not available for this report. Table 2 above detailed each PAs deadline for participation.

[5] Appendix A and Appendix B provide the PA and lead vendor interview guides.

Participant and Non-Participant Surveys

The Evaluation Team surveyed a sample of initiative participants (those that cleared or were clearing their pre-weatherization barriers at the time of the survey); and surveyed a sample of initiative non-participants (those who were offered the initiative but did not clear their pre-weatherization barrier, and were therefore not eligible to receive the initiative incentive). We did not conduct the participant and non-participant surveys until after the initiative offers expired.

The Evaluation Team conducted surveys during both phases of the initiative evaluation. The surveys during Phase 1 allowed the Team to provide PAs with early feedback on the initiative and add clarifying questions to the Phase 2 surveys based on the Phase 1 survey results. We focused these clarifying questions on understanding the customers' frequency and knowledge of knob and tube wiring and the impact of contractor selection or assignment. These questions have a smaller response rate than other survey questions since they were only asked of Phase 2 survey respondents. The survey findings indicate Phase 1 and Phase 2 designations to clarify the number of responses when needed.

The Evaluation Team focused the surveys on how the additional initiative incentives influenced customers' decisions to clear their pre-weatherization barriers and move forward with additional weatherization measures. Table 6 shows the breakdown of participants and non-participants who completed the survey.

Table 6. Total Survey Respondent by Type of Customer

Type	Number of Survey Respondents	Percentage of Survey Respondents
Participants	48*	40.7%
Non-Participants	70	59.3%
Total	118	100%

* Although the Evaluation Team's goal was to complete 70 participant surveys, we only completed 48 such surveys before exhausting the sample. The remaining participants in the sample were unwilling to be surveyed or could not be reached after eight to 10 attempts. However, due to the finite population correction factor, the overall participant survey results exceed 90% confidence with ±10% precision. The exact confidence and precisions associated with each specific question varies.

Data Analysis

Using data from approximately six months of implementation, the Evaluation Team analyzed the rate at which customers addressed pre-weatherization barriers. The Evaluation Team also compared the HES measure adoption rates and associated savings of initiative participants with the HES measure adoption rates and associated savings of historic HES participants, as an indicator of the initiative's effect on customers' implementing program-recommended measures.

4. FINDINGS

The Evaluation Team based the findings presented below on an analysis of lead vendor and PA interviews, participant and non-participant surveys, and a review of initiative and historic HES data. The results are organized by the following topics, with responses from PAs, lead vendors, and customers presented together, as appropriate:

- Design
- Delivery
- Process Satisfaction
- Participation
- Free-ridership
- Data Analysis
- Additional Survey Results

Design

The PAs designed the initiative with involvement from their lead vendors and stakeholders from the Energy Efficiency Advisory Council and the Green Justice Coalition.

The PAs developed the initiative to test the hypothesis that the upfront costs of addressing these specific low-cost pre-weatherization barriers deter customers from remediating those barriers and installing program-recommended measures. This is separate and distinct from any hypothesis about the potential financial challenge the upfront costs of installing weatherization measures may create (which the existing HES incentives and the HEAT Loan Program were designed to address).

All interviewed PAs and lead vendors described the initiative's overarching goal as increasing the number of customers installing recommended weatherization measures. The PAs did not set participation goals for the initiative. Rather, they divided the $300,000 program budget, providing each PA with a set funding amount to run the initiative based on the number of residential customers they serve (Table 7).

Table 7. PA Initiative Budget Allocations

PA	Initiative Budget
National Grid - Electric	$89,698
National Grid - Gas	$65,556
NSTAR - Electric	$65,252
Columbia Gas	$21,350
NSTAR - Gas	$19,340
Western Massachusetts Electric Company	$15,001
Cape Light Compact	$14,309
New England Gas	$3,919
Berkshire Gas	$2,509
Unitil - Electric	$1,965
Unitil - Gas	$1,096
Total	$300,000*

* The numbers in this column were rounded and do not sum to the total.

The following three barriers covered by the initiative, required relatively small financial investments to clear, and according to the initiative proposal, were determined to be the most common barriers found during home energy assessments:

1. Evidence of knob and tube wiring requiring an inspection (with incentive up to $250).
2. General combustion safety requiring an inspection/repair (with incentive up to $300).
3. Improper dryer venting requiring installations/repairs (with incentive up to $250).[6]

If an energy auditor found one of the three initiative barriers at a home, they informed the customer of the barrier and explained why it prevents them from moving forward with select weatherization measures. The auditor then provided the customer with materials that explain the initiative and the additional pre-weatherization incentives that were available to them for a limited time.

The requirements for overcoming weatherization barriers depended on the types and extent of barriers identified. General combustion safety and improper dryer venting required tune-ups, repairs, or replacements; while evidence of knob and tube wiring required additional steps if the wires were live.

Customers could face multiple barriers, but could only receive one initiative incentive. Once a customer chose to move forward, they submitted their paperwork and followed the barrier-clearing processes set up by their PA.

The PAs developed the initiative's overall structure; however, each PA worked with their lead vendor to refine the initiative design and the delivery preferences for their service territories. Some of the design differences included the varying deadlines for customers to participate in the initiative and the varying delivery processes.

[6] Cape Light Compact did not include the repair of improper dryer venting as a pre-weatherization initiative measure, as this PA already addresses this barrier as part of their home energy assessments.

Knob and Tube Inspection and Mitigation

If the knob and tube wiring found in a home during inspection was inactive, a certified electrician's signature on the initiative paperwork was sufficient documentation to install certain weatherization measures. If the electrician determined the wiring was live, it is required that it be deactivated (and presumably replaced) prior to installing select weatherization measures. Because there needs to be a distinction between these two steps, this report refers to the initial inspection, which is done to determine whether the wiring is live, as "inspection," and refers to the step customers have to take to deactivate or remove their wiring if it is found to be live as "mitigation."

The Evaluation Team interviewed a sample of Massachusetts electricians to determine the estimated cost of knob and tube wiring inspection and the cost of live wiring mitigation. These electricians indicated that the average cost for inspecting knob and tube wiring ranges from $75 to $300 (the initiative incentive covers up to $250 of this amount). Also according to the electricians interviewed, the average cost for rewiring, or mitigating, the live wiring in a standard 1,500 square-foot home in Massachusetts ranges from $5,000 to $15,000.

It is critical to note that the incentive offered through the initiative only covers the cost of knob and tube inspection, not mitigation. If knob and tube wiring was identified as live, the customer was financially responsible for having their home rewired before installing insulation measures through HES. According to initiative stakeholders, customers are able to finance up to $1,000 towards remediating pre-weatherization barriers through the Mass Save® HEAT Loan Program, provided that they also implement audit-recommended measures.

During Phase 1, the Evaluation Team found that survey respondents—particularly non-participants—had a difficult time separating the concepts of knob and tube wiring inspection from mitigation, and often confused the costs associated with each activity. As a result, the Evaluation Team added the following language to the Phase 2 survey to help customers distinguish between the cost of inspecting versus the cost of mitigating knob and tube wiring: "*I will be asking you several questions about the incentive you were offered. To be clear, this additional incentive was designed to cover just the cost to have an electrician or contractor come to your house and check to see if your knob and tube wiring was live or not. It was not intended to cover any further cost of rewiring if the knob and tube wiring was found to be live.*" However, despite this clarification, some customers continued to confuse inspection with mitigation. As a result, we indicate in this report, as appropriate, where customers may have given a mitigation response for questions designed to address inspection.

Delivery

Each PA[7] worked with their lead vendor to tailor the initiative to their service territory. The lead vendors then delivered the initiative to PA customers according to the eligibility and program requirements they established with the PA.

[7] Unitil is an exception, as it did not use an outside lead vendor for implementing the initiative.

Delivery Mechanism

Customers could utilize three delivery mechanisms to participate in the initiative:

1. ***Vendor Turnkey:***[8] Customers could request that the lead vendor assign a contractor to clear their barrier and submit paperwork on their behalf (this is described throughout the report as the turnkey option).
2. ***Own Contractor****:* Customers could hire their own contractor or electrician to clear the barrier and sign off on the paperwork. The customer would then submit the offer form, evaluation form, and paid invoice to the lead vendor.
3. ***Home Performance Contractor (HPC):*** Customers could use a HPC to help guide this process.

Eligibility

Current HES Program customers qualified for the initiative if their auditor identified pre-weatherization barriers. All PAs allowed customers with multiple barriers to participate; however, they noted that these participants were only eligible to receive one initiative incentive. The majority of lead vendors and PAs we interviewed said they primarily offered the initiative to new assessment customers at the time of the audit. However, some PAs also had their lead vendor conduct call backs or send mailings to customers who had barriers identified in a previous audit, and they offered these customers the initiative if they had not cleared their barrier. Table 8 shows which PAs offered the initiative through lead vendor call backs or mailings.

Of the 118 customers surveyed, 98 learned of the initiative at the time of their audit and 12 received a call back. The remaining eight reported either receiving a letter (n=6) or hearing about the offer through word-of-mouth (n=2).

Table 8. Customers Offered Pre-Weatherization Initiative by PA

PA	New Customer Offered During Audit	Prior Customer Offered Through Call Back or Mailing
National Grid	√	
NSTAR	√	√
Berkshire Gas	√	√
New England Gas	√	
Columbia Gas	√	
Western Massachusetts Electric Company	√	
Cape Light Compact	√	√
Unitil	√	√

[8] The turnkey option discussed in this report pertains to the pilot initiative, in instances when customers were assigned a program-identified contractor to address the pre-weatherization barrier in their home. This is different from the turnkey option offered by both home performance contractors (HPCs) and lead vendor/program contractor teams for the HES Program, in which either the HPC or lead vendor helped guide the process for the customer from initial audit through measure installation.

Program Requirements

As was shown in Table 2, the PAs' initiative deadline was either 30 days or 90 days. General requirements to receive the initiative incentive included:

1. Accepting the offer.
2. Working with a program-identified and assigned contractor (i.e., the turnkey option) or independently hiring an appropriate expert (which could be an HVAC contractor or an electrician, depending on the barrier) to clear the barrier and sign initiative paperwork.
3. Mailing in paperwork to the lead vendor/PA (if they selected their own contractor) showing that barriers were cleared and signed off by the contractor or electrician. In the turnkey option, program contractors submitted initiative paperwork on behalf of participants.

All PAs had these general requirements, while the more detailed requirements varied by PA.

Forms

Eligible customers received the following three main pieces of initiative-specific information at the time of their assessment, although the actual forms varied by PA:

1. A description of the initiative and initiative requirements;
2. The customer offer, which the customer filled out with their information and barrier details; and
3. The contractor evaluation, which the contractor or electrician completed and signed to indicate that they cleared the barrier(s).

