

Green Jobs - Green New York Audit Only Measure Adoption Rate (MAR)

Impact Evaluation (2016 – 2018)

Final Report

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1 Executive Summary

The Green Jobs – Green New York (GJGNY) Act-funded Residential Energy Audit Program provides New Yorkers in targeted communities with no cost in-home energy assessments.¹ Through this program auditors identify and report on cost-effective energy efficiency upgrade opportunities. The audit program is also the primary vehicle for delivering low- and moderate-income customers to two New York State Energy Research and Development Authority (NYSERDA) programs that offer installation incentives: EmPower NY and Assisted Home Performance with Energy Star (HPwES). GJGNY audit participants are not required or may not be eligible to participate in either of the follow up programs.

Audits that do not result in the installation of recommended measures through the HPwES or EmPower programs are considered “audit-only projects.” In some cases, audit recipients act on recommendations and install measures without applying for NYSEDA installation incentives. No NYSEDA program claims savings for these actions. The audit-only projects are the focus of this evaluation. Throughout the duration of this report, the respondent group is referred to as “GJGNY Audit Only” or “Audit Only” participants.

This report describes an impact evaluation that assessed the measure adoption rate (MAR) of measures recommended through residential audit reports as well as the customer satisfaction of NYSEDA’s Audit Only participants that received a program-funded in-home audit between January 1, 2016 and December 31, 2018.

The objectives of this impact evaluation are as follows:

- Estimate the evaluated gross energy impacts for Audit Only projects, which includes electric energy (kWh) and fossil fuel energy (MMBtu) savings and provide recommendations that seek to improve the program’s effectiveness.
- Develop MAR values (as a percentage of recommended savings) by measure type.
- Provide feedback on customer satisfaction based on the program participation experience.

¹ GJGNY was created in 2009 with revenue from the sale of carbon emission credits. Decarbonization is a primary goal. NYSEDA’s GJGNY Act-funded residential and small business programs are described at <https://www.nyseda.ny.gov/Researchers-and-Policymakers/Green-Jobs-Green-New-York>. Details of the audit program scope are at <https://www.nyseda.ny.gov/All-Programs/Programs/Energy-Audit-Programs>.

1.1 Approach

The GJGNY Audit is not a direct install program; therefore, measure adoption will occur over time as the customer explores the measures further (after the initial identification in the assessment). The customer will then solicit contractor quotes and prepare for construction – or perhaps the customer will wait for cash-flow conditions to improve to allow for implementation. This means that the number of installed measures will likely increase over time before plateauing at a long-term value. This concept is the basis for the MAR approach used in this evaluation and described further below.

Through the GJGNY program, NYSERDA funded 40,086 residential audits between January 1, 2016 and December 31, 2018. These audits provided customers with an overview of their homes’ energy consumption and made unique measure recommendations that generally included anticipated project costs and cost savings. Of that population, 26,220 customers did not participate in either follow up program. The Impact Evaluation Team (“evaluators”) estimated the gross savings for those projects based on data collected from an online survey of a statistically representative sample of 1,037 participants who received completed audits. The evaluators sent an initial screener email survey (“Residential Screener Survey”) to the 11,225 customers with email addresses on file to identify customers who installed the recommended measures. Of the respondents who confirmed installing measures in the Residential Screener Survey, measure information was extracted from their respective audit reports and a detailed follow up survey (“Follow-up Survey” or “MAR Survey”) was conducted to collect details of the installed measures. In preparation for the MAR Survey, engineers reviewed 499 audit reports and extracted information to inform a customized battery of questions for each MAR Survey participant. Of the 499 reports in the MAR Survey population, MAR Surveys were completed for a total of 164 interviews, representing a response rate of 33%. The Audit Only population survey disposition can be found in Table 1-1, below. A more detailed breakdown of this information can be found in Section 3.

Table 1-1. Screener and Measure Adoption Rate Survey Disposition

Disposition	Random Stratum
Audit Only participants	26,220
Residential Screener Survey population	11,225
Residential Screener Survey responses	1,037
Customers who confirmed installing measures	558
Audit reports provided to ERS	499
MAR Survey population	404
MAR Survey responses	164

These interviews included questions regarding the adoption rate of the measures recommended in the energy audit report, early retirement, the customer interaction with the contractor that conducted the audit, and the extent to which implemented projects recommended in the audits later received installation incentives from NYSERDA or other program administrators (e.g., utilities or other program overlap). MAR values as a function of measure type, fuel type, and other factors were examined to identify trends and opportunities for programmatic improvement.

1.2 Results

This section presents the results and findings from the completed Residential Screener and MAR surveys of GJGNY Audit Only customers.

1.2.1 Measure Adoption Rate Results

The primary focus of this study was developing gross energy savings estimates using the long-term MAR values for Audit Only participants in the Residential Energy Audit Program. The evaluators also developed MAR values by measure and fuel type. Gross savings and MAR by fuel type are outlined in Table 1-2, below.

Table 1-2. Audit Recommended and Installed Energy Savings (Adjusted Gross Impact)

Parameter	Audit Recommended Savings	Weighted Measure Adoption Rate	Installed Savings (Adjusted Gross Impact)
Electric energy (kWh/yr)	16,609,920	0.47	7,811,053
Natural gas energy (MMBtu/yr)	576,809	0.48	277,193
All other fuel energy* (MMBtu/yr)	352,360	0.41	146,122
Total energy (source-equivalent MMBtu)	985,842	0.46	421,819

*Includes fuel oil, wood, and propane

The total program long-term MAR for the combination of all measures is 0.46. The total installed source-equivalent energy savings for the entire Audit Only population is 421,819 MMBtu, which amounts to an average savings value of 26 MMBtu per household with installed measures. The calculated relative precision for this result is 12% at 90% confidence.

A previous study of Audit Only participants from 2010-2013 used billing analysis to estimate natural gas savings of 7.4±1.3 MMBtu per household with major installed measures. The average natural gas savings

based on this current study is 16 ± 1.9 MMBtu per household with installed measures. If the prior HPwES evaluation’s natural gas savings realization rate of $65\% \pm 5\%$ is applied to this study’s results for more similar comparison, the resulting 10.4 MMBtu of verified gross savings (VGS) is higher than the 2012 audit-only research but the uncertainty bounds overlap. Aside from that difference, because this evaluation covers all fuels the overall estimated program impact is higher.

The MAR varied based on the measure and fuel type with programmable thermostat and cooling measures yielding the highest MAR values of 0.61 and 0.73, respectively. Insulation and air-sealing measures were the most commonly recommended and installed measures, accounting for 50% of the installed measure count and 70% of the installed energy savings. Hot water heating measures were at the low end with a 0.17 adoption rate. Additionally, electric measures were more commonly installed than fossil fuel-saving measures, as can be seen in the MAR values in Table 1-2.

Figure 1-1, below, illustrates the MAR over time, based on customer responses associated with the 554 measures recommended in the 164 audits. Eventually, 46% of the savings associated with recommended measures were implemented by the audit recipients surveyed. Approximately half of those savings were realized within one year of audit completion and 73% within two years. Implementation continues through the third and fourth years at a lower adoption rate until the cumulative value plateaus in the second half of the fourth year, ultimately becoming the study’s MAR value.

Figure 1-1. Audit Only Energy Efficiency MAR over Time



Customers reported a very small proportion of the measures (1%) as being installed prior to the audit completion date. The small number of instances was likely the result of customers recalling the dates

incorrectly. These measures are represented by negative values on the x-axis of the plot above in Figure 1-1.