Each PA offered their customers one, two, or three of the above options, as shown in Table 9. The Evaluation Team asked Phase 2 participant survey respondents to identify which option they utilized to clear their barrier, to which 12 indicated using a HPC, nine found their own contractor, and two selected the turnkey option.[9]

Table 9. PA Delivery Mechanism Options

PA	Vendor Turnkey	Own Contractor	HPC
National Grid	√	√	√
NSTAR	√	√	√
Berkshire Gas		√	
New England Gas		√	
Columbia Gas		√	
Western Massachusetts Electric Company		√	
Cape Light Compact		√	
Unitil			√

While the initiative incentive amounts were consistent across PAs, the ways customers receive their incentive varied. Customers that used the turnkey option paid an upfront co-pay, rather than

[9] Phase 1 customers were not asked this question.

paying the full amount upfront and submitting a rebate application. Customers who hired their own contractor or electrician paid the full cost upfront and submitted forms and invoices to a lead vendor for reimbursement. The lead vendors mailed customer reimbursements as soon as the paperwork was processed.

The PAs and lead vendors said they discussed whether to combine the pre-weatherization barrier incentive with the HES weatherization incentive and require customers to clear the barrier and install the weatherization measures prior to receiving any reimbursement. This discussion was due to a concern about whether customers would still move forward with installing weatherization measures following receipt of their pre-weatherization barrier incentive.

The risk with the design they ended up using was that the PAs would pay for barrier-clearing and then the customer not move forward with weatherization, which would result in the PAs spending money and not gaining energy savings. However, most PAs and lead vendors agreed that, in an effort to make the initiative "*fair and helpful*," this risk was acceptable and they opted to reimburse following receipt and processing of the customer initiative paperwork. Only one PA required that customers have a weatherization measure installed prior to receiving the initiative incentive.

To minimize this risk, many PAs included a clause in the initiative paperwork where customers agreed to clear the barrier with the intent to move forward with weatherization. The lead vendors also emphasized the expectation that after clearing the barrier, customers would install the recommended weatherization measures. Some PAs mentioned that if the customer moved straight from barrier removal to installing weatherization measures, the initiative reimbursement could simply be added to the weatherization reimbursement (which is 75% up to $2,300), but this was not typical.

Data Collection

The PAs provided the Evaluation Team with initiative data and HES data for the time period of the initiative, which varied by PA but generally covered May through September 2012. These data included the following information:

- Customer information
- Home characteristics
- Relevant pre-weatherization barriers
- Status of barriers
- Proposed measures
- Installed measures

The initiative data contained additional details regarding the pre-weatherization incentive, including:

- Offer date
- Acceptance date

- Offer type (call back from previous audit, mailing, during the original audit if applicable, etc.)
- Barrier type for which the incentive was offered
- Incentive amount

Process Satisfaction

The Evaluation Team asked PAs and lead vendors to elaborate on which design and delivery elements of the initiative worked well, and which did not.

Turnkey Option

The most common topic cited by all PAs and lead vendors was whether or not to offer turnkey services. This was brought up as an important discussion point by both PAs and lead vendors who had offered the turnkey option to their customers, and those who had not offered the turnkey option but considered it.

One PA thought that providing a contractor for a customer would help them move forward in clearing barriers, but other PAs and lead vendors who offered the turnkey option faced a challenge with recruiting contractors to participate. One PA noted that the flexibility to allow a turnkey option proved advantageous in some cases, as customers did not need to pay full upfront costs.

Overall, the PAs and lead vendors cited that providing the turnkey option to customers was one of the greatest initiative obstacles. Although the turnkey option offered positive aspects (as noted above), PAs and lead vendors who implemented the turnkey option said that it was a struggle to recruit contractors to help clear the barriers.

- One PA said it was challenging to find licensed contractors and electricians who were willing to participate, and this required a lot of time and effort from the PAs and lead vendors. These administrative tasks placed additional time demands on PAs, and one PA said it would be difficult to maintain the turnkey option over time.
- One lead vendor said that not only was the initiative difficult from a timing perspective, but also that the response from the contractor community was not very strong because they did not have much of an incentive to participate. This lead vendor thought it would be difficult to widen the PAs contractor network to include HVAC contractors and electricians, and said: "*The most viable contractors with [an] active business do not see these inspections as important or lucrative*."
- Although some PAs who did not offer vendor turnkey services have some interest in adding turnkey as a delivery option in the future, one PA who offered the turnkey option said that most of their customers who participated found their own contractor. This was verified by the customer surveys, where very few customers surveyed in Phase 2 used the turnkey option (n=2).[10]

[10] Only Phase 2 survey customers were asked questions about whether or not a turnkey option was available and what option they chose.

Given these challenges, one lead vendor recommended discontinuing the turnkey option altogether, explaining that contractors may perceive more business potential from customers than from a lead vendor who assigns them a finite task. This lead vendor said: "*Contractors may be more willing [to accept the work when contacted by the customer], so the end result would be better for responding to individual customers*."

Initiative Successes

The PAs agreed that offering the initiative during the home energy assessment proved to be a positive design aspect, as it allowed auditors to explain the initiative to customers and answer their questions. One PA summed up the offering by saying that the initiative was a great success, as it assisted their customers with pre-weatherization barriers and provided them with information to use for future offerings.

Other cited benefits included:

- ***Ease of participation:*** the simple design, easy paperwork, and limited incentive offers made participation easy, and may have encouraged customers to act sooner than they otherwise would.
- ***The time of year chosen:*** the initiative was implemented during the slower season for the HES Program, giving PAs, vendors, and contractors more time to address questions and discuss issues with customers.
- ***Encouraged earlier barrier removal***: one lead vendor said that although most of the customers they spoke to who are moving forward with the HES Program would have done so anyway, the initiative moved them faster and served as a "*win-win*" for PAs and customers. This sentiment was reflected in the customer survey data: 15 of the 24 surveyed participants who said they would have addressed the barrier even without the extra incentive said the incentive moved them to address the barrier earlier than they would have otherwise.

Initiative Challenges

The PAs and lead vendors agreed that the rush to design and implement the initiative created obstacles.

- One PA said the short timeframe to get the initiative offerings into the field meant they were internally rushed when designing and developing the forms, and then had to: "*throw a lot of things at the auditors at once without working out the kinks*."
- One PA said they did not have enough time to market the initiative to their customers because they did not already have marketing materials, and had to rely on word-of-mouth and education during the assessment.

Initiative Improvement

PAs and lead vendors had the following initiative suggestions based on their initial impressions:

- *"Provide the customers with more time to complete the work; 30 days is not enough."*
- *"Use consistent forms across all PAs."*

- *"Consider targeting certain fuels, as customer gas bills are not as high as oil bills."*
- *"Have customers locate their own contractors."*

The following concluding comments are examples of common themes and sentiments the PAs and lead vendors offered regarding the initiative:

- *"We tried to do one-stop shopping and now it's getting a lot of layers of complication by needing to bring in different specialists. We're happy we committed to do this pilot, it's just the results are not what we wanted."*
- *"In theory, the intention [of the initiative] is well-being, but in practice it is much more complicated and much more expensive."* (sic)
- *"Have to prove the need for it [the initiative] first, many are still unconvinced that the amount being offered removes the barrier: that cost will only cover inspections, not fix the actual barrier."*
- *"The best step up would be to completely cover knob and tube replacement throughout the house, but PAs can't afford that so the program serves its purpose as is."*
- *"It was previously posited that pre-weatherization would bring a bevy of customers, and I have not seen that. It has helped a few customers, but perhaps efforts and money might have been provided to bigger barriers that exist for customers."*
- "*HPCs and PAs should work to network and build more close relationships with a cross promotion of contractors, banks, DHCD [Department of Housing and Community Development], DOE [Department of Energy], and local cities and towns in order to leverage resources. We need a customer 'one-stop shop' to more effectively address H&S [health and safety] issues that exist in the aging housing stock uncovered at the time of the home energy assessment.*"

Participation

PAs and lead vendors agreed that the initiative participation was lower than expected, with many offers made to customers but few completions. Table 10 shows the number of initiative offers per PA, and the number of customers who accepted those offers. Overall, 104 of 505 total customers that were offered the initiative accepted (21%). The remaining 401 either explicitly declined the incentive or allowed the initiative offer to expire. Table 11 breaks down participation levels by barrier types and PAs.

The majority of the customers that were offered the incentive were new customers who received the offer during their first audit (n=446); these customers had an acceptance rate of 22%. The small number of prior customers that were offered the initiative (n=59) received the offer through a call back or mailing; these customers had a lower acceptance rate of 14%. Seven of all the Phase 1 and Phase 2 surveyed participants (15%) said they received a call back (n=6) or mailing (n=1). Of the six who received a callback, four said they had aready taken steps to address the barrier prior to receiving the call. One of the two remaining participants who had not yet taken steps to address the barrier said the call back is what motivated them forward.

Table 10. Acceptance Rate of Initiative per Program Administrator

Program Administrator	Number of Initiative Offers	Number of Initiative Acceptances	Acceptance Rate
National Grid	186	47	25%
NSTAR	140	33	24%
Berkshire Gas	78	18	23%
New England Gas	2	0	0%
Columbia Gas	17	2	12%
Western Massachusetts Electric Company	21	2	10%
Cape Light Compact	47	2	4%
Unitil	14	0	0%
Total	505	104	21%

The three PAs (National Grid, NSTAR, and Berkshire Gas) with the highest participation rates (acceptances per offer) were the same PAs that required a 30-day deadline. However, given other program design differences between these three PAs and the PAs requiring a 90-day deadline (such as the availability of HPC contractors), it is not possible to definitively determine whether the shorter deadline is fully responsible for the higher acceptance rate.

However, it should also be noted that several survey respondents (participants and non-participants) who were given the 30-day deadline indicated that the timeframe presented a challenge when it came to addressing to the initiative barriers (12%, n=13).[11] Only one of the 90-day respondents indicated that the timeframe was too short (7%, n=1).[12]

[11] This percentage is based on the sample population of surveyed participants and nonparticipants who were offered the initiative in the 30-day deadline territory, which totaled 105.

[12] Ibid

Table 11. Pre-Weatherization Initiative Participation (as of September 2012)

Barrier	Decision	National Grid	NSTAR	Berkshire Gas	New England Gas	Columbia Gas	Western Massachusetts Electric Company	Cape Light Compact	Unitil	Total
Evidence of knob and tube wiring	Participated	33	25	9	0	1	1	1	0	70
	Declined	98	79	41	1	11	13	13	11	267
General combustion safety	Participated	9	6	8	0	1	1	1	0	26
	Declined	31	18	10	1	3	2	32	2	99
Improper dryer venting	Participated	5	2	1	0	0	0	0	0	8
	Declined	10	10	3	0	0	1	0	1	25
Multiple barriers	Participated	0	0	0	0	0	0	0	0	0
	Declined	0	0	6	0	1	3	0	0	10
Total	Participated	47	33	18	0	2	2	2	0	104
	Declined	139	107	60	2	15	19	45	14	401

Several lead vendors said customers who accepted offers were already motivated and: "*would have done this with or without the financial incentive,*" although one lead vendor thought the incentive did push their customers to act sooner than they otherwise might have. These assumptions were corroborated by the customer survey results, in which 53% of participants (n=24) said they would have addressed the barrier in the future if they had not received the extra incentive,[13] although most of those respondents (n=15) said they did address the barrier sooner than they would have without the extra incentive.

[13] Although the results of this one question indicate a possibility of high free-ridership, the Evaluation Team asked each customer a full battery of free-ridership questions, then assigned partial free-ridership scores based on all question responses, including the influence of the incentive and timing. As shown in the Free-Ridership section, many of the customers who responded affirmatively to this particular question did not receive a free-ridership score of 100%. In fact, some of these select respondents, due to their responses to other free-ridership questions, were assigned no free-ridership.

Participation Challenges

The lead vendors and PAs identified two main potential challenges to participating in the initiative: 1) it requires another step, and 2) overall costs.

The lead vendors and PAs noted that having the additional initiative step—clearing the identified barrier—might have prevented customers from participating in the initiative and the HES Program. One PA noted that: "*telling [customers] there's another step decreases the chances of them actually moving forward*." Part of this additional step, in some cases, required customers to find contractors qualified to clear barriers. As one lead vendor said, although dryer venting should be a simple problem to fix, enlisting an HVAC contractor to partner with the program to clear such a low-cost barrier (or verify that a homeowner cleared the barrier) proved to be a challenge.

Although lead vendors and PAs were concerned that the requirement to act—even with the initiative's turnkey option—would prove to be the additional step that prevented customers from moving forward with measure installation, this does not appear to have been the case. Specifically, very few surveyed customers mentioned this extra step as problematic. However, several PAs and lead vendors did mention the challenge of enlisting a contractor to clear the barrier.[14]

PAs and lead vendors also cited the overall costs of clearing barriers, particularly for mitigating live knob and tube wiring, as the most common participation challenge. One lead vendor said that with old houses in New England, old wiring is unsurprising: "*One comment I have heard more than once is about the knob and tube barrier. The incentive covers the inspection to see if the wiring is live, but it doesn't cover if the wiring needs to be removed, which is very expensive and it's the barrier we most often come across*."

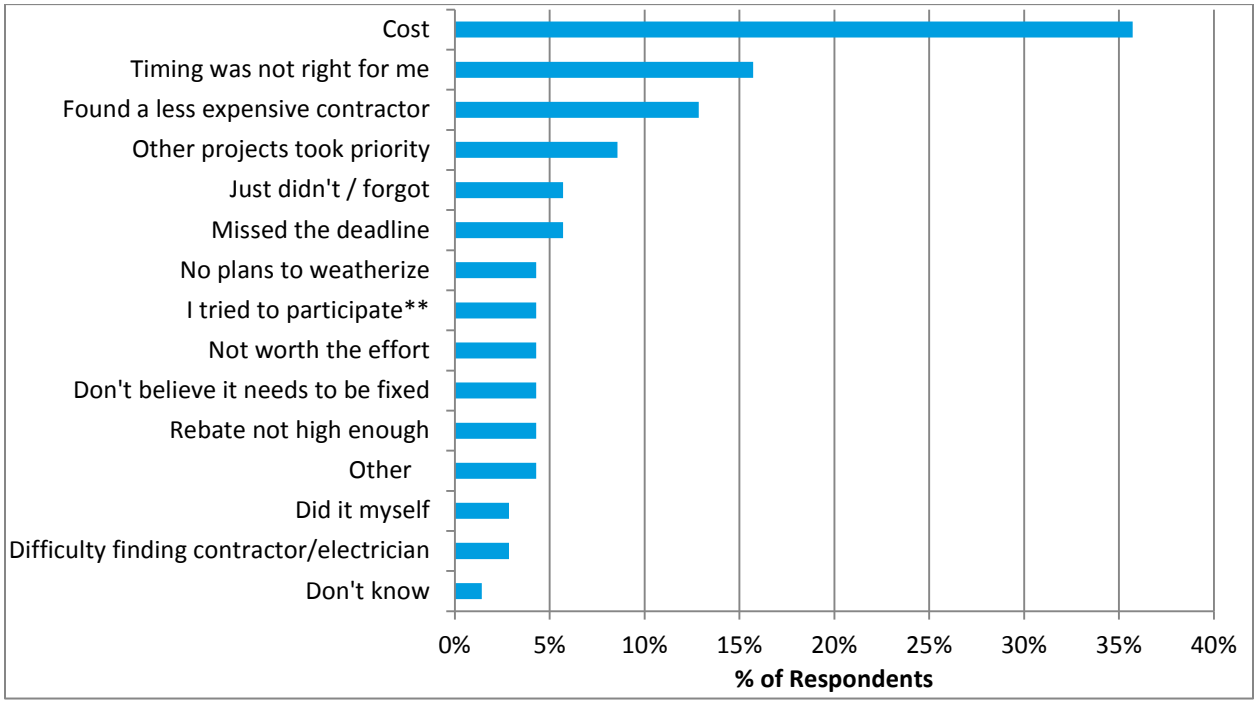
Customer survey results support the PAs and lead vendors assertion that overall cost is a challenge, as 25 non-participants (36%) said that cost of clearing the barrier was the main reason that they did not take advantage of the initiative incentive (Figure 1). Many of those respondents had knob and tube wiring as a barrier and were likely referring to the cost of rewiring their home (mitigation), not the cost of getting their wiring inspected. [15]

Non-participants exhibited confusion about what the initiative actually covered for knob and tube wiring as well. During the survey, even after being told that the incentive covered a wiring inspection, non-participants wanted a higher incentive: they did not differentiate between the cost of the inspection and the cost of mitigating live knob and tube wiring. This shows a lack of customer education or understanding, either about what the barrier is (customers could be assuming a high cost for replacing knob and tube wiring) or the steps required to clear the barrier.

[14] Although some PAs did offer a turnkey option to customers, this concern and issues around finding a contractor were still mentioned by PAs and lead vendors during interviews, as well as by a small number (n=4) of surveyed customers.

[15] These respondents could be confusing the inspection cost with the mitigation cost for live knob and tube wiring.

Figure 1. Reasons for Not Participating in the Initiative (n=70)*



* Multiple responses allowed.
** This includes non-participants who recalled completing some of the steps to participate, but either did not complete all the required steps or did not complete the work in time, as well as non-participants who may have been confused about what participation entailed.

When the Evaluation Team asked non-participants what services would have helped them move forward with weatherization, the majority who responded said none (n=38 of 63; seven did not respond). The remaining respondents said further reducing the cost[16] (n=8) or extending the timeframe (n=2) would have encouraged them to move forward. In addition, three said they would have participated if the program auditor had been able to perform the inspection as part of or immediately following the audit and one would have participated if they had received more education on how to proceed.

Initiative Participation Summary

The Evaluation Team analyzed all NSTAR and National Grid customers who were offered the initiative. The dataset includes all installations for these customers through mid-February 2013. Findings from the initiative data include:

- Out of initiative customers who had a barrier and were recommended weatherization measures, 28% accepted the initiative offer and cleared the barrier.
- 72% of participants who accepted the initiative incentive installed a recommended weatherization measure.
- 13% of participants who did not accept the initiative incentive still installed a recommended weatherization measure through HES.

[16] These respondents could be confusing the inspection cost and mitigation cost for live knob and tube wiring.

Table 12 shows the data comparison findings for NSTAR and National Grid customers.

Table 12. Comparison of Initiative Data (NSTAR and National Grid)

PA	Decision	Homes Where Insulation or Air Sealing was Recommended	Homes Where Insulation or Air Sealing was Installed*	% of Recommended That was Installed
National Grid	Participated	51	38	75%
	Declined	128	24	19%
NSTAR	Participated	34	23	68%
	Declined	95	5	5%
Total	Participated	85	61	72%
	Declined	223	29	13%

Note: Numbers in this table may not match findings based on previous data collected in September 2012, as the updated data received in February has slightly different totals.

* Installation took place from May 2012 through February 2013.

A similar comparison of measure adoption rates, broken out by barrier type, is shown in Table 13. The measure adoption rate is highest for customers who addressed the dryer vent barrier, and is the lowest for those who addressed combustion safety. Thirteen percent of those who did not accept the initiative offer still installed insulation in a home with the knob and tube barrier, while only 7% installed weatherization measures despite denying the initiative offer for combustion safety. In these instances, customers may have had the barrier taken care of outside of the program.

Table 13. Comparison of Measure Adoption Rates by Barrier Type (NSTAR and National Grid)

Barrier	Decision	Proposed Weatherization Measure	Installed Weatherization Measure	% of Proposed That was Installed
Knob & Tube*	Participated	63	45	71%
	Declined	159	21	13%
	Overall	222	66	30%
Combustion Safety	Participated	15	10	67%
	Declined	45	3	7%
	Overall	60	13	22%
Dryer Vent	Participated	7	6	86%
	Declined	16	4	25%
	Overall	23	10	43%

Note: Numbers in this table may not match findings based on previous data collected in September 2012, as the updated data received in February has slightly different totals.

* Only insulation measures are affected by this barrier; thus only insulation measures are counted in the table.

Net Impact Analysis

The Evaluation Team assessed the initiative's ability to cause customers to clear pre-weatherization barriers that they otherwise would not have cleared, and then to proceed with installing previously ineligible recommended efficiency measures. We conducted this assessment in two ways:

1. First, the Team asked surveyed customers a set of questions about the initiative's influence on their decision to clear the barrier. This assessment revealed customers' perspectives of the role of the additional incentive in their decision to clear the identified barrier.

2. Second, the Evaluation Team compared the rate at which initiative customers installed recommended measures after clearing the identified pre-weatherization barrier to the rate at which historic customers—who did not receive an additional incentive—overcame the same barrier and installed recommend measures. This second assessment answers the most critical question surrounding the initiative effort and evaluation: do the additional incentives for clearing pre-weatherization barriers result in more installed measures and therefore greater program savings?