1.2.2 Customer Satisfaction Results

In addition to studying the overall program and individual measure MAR values, the other primary focus of this evaluation was to assess customer satisfaction with the NYSERDA Residential Energy Audit Program. Of the 1,037 screener survey respondents, 880 participants provided customer satisfaction feedback for the evaluators to use (there were missing responses from 157 customers). The average response for each of the customer satisfaction questions can be seen in Table 1-3, below. The questions used a range of 0 to 10. The closer the response number was to 10, the more positive the response, with 0 representing very dissatisfied and 10 representing very satisfied.

Table 1-3. Customer Satisfaction Question Response Summary

Question topic	Average Response
Application process	8.2
In-home contractor visit	8.0
Energy audit results, quality, comprehensiveness and usefulness	7.4
Contractor responsiveness	7.3
Post-energy audit involvement	6.1
Overall contractor quality	7.1
Overall home energy audit experience	7.4

Post-energy audit involvement was the lowest-scoring question among the customer responses. The question was written as, *On a scale of 0-10 please rate the following: Post-energy audit involvement, such as contractor follow up on the recommended measures.* The low customer-satisfaction score is likely indicative of a general dissatisfaction with the lack of follow-up from the contractor after making recommendations in the audit report. [The average response for the overall experience was 7.4, which equated to a net-promoter score of 29. This is discussed further in Section 4.3 below.](#)

1.2.3 Overall Precision

The evaluators calculated an average adopted energy savings value of 26 ± 3 MMBtu per household with installed measures. The calculated relative precision for this savings estimate is 12% at the 90% confidence interval.

1.3 Findings and Recommendations

The evaluators identified three findings from this impact evaluation and offer the following recommendations. The recommendations follow each explanatory paragraph in the list below.

- 1. Finding:** GJGNY Audit Only participants prefer additional follow-up by the contractor post-energy audit. Overall customer satisfaction was quite high for the program. The one question where the average response was lower was with respect to program follow-up. Follow-up also can increase measure adoption.

Recommendation: The evaluators believe that more measures could be installed sooner if a follow-up with the Audit Only participant is conducted to serve as a reminder and, potentially, to address any outstanding questions the customer may have. The evaluators believe the respondent would favor a follow-up by NYSERDA staff directly. Further, the evaluators believe NYSERDA contact with the contractors would increase measure adoption by the customer. This recommendation is further supported by the fact that almost 20% of the respondents to the screener survey reported either not remembering if they had received an audit report or not remembering if they had installed measures. Follow-up could be conducted by NYSERDA staff, the contractor that already has the relationship with the customer and understands the recommendations, or by a third party contracted by NYSERDA to do so.

- 2. Finding:** Less than 15% of the recommended measures from reviewed reports targeted electric end uses or fuel-switching measures.

Recommendation: The evaluators recommend providing contractors with additional training on the benefits of electric measures (with a focus on heat pumps) to help drive an increase in recommendation (and adoption) of these measures. Doing so is expected to increase awareness of beneficial electrification, which becomes increasingly important as the shape of the energy grid continues to change and as program goals shift toward decarbonization efforts. As evidenced by this evaluation, the energy audit program is an effective driver of measure installation and can continue to drive efficiency and electrification moving forward by training contractors to promote these measures types.

- 3. Finding:** The Residential Energy Audit Program report content and quality varies significantly by contractor. The evaluators reviewed 499 audit reports as part of this evaluation. While most of those reports did provide actionable recommendations for customers, almost 20% of the provided reports were found to be unusable for this research due to the absence of measure-specific savings estimates and other key parameters.

Recommendation: The evaluators recommend providing additional standardization requirements and possibly calculation tools to the participating contractors of the GJGNY Residential Energy Audit Program. With the number of contractors that perform these audits, variation is to be expected. However, when the reports have confusing, missing, or potentially misleading information, it inhibits the homeowners' ability to make informed installation decisions. By standardizing the energy audit report format to include information that is easy to find and interpret, NYSERDA could aid customer decision making and awareness, as well as possibly drive additional installation of recommended measures.

2 Background

This section presents a program description, the evaluation goals, and a summary of the previous evaluations.

2.1 Program Description

In the fall of 2010, GJGNY was launched and made free or reduced-cost energy audits available to owners of one- to four-family homes. The GJGNY audit became the primary vehicle for entering the EmPower and HPwES programs, and NYSERDA program staff began tracking all GJGNY audits conducted, regardless of whether measures recommended in the audit were installed through either program. Audits that did not result in the installation of the recommended measures through the programs are considered Audit Only projects. These projects represent unclaimed savings and are the focus of this evaluation.

This evaluation included Audit Only projects conducted between January 2016 – December 2018. A breakdown of the recommended measure mix for the population of projects that the evaluators extracted information from can be found in Table 2-1, below.

Table 2-1. Program Recommended Measure Breakdown

Measure Category	Recommendation Count	% of Recommended Measure Mix	% of Homes Receiving Recommendation
Insulation	369	27%	91%
Air sealing	312	23%	77%
Energy-efficient windows and/or doors	40	3%	10%
High-efficiency heating	133	10%	33%
Programmable thermostats	63	5%	16%
High-efficiency water heating	109	8%	27%
Energy-efficient lighting	103	8%	25%
High-efficiency cooling	31	2%	8%
Hot water conservation	11	1%	3%
Other	196	14%	49%

2.2 Evaluation Objectives

The most common measures in the audit reports are for insulation and air-sealing measures, with those measures being recommended for 91% and 77% of all households, respectively. Together, those two categories account for 50% of all recommended measures.

The primary objectives were to:

1. Quantify the MAR over time. The MAR is a ratio that quantifies the percentage of recommended savings that customers chose to adopt after receiving a free audit through the program.
2. Estimate the total annual electric (kWh) and fossil fuel (MMBtu) savings that will accrue once all measures expected to be adopted are in place based on the results of the MAR and the program's estimated savings.
3. Compile feedback on customer satisfaction surrounding the quality and ease of the audit and subsequent measure installation process, measure performance and energy savings, and contractor performance.

2.3 Previous Evaluations

An impact evaluation of the HPwES program was completed in 2016 for program years 2010 – 2013². As part of that evaluation, a study of Audit Only participants was also conducted. The evaluation utilized a billing analysis approach to estimate natural gas savings for Audit Only customers. The results reflect the strengths and limitations of the method. The evaluators planned to estimate electric impacts but the small number of billing analysis-eligible customers in the electric measure pool (the study had predominantly focused on heating equipment) combined with a low survey response rate and typically small electric savings per site meant that the billing analysis approach was not feasible. Within the natural gas population, impact was only attempted for customers that reported implementing “major” measures (measure exceeding \$2,000 in cost), so that impacts could be detected within the billing analysis. Because the evaluation addressed energy savings directly, intermediate factors such as measure adoption rate and realization rate were not in scope. The strength of the approach is the defensibility of the important result: The overall gross estimated savings from that evaluation was 7.4±1.4 MMBtu (18%) of natural gas savings per home for the 20% of homes that implemented at least one major measure. The study was also able to normalize savings as 8% of pre-installation use. Given the study's scope limitations (no electricity, unregulated fuels or small natural gas savers), it can be considered a conservative estimate of overall audit program impact.

The evaluation also included cognitive interviews about the customers' decision-making process to inform evaluators and program staff of the barriers to measure adoption.

² Home Performance with ENERGY STAR® Program Impact Evaluation Report (PY2010-2013) Final Report Volume 4: Green Jobs-Green New York Audit-Only Impact Evaluation, November 21, 2016

3 Methods

Section 3 describes the methods used to develop impact estimates for the Audit Only population from project years 2016 through 2018.

3.1 Measure Adoption Rate Methods

The first step in estimating savings for Audit Only participants was to determine whether measures (including air sealing, insulation, lighting and HVAC systems) were installed as a result of recommendations made in the audit report. From December 6, 2019 through December 9, 2019, ICF conducted the Residential Screener Survey to identify the Audit Only participants who installed recommended measures and occupied their home for a year prior and a year after the installation.