The remainder of this section outlines the results of these two assessments on the net impact of the initiative.

Participant Self-Report Free-ridership

Using the methodology described in this section and based on 45[17] customer participant surveys, only 25% of the initiative barriers cleared would have been cleared without the extra incentive (with ± 9% precision at a 90% confidence interval).

The Evaluation Team recognizes that the self-report analysis for the initiative is one step removed from the traditional calculation of free-ridership, in that no savings are directly associated with clearing a barrier (but rather are associated with the ensuing installation of a program-recommended efficiency measure). The timing for this evaluation did not allow the Team to directly ask about the influence of the initiative on participants' uptake of weatherization measures made possible by clearing the barrier(s).[18] However, the results are indicative of what the free-ridership impacts might have been if measure installation were tied to barrier-clearing actions. For this section, the term free-rider is used to describe barrier-clearing actions that most likely would have occurred in the absence of the additional incentive.

To calculate the rate at which initiative customers would have acted similarly independent of the initiative, the Evaluation Team used a battery of self-report survey questions. Collectively, we

[17] Three of the 48 participating customers surveyed did not answer this battery.

[18] Since the Team conducted participant surveys shortly after the conclusion of the initiative, we limited the survey questions to the likelihood of clearing the pre-weatherization barrier, and not to the likelihood of installing the previously blocked efficiency measure (as insufficient time had passed for many participants to take the next program step). This issue is addressed in the following sub-section, Initiative and Historic Data Analysis, where the Team explores the measure installation rates of initiative and historic participants.

used these questions to estimate the initiative's influence on participants' decision-making processes.

Specifically, the Evaluation Team addressed the following questions:

- How influential was the additional incentive on the participants' decisions to clear the barrier?
- Would the participants have cleared the barrier at some point in the future, even if they had not received the extra incentive?
- Did receiving the extra incentive influence the timing of participants' clearing the barrier?

The Evaluation Team assessed the initiative's influence in three steps:

1. First, we analyzed each participant survey response to determine whether it indicated likely action independent of the initiative.
2. We then assigned a score to each unique set of participant response combinations.
3. Finally, we aggregated participant score by barrier type and for the initiative overall.

In other words, we evaluated the responses to each survey question to assess participants' likely action per question, then converted the survey response options into values of: yes (would have cleared the barrier independent of the initiative); no (would not have cleared the barrier independently); or partial (would have cleared the barrier independently, but at a later time).

Table 14 lists questions we posed, the corresponding response options, and whether responses indicated that the barrier would have been cleared without the additional incentive (shown in parentheses).

Table 15 shows unique response combinations, the scores assigned to each combination, and the number of responses for each combination. The Evaluation Team then used the arithmetic mean of the 45 survey respondents' free-ridership scores to calculate the initiative score of 25%.

Table 14. Mapping of Response Options

How influential was the additional incentive of <PILOT INCENTIVE> dollars on your decision to address <BARRIER> in order to move forward with installing the recommended measures?	To confirm, do you agree that the additional incentive was an important factor in your decision to address <BARRIER>?	To confirm, do you agree that the additional incentive was NOT an important factor in your decision to address <BARRIER>?	Just to clarify, the additional incentive played no role in your decision to address <BARRIER>?	Would you clarify in your own words how important the incentive was in your decision to address <BARRIER>?*	Do you think you would have addressed the <BARRIER> at some point even if you had not received the extra incentive?	You said you would have addressed the <BARRIER> at some point even without receiving the incentive. Did the extra incentive influence your plans on *when* to address the <BARRIER>?
Very influential (No)	Yes (No)	Yes (Yes)	Yes (Yes)	Very important (No)	Yes (Yes)	Around the same time (Yes)
Somewhat influential (Partial)	No (Yes)	No (No)	No (No)	Somewhat important (Partial)	No (No)	Earlier than you would have (No)
Not very influential (Yes)	Don't know (Partial)	Don't know (Partial)	Don't know (Partial)	Not very important (Partial)	Don't know (Partial)	Don't know (Partial)
Not at all influential (Yes)	Refused (Partial)	Refused (Partial)	Refused (Partial)	Not at all important (Yes)	Refused (Partial)	Refused (Partial)
Don't know (Partial)						
Refused (Partial)						

* The Evaluation Team analyzed responses to this survey question individually.

Table 15. Pre-Weatherization Initiative Participant Self-Reported Barrier Clearing Results

How influential was the additional incentive of <PILOT INCENTIVE> dollars on your decision to address <BARRIER> in order to move forward with installing the recommended measures?	To confirm, do you agree that the additional incentive was an important factor in your decision to address <BARRIER>?	To confirm, do you agree that the additional incentive was NOT an important factor in your decision to address <BARRIER>?	Just to clarify, the additional incentive played no role in your decision to address <BARRIER>?	Would you clarify in your own words how important the incentive was in your decision to address <BARRIER>?	Do you think you would have addressed the <BARRIER> at some point even if you had not received the extra incentive?	You said you would have addressed the <BARRIER> at some point even without receiving the incentive. Did the extra incentive influence your plans on *when* to address the <BARRIER>?	FR Score	Number of Responses
Not at all influential	x	x	Yes	x	Yes	Around the same time	100%	3
Not very influential	x	Yes	x	x	Yes	Around the same time	100%	1
Not very influential	x	Yes	x	x	Yes	x	100%	1
Not at all influential	x	x	No	Not at all	Yes	Earlier than would have	75%	1
Not very influential	x	No	x	x	Yes	Around the same time	75%	1
Somewhat influential	Yes	x	x	x	Yes	Around the same time	50%	3
Not at all influential	x	x	No	Not very	Yes	Earlier than would have	50%	1
Somewhat influential	No	Yes	x	Not very	Yes	Earlier than would have	50%	1
Very influential	Yes	x	x	x	Yes	Around the same time	25%	1
Somewhat influential	Yes	x	x	x	Don't know	x	12.5%	1
Very influential	Yes	x	x	x	No	x	0%	12
Very influential	Yes	x	x	x	Yes	Earlier than would have	12.5%	8
Somewhat influential	Yes	x	x	x	Yes	Earlier than would have	25%	4
Somewhat influential	Yes	x	x	x	No	x	0%	2
Very influential	Yes	x	x	x	Don't know	x	0%	1
Not very influential	x	Yes	x	x	No	x	0%	1
Very influential	(Don't know)	x	x	x	No	x	0%	1
Somewhat influential	No	Yes	x	Not at all	No	x	0%	1
Not at all influential	x	x	Yes	x	No	x	0%	1

As noted previously, based on 45 customer participant surveys, 25% of the initiative barriers cleared would have been cleared independently. The scores in Table 16 are broken out by barrier type. The small sample sizes at the barrier level mean that comparing these groups of participants is meaningless.

Table 16. Participant Self-Report Assessments by Barrier

Barrier	Count of Barrier Occurrence	Free-ridership Score
General Combustion Safety Issues	17	20%
Improper Dryer Venting	2	19%
Knob and Tube Wiring	26	29%
Total	45	25%

Initiative and Historic Data Analysis

This section compares initiative data to historic data, in an effort to understand how measure adoption rates may have been influenced by the additional pre-weatherization incentives.

Since the PAs and lead vendors offered the initiative incentive to all customers with known barriers during the initiative period (May to September 2012), there is no control group of customers with similar barriers that were not offered the initiative incentive. The lack of a direct control group of customers facing similar barriers from the same time period makes isolating the impact of the additional incentives on barrier clearing and measure adoption rates more difficult. As a result, the Evaluation Team analyzed historic barriers for HES participants to understand the naturally occurring rate at which participants overcome barriers without an additional incentive. We then compared these findings with the observed rates at which initiative participants overcame the same barriers and installed program-recommended measures.

When comparing initiative and historic data, the Evaluation Team could only directly compare initiative barrier inspection rates and the resulting installation rates with the historic rates for a subset of PAs and for only one barrier type: knob and tube wiring.[19] Unfortunately, historic data for the remaining PAs did not include the required details for this analysis. Table 17 lists how each barrier was tracked in the historic data. Only the knob and tube wiring barrier did not exhibit substantive tracking differences between the initiative and historic data, and could therefore be used for comparison.

[19] Some PAs only offered the initiative incentive when the detected knob and tube wiring status was known to be deactivated (thereby most likely only requiring verification by an electrician before measures could be installed). However, NSTAR and National Grid—the only two PAs with sufficient pre-program data to support the historical analysis—offered the initiative incentives to all customers with a knob and tube wiring barrier, regardless of the wiring status. As a result, historic NSTAR and National Grid customers who faced a knob and tube barrier are an appropriate comparison group for assessing the rate at which NSTAR and National Grid initiative customers facing the same barrier were likely to mitigate without program intervention. A comparison of the historic and initiative customers with just low-cost knob and tube barriers (in instances where the wiring was known to be deactivated) would have provided a better insight into the initiative's influence on verifying deactivation, but this distinction was not made in the data provided.

Table 17. Barriers Tracked Historically (All PAs)

Barrier	Historic Tracking is Relevant to Initiative?	Issue
Evidence of knob and tube wiring	Yes	N/A
General combustion safety	No	Historic data flagged all combustion issues, but did not have enough detail to distinguish those issues eligible for the initiative.
Improper dryer venting	No	Historic data flagged all moisture control issues, but dryer vent-related issues were not tracked distinctly.

The historic tracking data that was most comparable to initiative data was provided by the Conservation Services Group (CSG), and includes the last half of 2011. Specifically, the Team analyzed all the historic knob and tube data provided by CSG from July 2011 through April 2012,[20] as well as all 2010 HES customer data.

To quantify the initiative effects, the Evaluation Team compared the percentage of historic HES customers that overcame the knob and tube barrier and installed a recommended insulation measure without an additional incentive to initiative customers. Table 18 compares the overall measure adoption rates for initiative and historic NSTAR and National Grid customers. For the initiative, the data is further broken out by those customers who accepted the initiative offer and those who declined the offer.

Table 18. Comparison of Initiative and Historic HES Participants (Knob and Tube Barriers for National Grid and NSTAR Only)

Data Source	Decision	N	Fixed Barrier	Percent Fixed Barrier	Installed Insulation	Percent Installed Insulation
Initiative Data (May – February 2013)	Participated	55	51*	93%	35	64%
	Declined	183	69	38%	25	14%
	Total	238	120	50%	60	25%
Historic Data (July 2011 – April 2012)	No offer	2,438	1,383	57%	567	23%

Note: Numbers in this table may not match findings based on previous data collected in September 2012, as the updated data received in February has slightly different totals.