NYSERDA evaluation staff provided the sampling frame for the Residential Screener Survey and worked with ERS and ICF on the details of fielding the survey.

In addition to providing an initial measure screening, the Residential Screener Survey also assessed customer experience/satisfaction with the audit process and follow-up on project work.

Respondents to the Residential Screener Survey who installed measures were included in a follow-up MAR Survey. These respondents were asked about the specific measures they implemented or installed, based on audit recommendations. Those audit recommendations were embedded in PDF documents and not easily exported to populate a survey. ERS engineers extracted the information out of the PDFs and provided measure details to ICF to be inserted into the customized MAR Survey as needed.

3.1.1 Calculation Methodology

The primary goal of the impact evaluation was to determine the MAR. This, in turn, has been used to calculate the adjusted gross impact. The MAR was estimated through a series of two online surveys of Audit Only recipients. The equation and definitions below show the adjusted gross impact calculation.

$$\text{Adjusted gross impact} = \text{Assessment savings} \times \text{MAR}_{\text{survey}}$$

where,

Assessment savings = The sum of the savings listed in the assessment report for all the recommended measures, as listed in NYSERDA’s assessment program tracking database

MAR_{survey} = The measure adoption rate, based on online survey responses

3.1.1.1 **MAR**

The MAR quantifies the percentage of study-recommended savings that customers chose to adopt and that were not incentivized by NYSERDA or any other incentive programs. The evaluators used a combination of online surveys and information embedded within customer audit reports to develop this factor. The MAR_{survey} is defined as follows:

$$MAR_{survey} = \frac{\text{Assessment's estimate of savings for measures reported installed by the online survey respondent}}{\text{Assessment's estimate of savings for all measures recommended for installation}}$$

The GJGNY Audit is not a direct-install program; therefore, measure adoption will occur over time as the customer explores the measures further (after the initial identification in the assessment). The customer will then solicit contractor quotes and prepare for construction – or perhaps wait for cash-flow conditions to improve to allow for implementation. This means that the number of installed measures will likely increase over time and will then plateau at a long-term MAR value.

The evaluation design was to conduct a survey of respondents who received energy audits between 2016 and 2018, collect information on which recommended measures they implemented and when, and build a MAR curve that demonstrates this measure adoption over time. The final plateau, which occurs after about 4 years in this case, represents the long-term MAR value that can be used to project installed savings from the program. If a customer reported receiving an incentive for a measure installation, either through NYSERDA or elsewhere, the measures were excluded from the adopted savings.

A team of ERS analysts led by a senior engineer reviewed the project tracking database and the audit reports to extract details of the recommended measures. The team performed a comprehensive review of each audit report and extracted measure details including the measure type, anticipated costs, cost and energy savings, impacted fuel types, fuel rates, and other details for measure specific modifications such as recommended equipment quantities or efficiencies. These measure details were populated into a database integrated with other project tracking data that was used as the data source for the MAR surveys.

3.2 Customer Satisfaction Methods

In addition to quantifying the MAR and gross energy impacts described above, the evaluators also solicited survey recipients to answer questions about their satisfaction with the program as part of the Residential Screener Survey. The customer satisfaction survey questions were developed in conjunction with NYSERDA and designed to provide meaningful and actionable results. The survey results are presented in Section 4.

3.3 Measure Adoption Rate Sample Design

The evaluators used online surveys and attempted a census of the population with email addresses to obtain the target number of completes for each survey. The evaluators sent the screener survey to all 11,225 Audit Only participants with provided email addresses and received just over 1,000 responses. Out of those responses, 558 reported having installed measures. The evaluators distributed the detailed MAR follow-up survey to 404 audit recipients that reported having installed measures, had useable audit reports, and agreed to participate in the follow-up survey. The number of completed screener surveys by survey year and the number of completed MAR surveys by year is in Table 3-1.

Table 3-1. Completed Interviews

Evaluation Year	Screener Survey Completes	% of Screener Completes	MAR Survey Completes	% of MAR Completes
2016	371	35.8%	57	34.6%
2017	322	31.0%	54	32.7%
2018	344	33.2%	53	32.7%
Total	1,037	-	164	-

3.3.1 Survey Disposition

Census attempts were made to each of the sample frames, the Audit Only participants for the Residential Screener Survey, and those that had installed measures and agreed to participate in the Follow-up MAR Survey. The overall response rate for the Screener and MAR surveys were 9% and 41%, respectively. Response rates were reviewed by groups to assess whether specific segments of the population were disproportionately represented in the survey responses. The likelihood of non-response bias was found to be low. The results are shown in Table 3-2, below.

Table 3-2. Detailed Screener and Measure Adoption Rate Survey Disposition

Disposition	Random Stratum
Residential Energy Audit Program participants	40,086
Audit Only population	26,220
Audit Only population with email addresses (Residential Screener Survey population)	11,225
Residential Screener Survey respondents	1,037
Screener respondents who confirmed receiving an audit report	952
Screener respondents who confirmed installing measures	558
Screener respondents who confirmed not installing measures	280
Screener respondents unable to confirm or deny measure installation	114

Disposition	Random Stratum
Audit reports provided to ERS	499
MAR Survey population	404
MAR Survey responses	164

Of the 1,037 respondents to the Residential Screener Survey, 30 customers were unable to confirm receiving an audit report while another 55 customers claimed they never received an audit report. Of the 952 customers that did receive audit reports, another 114 were unable to confirm whether they received measures while another 280 confirmed that they did not install any measures. Using information from the confirmed respondents (customers who gave definitive answers), the evaluators determined approximately 67% of Audit Only participants installed measures recommended in their audit reports.

3.3.2 Precision and Bias

The key audit influence parameters were collected based on the same sample as the MAR. Table 3-1 above, therefore, is equally representative of audit influence as the MAR. Assuming the same variability on those parameters as with MAR, the influence parameter sampling precision was targeted to be 90/10.

4 Results, Findings, and Recommendations

This section presents the results and findings from the gross savings evaluation. The section concludes with recommendations.

4.1 Gross Energy Savings Results

The primary factor developed as part of this effort to determine gross savings was the MAR value.

4.1.1 Measure Adoption Rate and Program Energy Savings

The MAR for audits completed between January 1, 2016 and December 31, 2018, is calculated as the total savings reported as being installed over the total savings recommended through the Residential Energy Audit Program. The long-term MAR and gross savings by fuel type are shown in Table 4-1.

Table 4-1. Audit Recommended and Installed Energy Savings (Adjusted Gross Impact)

Parameter	Audit Recommended Savings	Weighted Measure Adoption Rate	Installed Savings (Adjusted Gross Impact)
Electric energy (kWh/yr)	16,609,920	0.47	7,811,053
Natural gas energy (MMBtu/yr)	576,809	0.48	277,193
All other fuel energy (MMBtu/yr)	352,360	0.41	146,122
Total energy (source-equivalent MMBtu)	985,842	0.46	421,819

*Includes fuel oil, wood, and propane

The total program long-term MAR for the combination of all measures is 0.46. The total installed source-equivalent energy savings for the entire Audit Only population is 421,819 MMBtu, which amounts to an average savings value of 26 MMBtu per household with installed measures. The calculated relative precision for this result is 12% at 90% confidence.

The MAR varied based on the measure and fuel type with programmable thermostat and cooling measures yielding the highest MAR values of 0.61 and 0.73, respectively. Insulation and air-sealing measures were the most commonly recommended and installed measures, accounting for 50% of the installed measure count and 70% of the installed energy savings. Hot water heating measures were at the low end with a 0.17 adoption rate. Additionally, electric measures were more commonly installed than fossil fuel-saving measures, as can be seen in the MAR values in Table 4-1.

Analysts examined the MAR over time, as described in the methodology, using the sample design’s expansion weight associated with the study multiplied by the source-equivalent energy savings to represent the relative influence of each measure on the results. The MAR over time can be seen in Figure 4-1.

Figure 4-1. Measure Adoption Rate over Time (Months after audit completion date)



4.1.2 MAR Breakdown by Measure and Fuel Type

In addition to looking at the total program MAR, the evaluators also looked at the MAR broken down by technology end use and impacted fuel type. The evaluators looked at the MAR for each technology end use category extracted from the audit reports. The breakdown by end use is presented in Table 4-2, below.

Table 4-2. Measure Adoption Rate by End Use

End Use	Weighted Measure Adoption Rate ¹	Recommended Measure Count	Installed Measure Count
Insulation	0.53	151	108
Air sealing	0.45	116	70
Windows & doors	0.53	17	11
Heating equipment	0.36	56	29
Programmable thermostats	0.61	32	30
Hot water heating equipment	0.17	49	14
Lighting	0.57	38	29
Cooling equipment	0.73	13	13
Hot water conservation	0.23	5	5
Other	0.42	77	48
Total	0.46	554	357

¹The individual end use MARs as well as the total of 0.46 represent a weighted average based on savings

Cooling equipment, programmable thermostats, and lighting measures were the measures most commonly adopted (meaning they had the highest MAR values). Hot water heating equipment had the lowest adoption rate. This is consistent with other evaluations of similar programs. Controls and lighting measures generally have the lowest upfront cost and are considered the most accessible to customers. In some instances, all the recommended measures in a category were realized as installed through the MAR Survey, but due to fuel switches and other measure-level savings adjustments (like updating the installed efficiency), the MAR value still falls below 100%.

A breakdown of the measure recommendations compared to the installed savings (by percent of total installed savings) can be found in Figure 4-2, below.

Figure 4-2. Measure Recommendations vs. Realized Savings

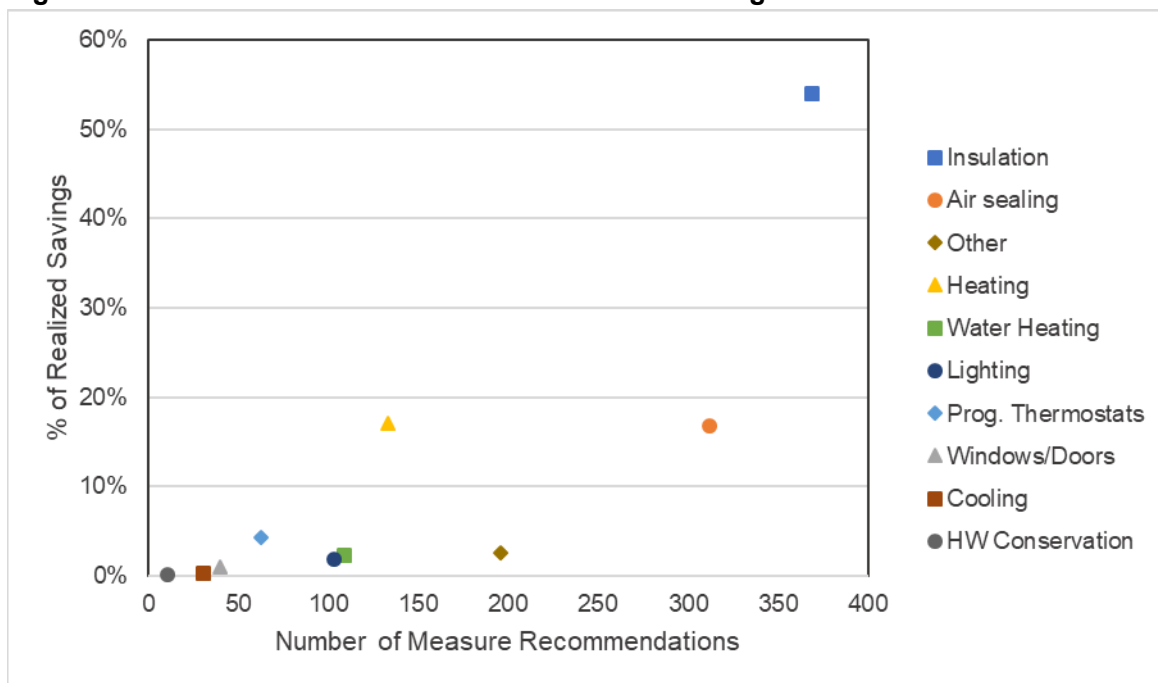


Figure 4-2, above, illustrates a pattern suggesting that an increase in recommendations for a certain measure will likely increase the realized savings for that measure. The “other” measure category was among the most commonly recommended type but only accounts for a small portion of installed savings. This is because many of the “other” measures were recommended with non-energy benefits in mind, like dehumidification and additional ventilation.

A breakdown of the MAR by impacted fuel type can be found in Table 4-3, below.

Table 4-3. Measure Adoption Rate by End Use

Fuel Type	Weighted Measure Adoption Rate ¹	Recommended Measure Count	Installed Measure Count
Natural gas	0.48	278	176
Electric	0.47	75	56
Other	0.41	201	125
Total	0.46	554	357

¹The individual fuel type MARs as well as the total of 0.46 represent a weighted average based on savings

Measures aimed at natural gas end uses were among the most commonly recommended and yielded the highest MAR among all fuel types. While electric saving measures were adopted at a similar rate to those targeting natural gas end uses, the low volume of electric measure recommendations yielded a low installed measure count.

4.2 Comparison with Prior Results

The 2016 audit-only impact evaluation of the 2010-2013 period used billing analysis to estimate an impact of 7.4 ± 1.3 MMBtu of natural gas savings per home for the 20% of homes that implemented at least one major natural gas saving measure. Extrapolated savings were 105,000 MMBtu per year for each year of audits.

Comparatively, the current evaluation found measure adoption of 16 ± 1.9 MMBtu per household for the 33% of customers that implemented at least one natural gas measure of any size. If the prior HPwES evaluation’s natural gas savings realization rate of $65\% \pm 5\%$ is applied to this study’s results, the resulting 10.4 MMBtu of VGS is significantly higher than the 2012 audit only research although the uncertainty bounds overlap. Table 4-4 shows the most similar comparison, with the 2020 results adjusted to represent a single year of natural gas savings only.

Table 4-4. Comparison of 2016 and 2020 Study Natural Gas Results for Customers that Adopted at Least One Recommended Natural Gas Measure Outsider of the HPwES Program

Evaluation	Number of Audits per Year	Percent Customers Adopting Measures	Audit Report Savings for Adopted Measures (MMBtu/yr)	Realized Savings for Adopted Measures (MMBtu/yr)	Total Audit Only Impact (MMBtu/yr)
2016 HPwES Billing Analysis	10,300	20% (major)	N/A	7.4 ± 1.3	15,000
2020 Audit Only MAR	8,740	33% (any)*	16 ± 1.9	10.4 ± 2.0	30,065*

*These values are approximations for comparative purposes only and not for impact reporting

The annual impact for this study is significantly larger than the previous study due to the inclusion of all measure-adopting customers rather than only those who adopted major natural gas measures.

4.3 Customer Satisfaction Results

In addition to studying the overall program and individual measure MAR values, the other primary focus of this evaluation was to assess customer satisfaction with the NYSERDA Residential Energy Audit Program. The evaluators gathered customer satisfaction information from 880 participants out of the 1,037 responses as a part of the screener survey (there were missing responses from 157 customers). Overall responses to the questions were positive.