* The initiative database included participants who were in the process of, but had not yet completed, clearing the barrier.

As shown in Table 18, the two datasets compared as a whole show that the measure adoption rate for the initiative customers is marginally higher. However, there are two unaccounted-for factors in this comparison: seasonality and amount of time that has passed since the audit or offer date.

The full historic dataset of customers with a knob and tube wiring barrier includes individuals who had audits throughout the majority of the year—July 2011 through April 2012—whereas the initiative data only includes HES customers who had an offer extended as part of the pilot—May 2012 through July 2012. For a better comparison, the Team trimmed the proposed and installed

[20] Due to changes made to the HES Program tracking data system, historic data containing knob and tube barrier details are not readily available before July 2011 to compare to current initiative data.

dates in the historic data to approximately match the timeframe of the initiative data; the compared historic dataset just included those customers who had at least seven months and under 10 months since their audit. Finally, to ensure a reasonable comparison, the Team determined the measure adoption rate at the end of month seven for both groups. By looking at the installation rates seven months after the audit or offer, we are able to use all the initiative data that covers the most number of months. (Table 19)

Figure 2 shows a comparison of uptake rates based on the number of months that elapsed since the offer date. As shown, less data is available as the number of months from the offer increases. This demonstrates that the certainty of uptake rates decreases as less data becomes available. Since the data does not show what action, if any, was taken in the eighth month or beyond for many records, these data can begin to skew the results.

Figure 2. Measure Adoption Rates by Number of Months of Initiative Data Available

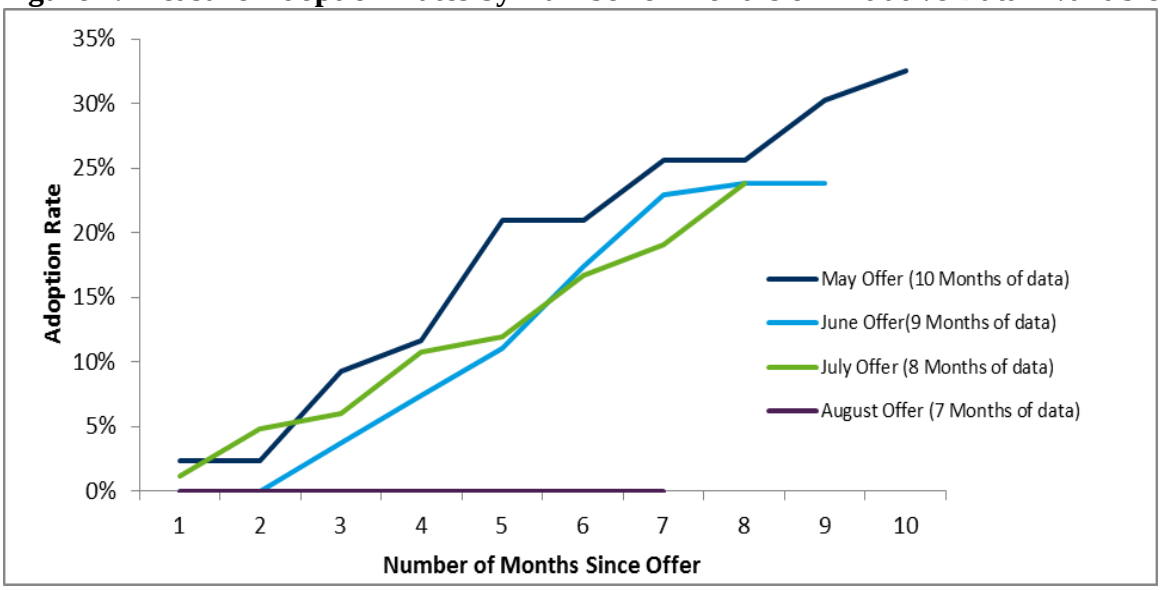


Table 19 compares the two datasets seven months after the audit or offer, just for customers who had between seven and 10 months since their audit or offer date.

Table 19. Comparison of Initiative and Historic HES Participants' Measure Adoption Rates (Knob and Tube Barriers for National Grid and NSTAR Only)*

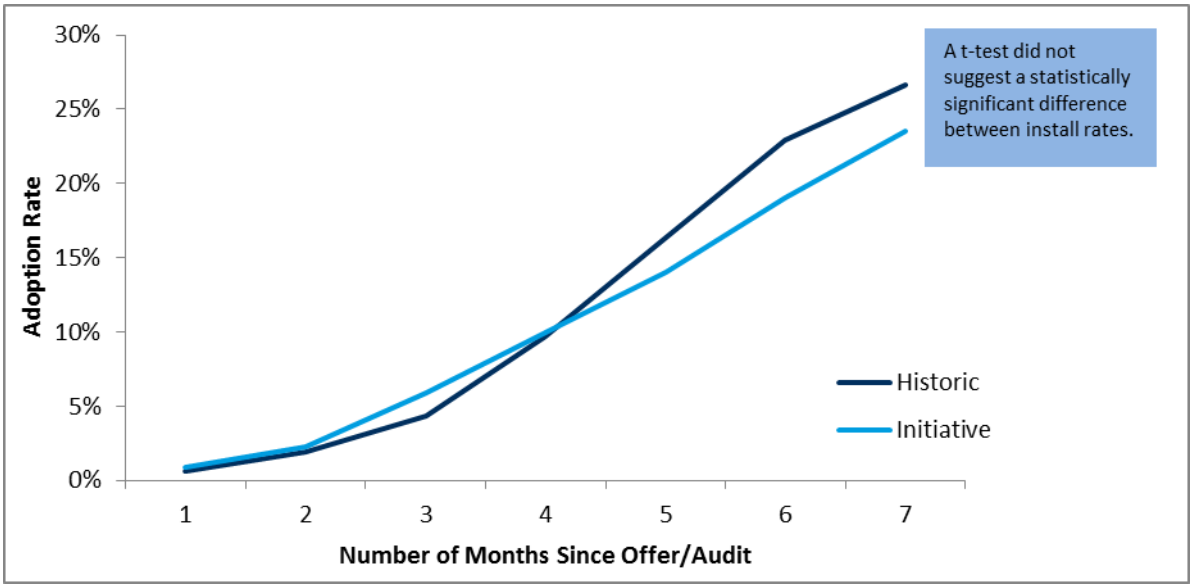
Data Source	Offer Status	n	Fixed Barrier	Percent Fixed Barrier	Installed Insulation	Percent Installed Insulation
Initiative Data (at month seven)	Offer	238	110	46%	52	22%
Historic Data (at month seven)	No offer	1,378	775	56%	367	27%

Note: Numbers in this table may not match findings based on previous data collected in September 2012, as the updated data received in February has slightly different totals.

* This table only shows customers' data at seven months for those with between seven and 10 months since the audit or offer.

As shown in Table 19, the measure adoption rate from the historic data is slightly higher than from the initiative data. This comparison of cumulative measure adoption rates is also presented in Figure 3, which shows how the adoption rate increases as time passes. The Evaluation Team conducted a t-test[21] at a confidence and precision of 95/5, which did not indicate the presence of a statistically significant difference between the measure adoption rates for initiatives participants and the rate of adoption demonstrated historically (p=0.72).

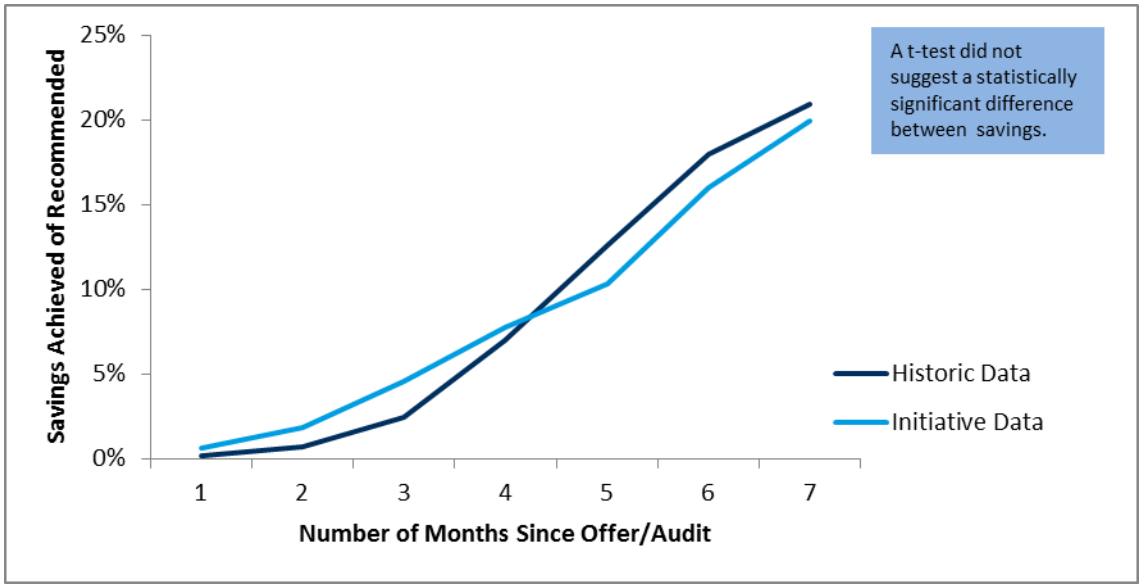
Figure 3. Cumulative Measure Adoption Rates Seven Months Following Audit or Offer



To understand how this measure adoption rate translates to energy savings, the Evaluation Team compared *ex ante* savings for the initiative data and historic data. We found that for the first four months after the audit or offer the initiative, the data show greater savings, but then after that four months the historic data shows greater savings (Figure 4). When the Evaluation Team ran a t-test on these data, it did not indicate a statistically significant difference between the *ex ante* savings realized seven months after the initiative population received an audit and historic participation in the HES Program (p=0.98).

[21] The t-test is a statistical test used to determine whether two sample means, or proportions, are statistically significantly different. The Evaluation Team ran a t-test to determine whether statistically significant differences existed between the implementation rates for the historic and initiative populations (for groups having equal variance and utilizing a two-tailed distribution). For these two groups, the probability of obtaining a t-statistic (probability: p=0.72) suggests that the implementation rates did not differ significantly between individuals who received an incentive and those who did not (historically).

Figure 4. Cumulative Savings Seven Months Following Audit or Offer



This comparison could still be influenced by seasonality, given that initiative customers only received offers from May 2012 through July 2012. To control for seasonality, the Evaluation Team then compared the historic and initiative data of only those customers who were audited in July 2011 (for historic data), and July 2012 (for initiative data). This was the only month when both historic and initiative data were available for the same time period. Although this limits the datasets to just one month, it does allow for comparison with the seasonality effect removed.