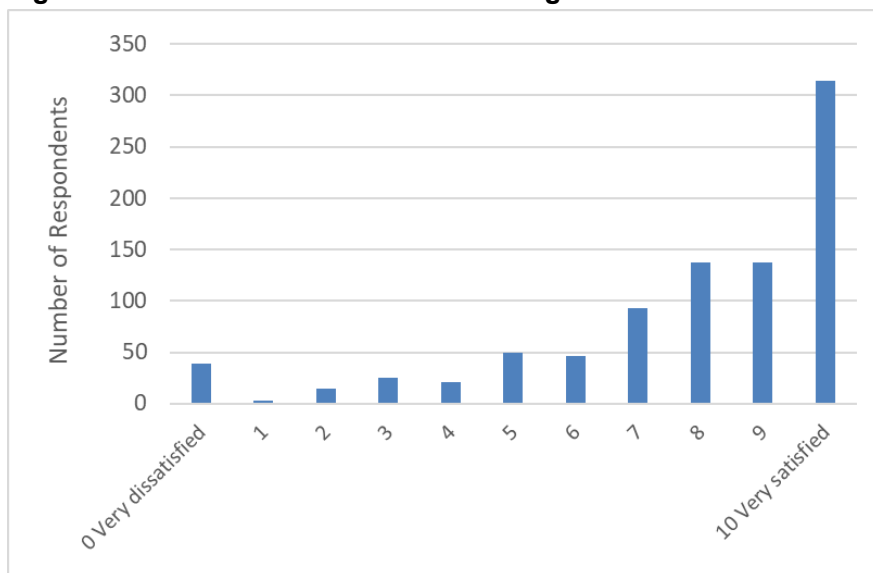
The average response for each of the customer satisfaction questions can be seen in Table 4-5, below. The questions used a range of 0 to 10. The closer the response number was to 10, the more positive the response, with 0 representing very dissatisfied and 10 representing very satisfied.

Table 4-5. Customer Satisfaction Question Results

Question Topic	Average Response
Application process	8.2
In-home contractor visit	8.0
Energy audit results, quality, comprehensiveness and usefulness	7.4
Contractor responsiveness	7.3
Post energy audit involvement	6.1
Overall contractor quality	7.1
Overall home energy audit experience	7.4

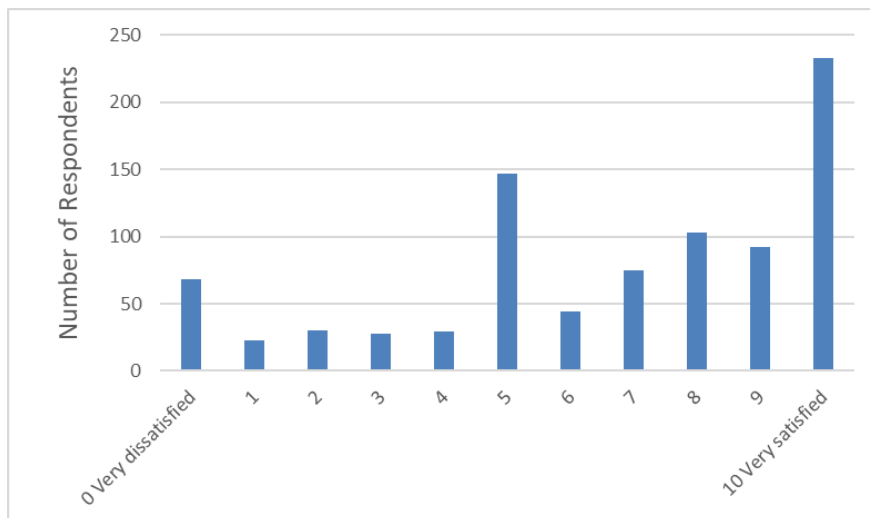
The overall responses to the customer satisfaction questions were very positive, with the application process receiving the highest score. The question with the lowest average response was with respect to post energy audit involvement. While still above 5, it is substantially less than the other values. Figures 4-3 and 4-4, below, show the distribution of the question on overall home audit experience as well as the post-audit involvement.

Figure 4-3. Distribution of Customer Rating of Their Overall Home Audit Experience



For customers who rated their overall experience as “very dissatisfied,” their common responses included dissatisfaction with the contractor, lack of incentives available, lack of follow up, and poor report quality contributing to their rating.

Figure 4-4. Distribution of Customer Rating of the Post Energy Audit Involvement, Contractor Follow-Up on Recommendations



The mean score of 7.4 for the overall home energy audit experience also equated to a net promoter score (NPS) of 29. The NPS is a metric used to measure customer loyalty, or how likely a customer is to recommend the program. Survey responses are grouped into three buckets; promoters (score of 9 or 10), passives (score of 7 or 8) and detractors (score of 0 through 6). Subtracting the detractors from the promoters provides the NPS. If this score is above zero, it means there are generally more promoters than detractors. Scores vary between industries, however in this case a score of 29 can be thought of as generally positive.

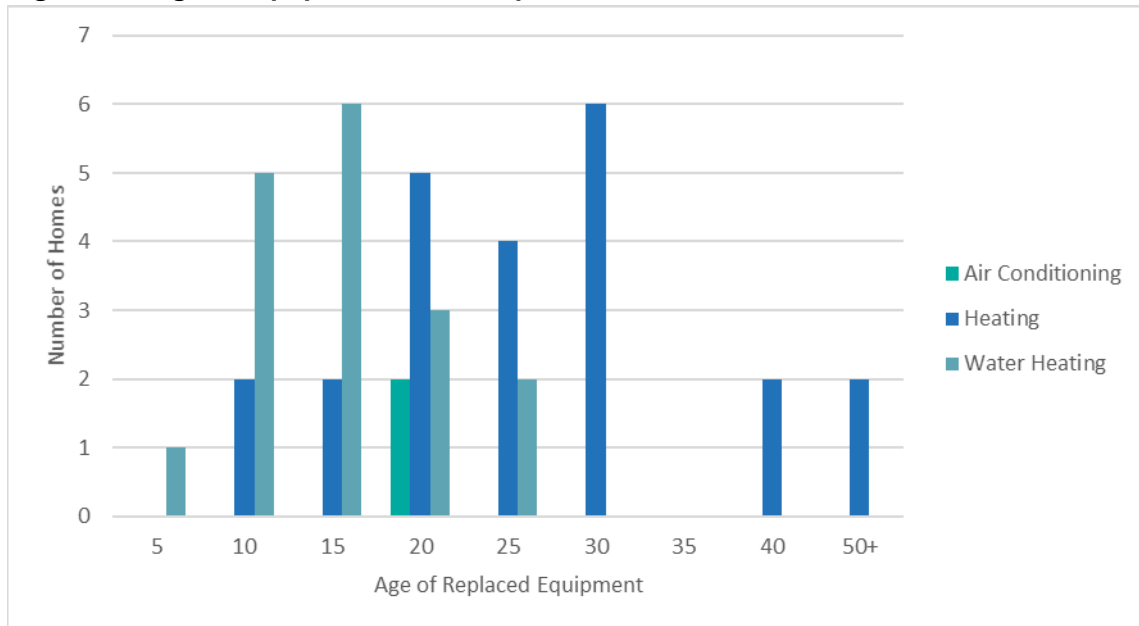
4.4 Early Replacement

Although it was not included within the scope of work for this effort, the evaluators incorporated questions in the MAR Survey that addressed the program’s ability to drive the early replacement of equipment in order to provide additional feedback to NYSERDA. The results are summarized below.

Early replacement of inefficient equipment involves removal of the equipment before the end of its effective useful life and replacement with a new high-efficiency unit. In this case, the baseline is the pre-existing heating, cooling, lighting, or other applicable system until the old system would be expected to fail. In contrast, the baseline for replacement at time of failure is a standard-efficiency system currently on the market.