Figure 5 shows a comparison of the measure adoption rates of customers that had audits in July. Figure 6 shows the same comparison groups by savings achieved over savings recommended. When the Team ran a t-test on these data, it did not indicate a statistically significant difference ($p=0.68$ for Figure 5 and $p=0.54$ for Figure 6).

Figure 5. Cumulative Measure Adoption Rates Over Eight Months for Initiative and Historic Customers with Audits or Offers in July

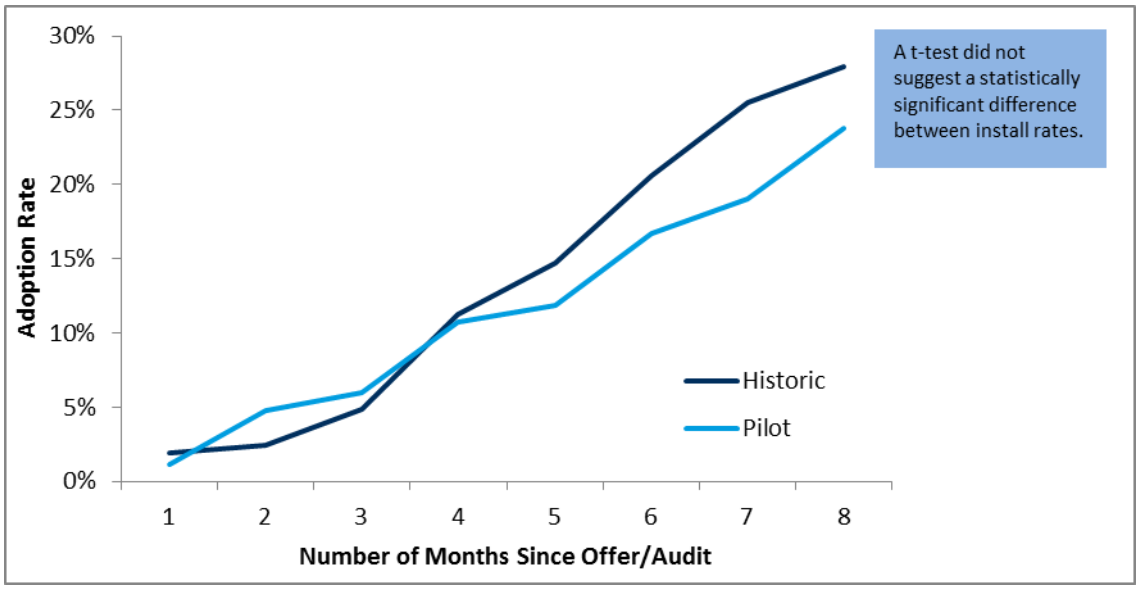
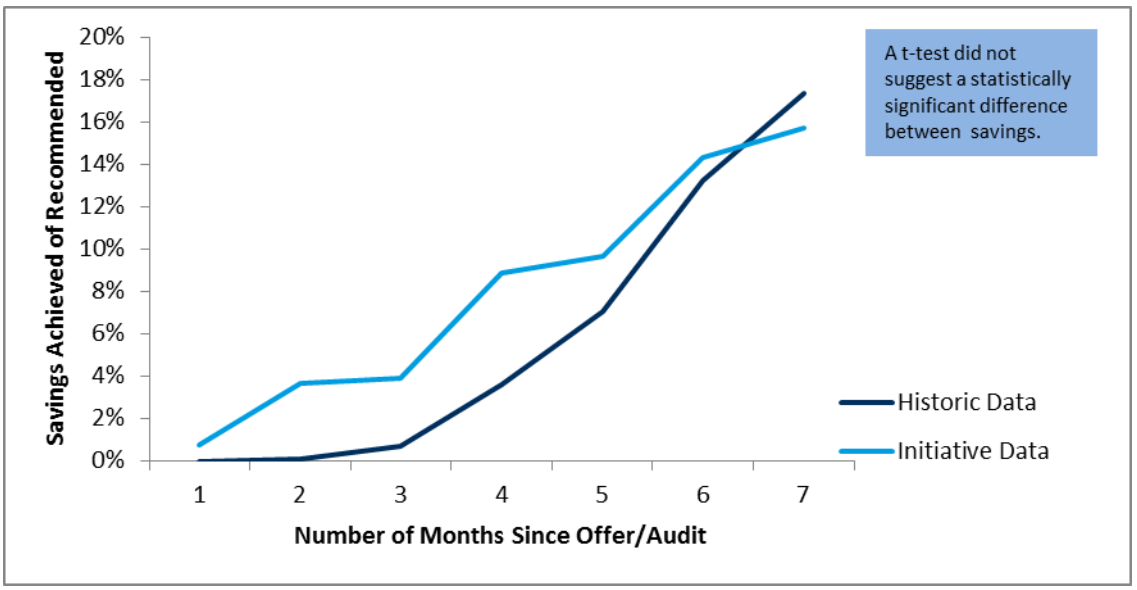


Figure 6. Cumulative Savings Over Eight Months for Initiative and Historic Customers with Audits or Offers in July

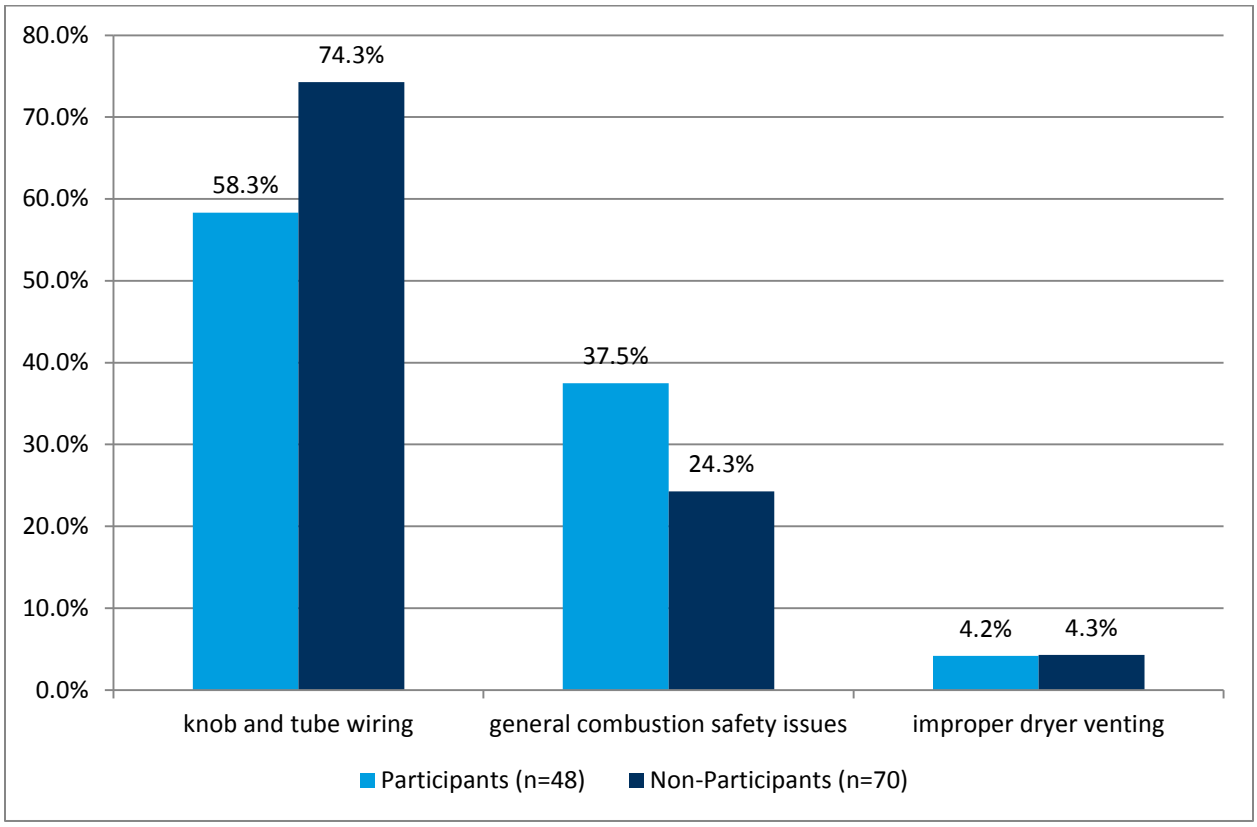


Additional Survey Results

In total, 118 homeowners responded to the Phase 1 and Phase 2 surveys. Of those respondents, 48 accepted the offer (participants) and 70 did not (non-participants).

As shown in Figure 7, of the three barriers eligible for the initiative incentive, the majority of survey respondents (80 homeowners; 68%) had knob and tube wiring as their identified barrier. Conversely, only five homeowners cited improper dryer venting as a barrier (4%).

Figure 7. Barriers Identified by Survey Respondents (n=118)*



* Two non-participant respondents had multiple barriers.

All but six survey respondents (95%) recalled that their auditor explained why the barriers needed to be fixed before they could move forward with the program. The most commonly cited reasons for fixing the barriers included that they pose possible fire hazards (35%), carbon monoxide risks (20%), safety issues (14%), and because it was a requirement for weatherization (13%).

Knob and Tube Wiring Status and Awareness

Knob and tube wiring was one of the more common barriers, and one of the more complex for customers to deal with. The Evaluation Team therefore asked a few more in-depth questions pertaining to this barrier.