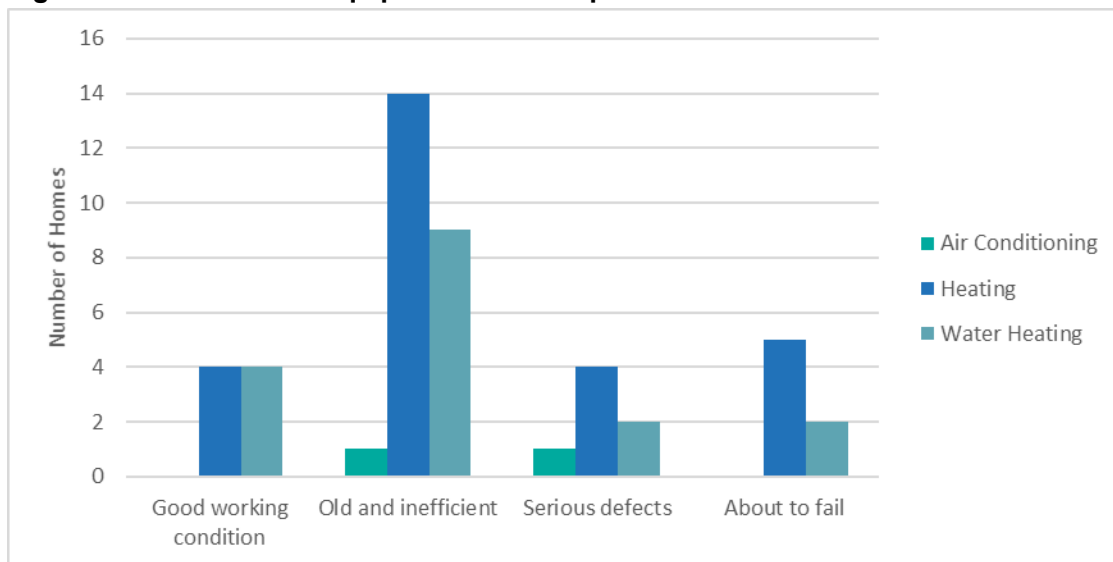
MAR Survey respondents were asked about the age and condition of their heating, water heater, and air conditioning system before replacement. Nearly two-thirds (65%) of the respondents indicated that the replaced equipment was at least 20 years old at the time of replacement. Figure 4-5, below, provides an overview of the age distribution of replaced air conditioning, heating, and water heating equipment.

Figure 4-5. Age of Equipment Before Replacement



On average, 52% of respondents reported that the equipment replaced was old and inefficient, and 15% reported that the old equipment had failed or was about to fail. Figure 4-6 provides a summary of the number of responses.

Figure 4-6: Condition of Equipment before Replacement



These results suggest that a combination of early replacement and replacement on failure is occurring, with at least a quarter of the units falling into the “replace on failure” category.

4.5 Findings and Recommendations

The evaluators offer three findings and recommendations based on the impact evaluation research. These recommendations follow each explanatory paragraph of the finding in the list below.

- 1. Finding:** GJGNY Audit Only participants prefer additional follow-up by the contractor post-energy audit. Overall customer satisfaction was quite high for the program. The one question where the average response was lower was with respect to program follow-up. Follow-up also can increase measure adoption.

Recommendation: The evaluators believe that more measures could be installed sooner if a follow-up with the Audit Only participant is conducted to serve as a reminder and, potentially, to address any outstanding questions the customer may have. The evaluators believe the respondent would favor a follow-up by NYSERDA staff directly. Further, the evaluators believe NYSERDA contact with the contractors would increase measure adoption by the customer. This recommendation is further supported by the fact that almost 20% of the respondents to the screener survey reported either not remembering if they had received an audit report or not remembering if they had installed measures. Follow-up could be conducted by NYSERDA staff, the contractor that already has the relationship with the customer and understands the recommendations, or by a third party contracted by NYSERDA to do so.

- 2. Finding:** Less than 15% of the recommended measures from reviewed reports targeted electric end uses or fuel-switching measures.

Recommendation: The evaluators recommend providing contractors with additional training on the benefits of electric measures (with a focus on heat pumps) to help drive an increase in recommendation (and adoption) of these measures. Doing so is expected to increase awareness of beneficial electrification, which becomes increasingly important as the shape of the energy grid continues to change and as program goals shift toward decarbonization efforts. As evidenced by this evaluation, the energy audit program is an effective driver of measure installation and can continue to drive efficiency and electrification moving forward by training contractors to promote these measures types.

- 3. Finding:** The Residential Energy Audit Program report content and quality varies significantly by contractor. The evaluators reviewed 499 audit reports as part of this evaluation. While most of those reports did provide actionable recommendations for customers, almost 20% of the provided reports were found to be unusable for this research due to the absence of measure-specific savings estimates and other key parameters.

Recommendation: The evaluators recommend providing additional standardization requirements and possibly calculation tools to the participating contractors of the GJGNY Residential Energy Audit Program. With the number of contractors that perform these audits, variation is to be expected. However, when the reports have confusing, missing, or potentially misleading information, it inhibits the homeowners' ability to make informed installation decisions. By standardizing the energy audit report format to include information that is easy to find and interpret, NYSERDA could aid customer decision making and awareness, as well as possibly drive additional installation of recommended measures.

Appendix A: Glossary of Terms

census – All individuals in a group. In evaluations of energy-efficiency programs, census typically refers to all the projects in a stratum of program projects.

evaluated gross savings – The change in energy consumption and/or demand that results directly from program-related actions taken by participants in an efficiency program, regardless of why they participated, as calculated by the program evaluators.

evaluated net savings – The total change in load that is attributable to an energy efficiency program, as calculated by the program evaluators. This change in load may include, implicitly or explicitly, the effects of free drivers, free riders, energy efficiency standards, changes in the level of energy service, and other causes of changes in energy consumption or demand.

measure adoption rate (MAR) – A ratio that quantifies the percentage of audit-recommended savings that customers chose to adopt after the program has ceased involvement in the project.

net savings – The total change in load that is attributable to an energy efficiency program. This change in load may include, implicitly or explicitly, the effects of spillover (SO), free riders, energy efficiency standards, changes in the level of energy service, and other causes of changes in energy consumption or demand.

nonparticipants/nonparticipating – Any customer or contractor who is eligible but did not participate in the program under consideration. Nonparticipating contractors can include contractors who have never participated in the program and contractors who formerly participated prior to the year(s) being evaluated but have not participated since.

normal replacement – The replacement of equipment that has reached or passed the end of its measure-prescribed expected useful life (EUL).

overlap (OL) – The proportion of installed measures for which customers received funding from other NYSERDA programs or other sources.

participant – An end user who receives an assessment or a service provider—assessment provider, expeditor, or finance partner—associated with the program.

relative precision – Reflects the variation due to sampling as compared to the magnitude of the mean of the variable being estimated. It is a normalized expression of a sample's standard deviation from its mean. It represents only sampling precision, which is one of the contributors to reliability and rigor and should be used solely in the context of sampling precision when discussing evaluation results.

Relative precision is calculated as shown below. It must be expressed for a specified confidence level.

The relative precision (rp) of an estimate at 90% confidence is given below:

$$rp = 1.645 \frac{sd(\mu)}{\mu}$$

$$rp = 1.645 \frac{sd(\mu)}{\mu}$$

where,

μ = The mean of the variable of interest

$sd(\mu)$ = The standard deviation of μ

1.645 = The z critical value for the 90% confidence interval

For the 90% confidence interval, the error bound is set at 1.645 standard deviations from the mean. The magnitude of the z critical value varies depending on the level of confidence required.

Appendix B: Screener Survey Instrument

Section	Question Numbers
Screeener	SCR1 (1 questions)
Program Recall	PR1 – PR5 (5 questions)
Detailed Screener	DS1 – DS5 (5 questions)
Customer Satisfaction	CS1 – CS4 (4 questions)
Demographics	D1 – D4 (4 questions)
Closing	C1 – C3 (3 questions/statements)

Survey Instrument

Thank you for participating in this survey and sharing your experience with the home energy audit you received. Your home energy audit conducted at 123 Broadway was selected as part of a random sample of households that received a home energy audit through NYSERDA’s Home Performance with ENERGY STAR Program. Your feedback about how this energy audit influenced your decisions is very important to future planning for residential energy efficiency programs in the State.

SCREENER FOR CONTACT

SCR1. Do you recall receiving a home energy audit from a contractor participating in NYSERDA’s program in INSERT YEAR?

1. YES [GO TO PR1]
2. NO [TERMINATE]
- 96 DON’T KNOW [TERMINATE]

GENERAL INSTRUCTIONS

Your opinions about NYSERDA’s home energy audit program are important to this research effort. Please answer each question to the best of your ability, your best guess or even a rough judgment is fine.

PROGRAM RECALL

PR1. Was the home energy audit conducted in [AUDITMONTH] of [AUDITYEAR]?

- 1. YES
- 2. NO; IT WAS CONDUCTED ON A DIFFERENT DATE. THE CORRECT DATE IS: (PLEASE SPECIFY [AUDITMONTH] OF [AUDITYEAR])_____
- 97 DON’T KNOW

PR2. According to our records, [AUDITCONTRACTOR] conducted the audit. Is this correct?

- 1. YES, THAT IS CORRECT
- 2. NO, A DIFFERENT CONTRACTOR CONDUCTED THE AUDIT (PLEASE SPECIFY): _____
- 97 DON’T KNOW / DON’T REMEMBER

PR3. Do you recall receiving an audit report with recommendations?

- 1. YES, I DO RECALL RECEIVING AN AUDIT REPORT
- 2. NO, I DON’T RECALL RECEIVING AN AUDIT REPORT
- 97 DON’T KNOW / DON’T REMEMBER

[(PR1 = 97 or skip) and (PR3 = 2, 97, skip)] THEN GO TO C2 (No incentive)

PR4. Our records show that the home energy audit was conducted at [ADDRESS]. Is this correct?

- 1. YES [GO TO PR5]
- 2. NO, THE AUDIT WAS CONDUCTED AT A DIFFERENT ADDRESS: (PLEASE SPECIFY)_____
- 3. DON’T KNOW / DON’T REMEMBER

PR5. Do you still own this property?

- 1. YES

2. NO
3. DON'T KNOW / DON'T REMEMBER

[IF PR1, PR3, PR4 AND PR5 = DK or skip, THEN GO TO C2 (No incentive)]

DETAILED SCREENING QUESTIONS

DS1. Have you made any energy efficiency improvements or purchased any new major appliances that were recommended by the contractor in the audit?

1. YES [GO TO DS2]
2. NO [**GO TO DS1A**]

DS1a. Which of the following best describes why no upgrades were completed:

1. COST
2. RECOMMENDATIONS IN THE AUDIT NOT CLEAR
3. NOT SURE WHERE TO FIND A CONTRACTOR
4. EQUIPMENT STILL FUNCTIONING NORMALLY
5. OTHER – PLEASE INDICATE _____

DS2. We are interested in five types of home energy improvements: sealing against cold air leaking into your home, insulation, lighting, heating and cooling. Did you make any improvements in any of these areas?

1. YES
2. NO [**GO TO CS1**]

DS3. Are you willing to participate in a follow-up survey about these improvements? You may be eligible to receive an additional incentive of \$10 if you qualify for and complete the follow-up survey.

1. YES
2. NO

DS4. Which of the following ranges represents the total cost of the improvements:

- 1. \$0-\$3,000
- 2. \$3,001-\$6,000
- 96 \$6,001-\$9,000
- 97 More than \$9,000

DS5. Did you receive incentives or obtain a loan for these energy efficiency upgrades through NYSERDA’s Home Performance with ENERGY STAR® program?

- 1. YES
- 2. NO
- 97 DON’T KNOW

Customer Satisfaction & Program Process:

CS1. On a scale of 0 to 10, with 0 being very dissatisfied and 10 being very satisfied, how would you rate your satisfaction with each of the following aspects of the home energy audit process:

- a. Application process
- b. In-home contractor visit
- c. Energy audit results, such as report quality, comprehensiveness or usefulness of results
- d. Contractor responsiveness to customer needs
- e. Post-energy audit involvement, such as contractor follow upon the recommended measures
- f. Overall contractor quality

CS1a. Please elaborate on the reason for your rating in each category if you selected a rating less than 5:

96 Prefer not to answer

CS2. Were there any barriers or challenges you experienced during the energy audit process?

- 1. YES [go to CS2a]
- 2. NO
- 96. Prefer not to answer

CS2a. Which of the following best describes the barriers you encountered?

- 1. Did not receive the AUDIT report
- 2. a delay in receiving THE AUDIT REPORTDissatisfied with the contractor
- 3. Contractor did not follow up with me
- 4. Too much of a sales pitch
- 5. Didn't understand or agree with audit outcome
- 96. Prefer not to answer

CS3. On a scale of 0 to 10, with 0 being very dissatisfied and 10 being very satisfied, how would you rate your satisfaction with the overall home energy audit experience?

CS3a. Please explain the reason for your rating: _____

- 96. Prefer not to answer

CS4. What suggestions do you have on how the home energy audit experience could be improved?
Please specify _____

DEMOGRAPHICS

Please answer the following general demographic questions that will help with the analysis of our results.

This information will be combined across all participants and will not be shared with anyone outside of the evaluation team in any way that identifies you or your household.

D1. Please indicate the correct timeframe of when your home was built?

- 1930's or earlier
- 1940's or 1950's
- 1960's or 1970's
- 1980's or 1990's
- 2000 or later

96 Prefer not to answer

97 DON'T KNOW

D2. Please indicate the range which includes your age:

18 TO 24

25 TO 34

35 TO 44

45 TO 54

55 TO 64

65 OR OVER

96. Prefer not to answer

D3. Counting yourself, how many people typically live in your household on a full-time basis? Please include everyone who lives in your home whether or not they are related to you and exclude anyone who is just visiting or children who may be away at college or in the military.

RECORD NUMBER: _____

96 Prefer not to answer

D4. Please indicate the total combined income of all members of your household over the last 12 months:

Less than \$25,000

\$25,000 to less than \$50,000

\$50,000 to less than \$75,000

\$75,000 to less than \$100,000

\$100,000 to less than \$150,000

\$150,000 to less than \$200,000

\$200,000 or more

96 Prefer not to answer

97 DON'T KNOW

CLOSING

C1. [If DS2=1 and DS3=1] Thank you for participating in the survey. The information you provided will be helpful in evaluating and improving the program. We will be contacting you soon about our follow-up survey that will ask to provide additional information on energy-using features of your home, such as lighting, appliances, and heating and cooling equipment that may have been installed or are planned after the energy audit. If you are eligible for this additional survey, you may receive another \$10 incentive. To collect your \$10 gift card to Amazon for completing this survey, please follow the link to confirm your email address below, or if you would prefer a physical Visa gift card instead please select the home delivery option. If you prefer the home delivery option of the gift card, please provide your home mailing address below.