Participants

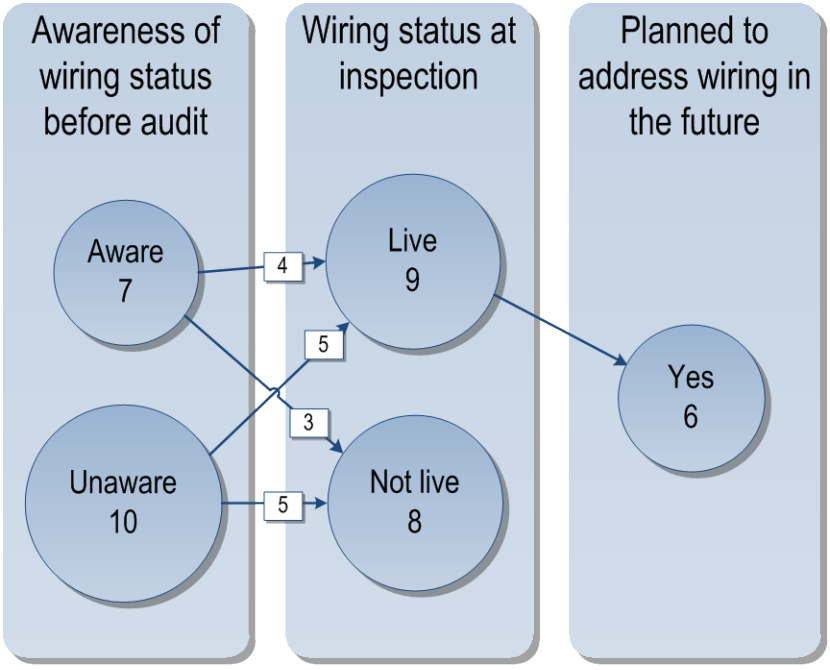
The Evaluation Team asked all Phase 2 survey respondents if they knew whether their wiring was live prior to the inspection. Seven participants said they already knew their wiring status, while 10 said they did not know. We also asked Phase 2 participant survey respondents whether their wiring was live at the time of the inspection: nine said their wiring was designated live at

the time of the inspection and eight said their wiring was designated not live at the time of the inspection. One participant did not know.[22]

Of the nine participants who said the wiring was live at the time of inspection, seven have since had their the knob and tube wiring removed or replaced. One respondent intends to remove the wiring within the next couple of months,[23] and another participant does not intend on removing the wiring because the cost of rewiring is too high.

Figure 8 maps out the awareness, wiring status, and future plans of surveyed initiative Phase 2 participants with a knob and tube wiring barrier. The graphic illustrates that whether or not a customer's wiring was live did not have a strong correlation to their awareness of their wiring status or their plans to address the wiring. Awareness of wiring status and those who had plans to address the barrier were a mix of those with live wiring and non-live wiring.

Figure 8. Breakdown of Phase 2 Participants'* Wiring Status, Awareness, and Plans



* Only Phase 2 participant survey respondents were asked this series of questions.

Non-Participants

Of the 52 non-participants who had knob and tube wiring as a barrier, 31 (60%) responded to the question of whether they knew their knob and tube wiring was live prior to the home energy

[22] We only asked live and not-live wiring questions in the Phase 2 survey. Therefore, no Phase 1 survey participants with a knob and tube wiring barrier was asked this question, which is a factor in the low response rate.

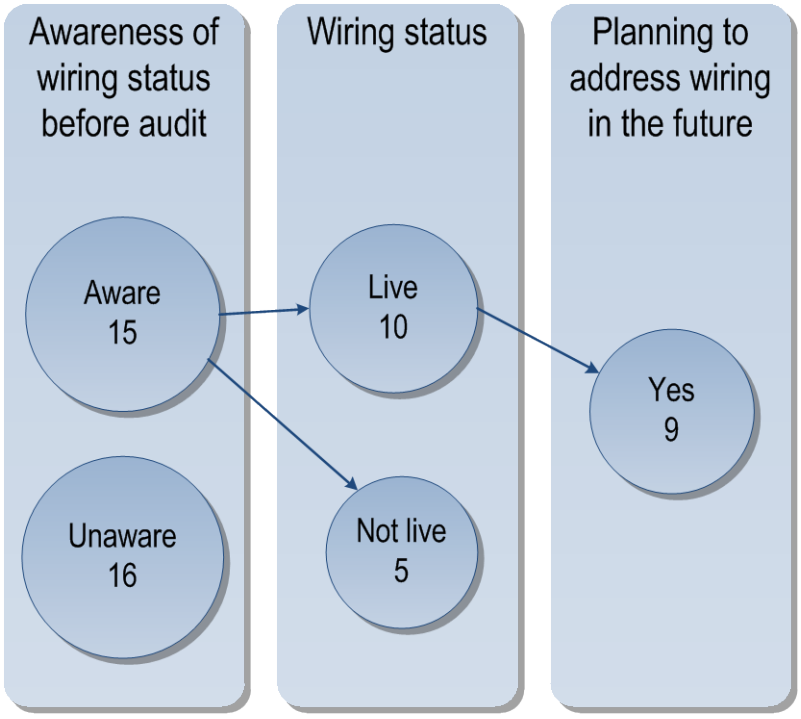
[23] Knob and tube wiring can also serve as a barrier to obtaining homeowners insurance, which may be an indication of why so many participants decided to move forward with replacing their knob and tube wiring despite its high cost.

assessment. Fifteen of these 31 respondents said they already knew, and 10 of those 15 said their wiring was live (with the remaining five responding that their wiring was not live). Nine of those 10 non-participants with live wiring said they plan to remove or replace the knob and tube wiring in the future.

Additionally, the Evaluation Team has learned through our research and contractor interviews that knob and tube wiring may prevent homeowners from acquiring homeowners insurance; therefore, homeowners have a motivation outside of the initiative to replace their wiring. This outside motivation may influence some initiative non-participants to clear their knob and tube wiring barrier even without receiving an incentive to do so.

Figure 9 maps out the awareness, wiring status, and future plans of surveyed initiative Phase 2 non-participants with a knob and tube wiring barrier.

Figure 9. Breakdown of Phase 2* Non-Participants' Wiring Status, Awareness, and Plans

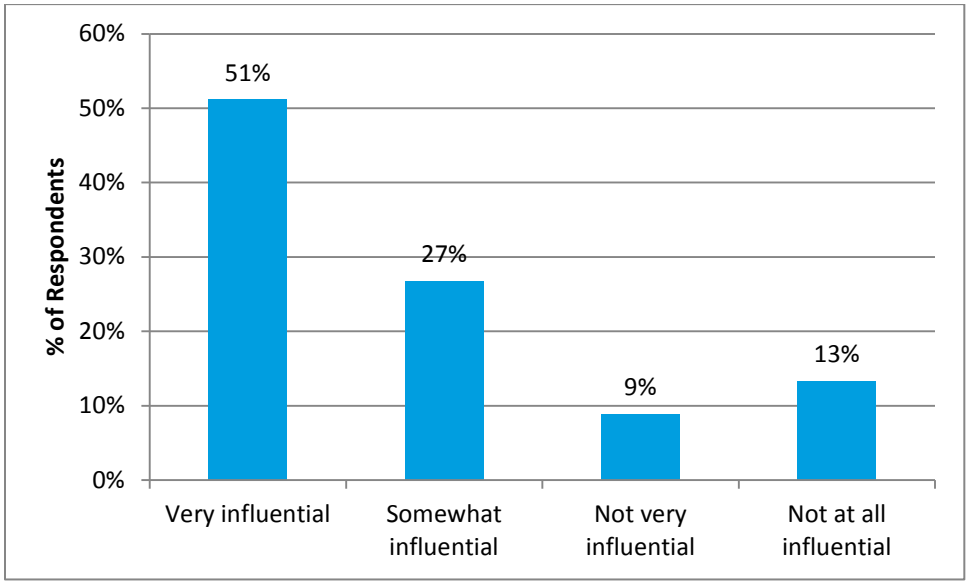


* Only Phase 2 non-participant survey respondents were asked this series of questions.

Influence

The initiative incentive was very influential for the majority of participants to clearing their weatherization barrier (Figure 10), with only 10 respondents noting that the extra incentive was not very or not at all influential on their decision to address barriers.

Figure 10. Influence of Incentive on Barrier Clearing (n=45)



Twenty-four participants would have addressed the barrier in the future even if they had not received the initiative incentive,[24] whereas 18 would not have addressed the barrier and one did not know. Most of the 24 participants who would have addressed the barrier without the incentive (n=15) addressed the barrier sooner than they would have without the extra incentive, while nine participants would have addressed the barrier at around the same time.

Of the 24 participants who would have addressed the barrier without the initiative incentve, only three reported that their wiring as not live at the time of the inspection. Of the 18 participants who would not have addressed the barrier outside the initiative, only five reported having inactive wiring at the time of inspection.

The Team asked participants how influential the information provided by their auditor was on their decision to address the barriers. The majority of Phase 2 participants (19 of 27) noted that the information provided by the auditor was very influential on their decision to address barriers.

Cost Estimates and Understanding

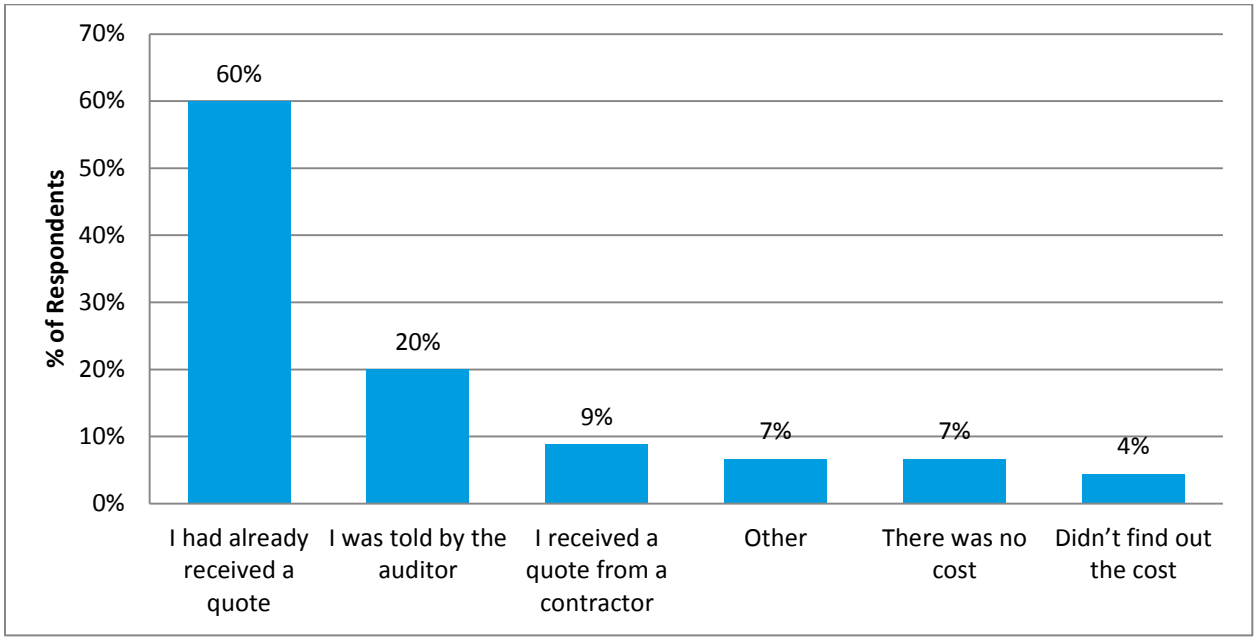
The Evaluation Team asked both participants and non-participants about the cost of addressing the barrier in order to assess customers' understanding of the costs and steps involved with clearing the barriers found during the audit.

[24] Although the results of this one question indicate a possibility of high free-ridership, the Evaluation Team asked each customer a full battery of free-ridership questions, and assigned partial free-ridership scores based on all question responses, including the influence of the incentive and timing. As shown in the Free-Ridership section, many of the customers who responded in the affirmative to this particular question did not receive a free-ridership score of 100%. In fact, some of these select respondents, due to their responses to other free-ridership questions, were assigned no free-ridership.

Participants

To determine how much it would cost to address the barrier, the majority of participants (n=27; 60%) received a price quote from a contractor. Figure 11 shows the methods participants used to determine the barrier cost.

Figure 11. How Participants Learned of the Cost to Address Barrier (n=45)*



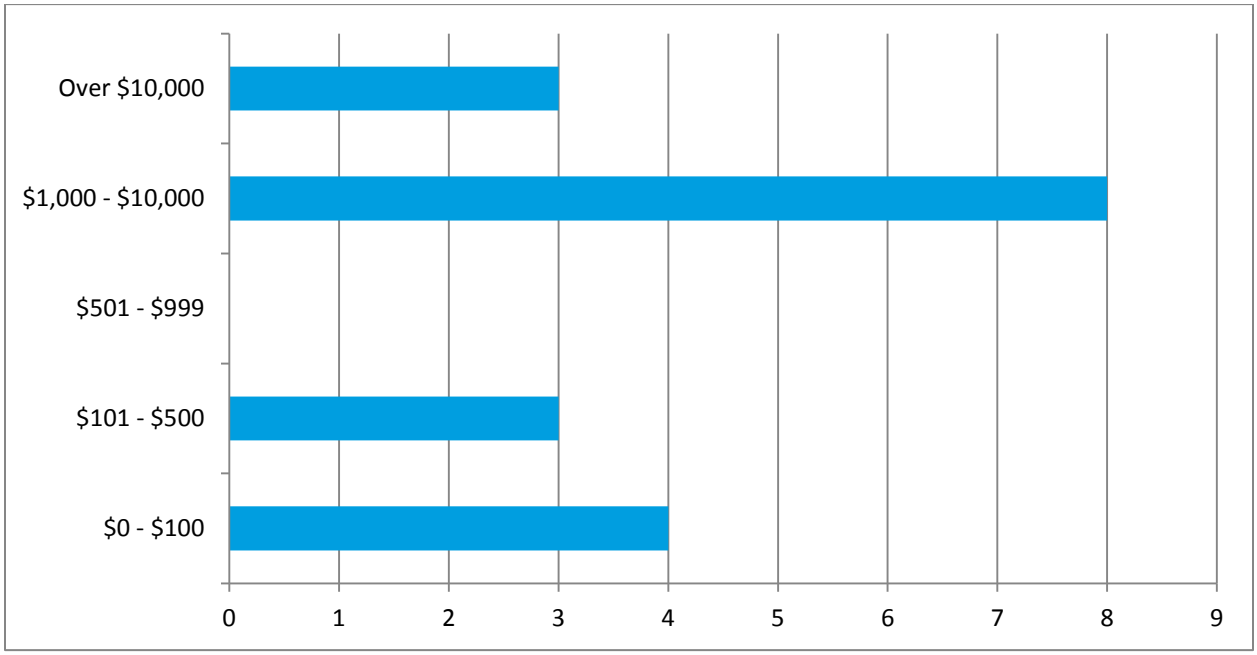
* Multiple responses allowed.

Most participants learned about the steps needed to fix the problem through their contractor (49%) or the auditor (38%), while one participant did not know and the remaining six had not looked into it yet.

Non-Participants

Of the 70 non-participants surveyed, 39 reported having future plans to address the barrier identified during the home energy assessment. When the Team asked if they knew how much it would cost to address the barrier, 20 said they did. The majority of these 20 respondents thought it would cost thousands of dollars, while one respondent simply stated that it would be expensive. Two changed their response, finally stating they did not know (Figure 12).

Figure 12. Non-Participant Cost Assumption for Clearing Barrier (n=17)*



* Multiple responses included

The high cost assumptions show a lack of customer education on either what the barrier is (customers could be assuming a high cost for mitigation of knob and tube wiring) or the steps required to clear the barrier. Only seven respondents assumed a cost close to the actual cost range of inspecting the status of the wiring (less than $500).

Eleven respondents assumed a cost over $1,000 and nine of those had a knob and tube wiring barrier. For these nine respondents the high assumed cost could be a result of the customers confusing the inspection cost with the mitigation cost.

Participants' Contractor and Turnkey Use

The Evaluation Team asked Phase 2 survey participants[25] whether the contractor who conducted their energy audit was the same contractor who addressed their barrier. Twelve respondents said yes, possibly indicating they were working with a HPC. Of the remaining 11 respondents, five said they were told to find their own contractor and six said they were given a choice to either find their own contractor or have one selected for them. Of the six participants given a choice, two used the contractor selected for them and four found their own contractor.

[25] We conducted surveys in both phases of the initiative evaluation; however, following our review and analysis of the Phase 1 survey findings, we added questions to the Phase 2 survey. Therefore, the results of these additional Phase 2 questions have a smaller sample population. The Phase 1 and Phase 2 designations indicate which samples were asked which questions.

Feedback

Participant

More than half of surveyed participants had positive feedback on the initiative, including:

- It allowed them to install energy-saving measures that will save them money;
- The staff and contractors were knowlegable and friendly; and
- They recommended the HES Program to their friends and neighbors.

Other comments from participants include:

- The turn-around time to address barriers is not long enough;
- The process is complicated and confusing; and
- It has been difficult to receive rebates.

Non-Participants

The following are the results of non-participants' answers about their experience with the home energy assessment:

- 36 non-participants provided feedback about their home energy assessment; 21 (58%) said it was positive.
- Of those who did not report a positive experience, three mentioned wanting more clear communication about the initiative and its requirements, such as emphasizing the deadline and offering greater accessibility to program staff.

Additional comments from non-participants on why they decided not to participate in the pre-weatherization initiative pilot included:

- One non-participant said they are planning a major home renovation and will address the barrier at that time by replacing their knob and tube wiring.
- Another non-participant said: "*I decided to just get my wiring replaced. I wasn't interested in paying to know if it was live*."
- One non-participant said he had his wiring checked by a family friend who is a licensed electrician and did not charge him.
- One surveyed non-participant who had moved ahead with weatherization work after learning that his knob and tube wiring was inactive said: "*I found a contractor that would install the insulation at a lower price than what was quoted to me by the contractor that was assigned the case.*"

5. CONCLUSIONS AND RECOMMENDATIONS

The Evaluation Team assessed initiative perspectives, assumptions, and processes to determine whether the initiative met its goal of encouraging customers to move forward with weatherization measures by offering additional incentives to remove pre-weatherization barriers.

Our conclusions, based on the findings above, are as follows:

- **The initiative data did not show a significant change in the measure adoption rate for National Grid and NSTAR customers who faced the knob and tube wiring barrier.** Although these findings suggest that the initiative may not have influenced the measure adoption rate, it is important to remember that the provided data only represent a subset of HES customers, and the Team's analysis was limited to two PAs and only one barrier.[26]

If the PAs wish to incorporate the additional incentive into the HES Program, the Team suggests the following observations and recommended program design improvements:

- **While the turnkey option offers customers easy access to approved contractors, the PAs and lead vendors that offered the turnkey option were uncertain of the delivery option's long-term viability.** These PAs and lead vendors cited difficulties identifying and enrolling contractors given the limited financial opportunities for these contractors. In other words, the level of work for contractors generated by the initiative (to inspect knob and tube wiring and clear other pre-weatherization barriers) was not substantial enough to interest and enlist a sufficient number of approved turnkey contractors. These PAs and lead vendors also cited the administrative burden, such as managing and updating the lists, as a challenge to turnkey viability. Further, according to Phase 2 participant survey respondents, only a small number of participants used this delivery option.
  - ***Recommendation: The PAs should work closely with their lead vendors to determine the long-term viability and effectiveness of the turnkey option.***

[26] The Team compared all customers facing a knob and tube barrier (those with known live wiring, known deactivated wiring, and those whose wiring status was unknown). Given the higher cost to mitigate live wiring, customers with known deactivated wiring were most likely to have been encouraged to clear the barrier by the initiative incentive (which was specifically designed to offset the cost of a licensed electrician certifying deactivation). A comparison of the historic and initiative customers with just low-cost knob and tube barriers (in instances where the wiring was known to be deactivated) would have provided a better insight into the initiative's influence on verifying deactivation, but this distinction was not made in the data provided.

- **Non-participants indicated having confusion about what the initiative actually covered for knob and tube wiring.** During the survey, even after being told the incentive was only to check the wiring, non-participants still wanted a higher incentive: they did not differentiate between the cost of the inspection and the cost of replacing the knob and tube wiring. This confusion is worth noting, given that most customers surveyed (97%) said the information provided by their auditor was somewhat or very helpful, indicating that customers appreciate the information from the auditor and take it seriously.
  - ***Recommendation: Identify ways to better communicate what the cost of checking knob and tube actually covers and how it differs from the cost to actually replace the knob and tube wiring.***
- **Stakeholders and customers that were subjected to the 30-day requirement indicated that additional time would have helped.** Specifically, survey respondents that were given the 30-day deadline indicated that the timeframe presented a challenge for addressing the initiative barriers (12%, n=13). **However, an analysis of acceptance rates revealed that customers who were given a 30-day deadline had higher acceptance rates than those offered the 90-day deadline.**
- **Also, as previously stated, two of the three 30-day PAs (NSTAR and National Grid) offered additional delivery channels (HPC and turnkey) that were not available to some of the customers subjected to the 90-day timeline.**[27] It is not possible to conclusively distinguish between the relative influence of the timeline versus the influence of delivery option differences. Empirically determining the relative influence of the timeframe is made more difficult by the large disparity of initiative offers made by 30-day (n=404) versus 90-day (n=101) PAs.
  - ***Recommendation: Consider a compromise deadline of 45 or 60 days that keeps some of the benefits of the immediacy of the deadline, but makes it more realistic to meet the deadline. Additional research could be conducted to identify the most effective deadline.***
- **Interviews with PAs and lead vendors indicate that elements of the initiative's design and delivery varied across PAs.** Examples of variation included marketing materials, participant forms, incentive amounts, and the timing of when participants received the rebate for clearing a barrier.
  - ***Recommendation: While some variation may be necessary, PAs should discuss these variations, determine best practices, and standardize design and delivery as much as possible across the state.***

[27] With the exception of Unitil, who offered 90 days and also used HPCs.