[ASK IF ((PR1 = 97,888) AND (PR3 = 2,97,888)) OR ((PR1=97,888) OR (PR3=97,888) OR (PR5=97,888) OR (PR5=97,888))]

C2. Thank you. That concludes our survey. Based on your responses you are not eligible to receive an incentive at this time. However if you are interested in receiving a home energy audit please click here: <https://www.nyserdera.ny.gov/Residents-and-Homeowners/Find-Contractors-and-Incentives>.

1 Continue [SET C2=1; CLOSE SURVEY AND MARK AS A COMPLETE]

[ASK IF DS2 NE 1 OR DS3 NE 1]

C3. Thank you for participating in the survey. You are not eligible for our follow-up survey at this time, but we wish to thank you with a \$10 gift card. To collect your \$10 gift card to Amazon for completing this survey, please follow the link to confirm your email address below, or if you would prefer a physical Visa gift card instead please select the home delivery option. If you prefer the home delivery option of the gift card, please provide your home mailing address below.

- 1 Confirm email address
- 2 Home delivery option

[ASK IF C1=2 OR C3=2]

[REQUIRED]

HOMEDELIVERY. Please provide your home mailing address for where you'd like the Visa gift card sent.

Name: [TEXT BOX]

Street Address: [TEXT BOX]

City: [TEXT BOX]

State: [TEXT BOX]

Zip code: RANGE 00000-99999 [NUMBER BOX]

Appendix C: MAR Survey Instrument

Section	Question Numbers	Asked of...
Measure details	MD1 to MD8 (8 questions)	Based on responses to measures SM1, SM2, SM3, and SM6 and only respondents who pass detailed screener questions
Early replacement	ER1 to ER 4 (4 questions)	Installed measure SM4, SM6 and/or SM8 and only respondents who pass detailed screener questions
Appliances	AP1 to AP4 (asks about purchase of 12 appliances, then 3-question loop for each of those purchased)	Respondents who pass detailed screener questions
Heating system	HS1 to HS8 (10 questions)	Respondents who pass detailed screener questions
Supplemental heating	SUP1 to SUP5 (5 questions)	Respondents who pass detailed screener questions

Landing Page:

[ASK ALL]

INTRO. Thank you for participating in this survey and sharing your experience with the home energy audit you received. Your home energy audit conducted at [ADDRESS] was selected as part of a random sample of households that received a home energy audit through NYSERDA’s Home Performance with ENERGY STAR Program. Your feedback about how this energy audit influenced your decisions is very important to future planning for residential energy efficiency programs in the State.

Survey Instrument

[ASK IF SM1=1]

M1A. Our records show that the following energy efficiency measures were recommended based on the energy audit at your home. Please indicate which of the following recommended energy efficiency upgrades you installed after you received the home energy audit.

Insulation

- 1 Yes
- 2 No
- 97 Don't Know

[ASK IF SM2=1]

M1B. Our records show that the following energy efficiency measures were recommended based on the energy audit at your home. Please indicate which of the following recommended energy efficiency upgrades you installed after you received the home energy audit.

Air sealing to reduce drafts

- 1 Yes
- 2 No
- 97 Don't Know

[ASK IF SM3=1]

M1C. Our records show that the following energy efficiency measures were recommended based on the energy audit at your home. Please indicate which of the following recommended energy efficiency upgrades you installed after you received the home energy audit.

Energy-efficient windows or doors

- 1 Yes
- 2 No
- 97 Don't Know

[ASK IF SM4=1]

M1D. Our records show that the following energy efficiency measures were recommended based on the energy audit at your home. Please indicate which of the following recommended energy efficiency upgrades you installed after you received the home energy audit.

High efficiency heating system or heat pump

- 1 Yes
- 2 No
- 97 Don't Know

[ASK IF SM8=1]

M1E. Our records show that the following energy efficiency measures were recommended based on the energy audit at your home. Please indicate which of the following recommended energy efficiency upgrades you installed after you received the home energy audit.

New central air conditioner

- 1 Yes
- 2 No
- 97 Don't Know

[ASK IF SM5=1]

M1F. Our records show that the following energy efficiency measures were recommended based on the energy audit at your home. Please indicate which of the following recommended energy efficiency upgrades you installed after you received the home energy audit.

Programmable thermostat (including wi-fi and smart thermostats)

- 1 Yes
- 2 No
- 97 Don't Know

[ASK IF SM6=1]

M1G. Our records show that the following energy efficiency measures were recommended based on the energy audit at your home. Please indicate which of the following recommended energy efficiency upgrades you installed after you received the home energy audit.

High efficiency water heater

- 1 Yes
- 2 No
- 97 Don't Know

[ASK IF SM9=1]

M1H. Our records show that the following energy efficiency measures were recommended based on the energy audit at your home. Please indicate which of the following recommended energy efficiency upgrades you installed after you received the home energy audit.

Hot water conservation measures such as low flow showerheads

- 1 Yes
- 2 No
- 97 Don't Know

[ASK IF SM7=1]

M1I. Our records show that the following energy efficiency measures were recommended based on the energy audit at your home. Please indicate which of the following recommended energy efficiency upgrades you installed after you received the home energy audit.

Energy-efficient lighting

- 1 Yes
- 2 No
- 97 Don't Know

[ASK IF SM10=1]

M1J. Our records show that an additional energy efficiency measure was recommended based on the energy audit at your home that did not fall into one of our primary categories. Please indicate if that additional recommended energy efficiency upgrade was installed after you received the home energy audit.

Additional Energy Efficiency Measure

- 1 Yes
- 2 No
- 97 Don't Know

MEASURE DETAILS

[ASK IF M1A=1]

[MUL=5]

MD1. Where in your home was the insulation installed? Select all that apply.

- Attic
- Basement/crawlspace
- Walls
- Floors
- Other [TEXT BOX]
- 97 DON'T KNOW

[ASK IF M1C=1]

MD3. How many windows did you replace with energy efficient windows? An estimate is okay.

Windows Quantity: RANGE 0-95 [NUMBER BOX]

[ASK IF M1C=1]

MD4. How many doors did you replace with energy efficient doors?

Doors Quantity: RANGE 0-95 [NUMBER BOX]

[ASK IF MID=1]

MD5. What type of high efficiency heating system did you install? [RECORD ONE]

- Furnace, with hot air distribution
- Boiler, with hot water baseboard, radiant heat or steam radiators
- Heat pump with electric back up
- Heat pump with natural gas back up
- Heat pump with other fuel back up (not electricity or natural gas)
- Or something else? Please Specify [text box]

97 Don't Know

[ASK IF MID=1]

MD6 To the best of your recollection, was the heating system you installed as efficient, more efficient, or less efficient than what was recommended in the report?

- As efficient
- More efficient
- Less efficient

97 Don't Know

[ASK IF MD6=2 OR 3]

MD6a. What was the efficiency of the heating system you installed?

- <80%
- 80% - 85%
- 85% - 90%
- >90%

97 Don't Know

[ASK IF MD6=2 OR 3]

MD6b. What fuel does the heating system use?

- Natural Gas
- Fuel oil
- Propane
- Electricity
- Other (please specify) [TEXT BOX]

97 Don't Know

[ASK IF MD6=2 OR 3]

MD6c. What fuel did the previous system use?

Natural Gas

Fuel oil

Propane

Electricity

Other (please specify) [TEXT BOX]

97 Don't Know

[ASK IF M1F=1]

MD8. How many programmable thermostats were installed?

RANGE 1-100 [NUMBER BOX]

[ASK IF M1F=1]

MD8a. What were the brands of the programmable thermostats?

Google Nest

Honeywell

ecobee

Lennox

Emerson

Lux/Geo

White Rodgers

Other, please specify _____

97 DON'T KNOW

[ASK IF M1F=1]

MD8b. Were the thermostat(s) WiFi enabled?

1 Yes

2 No

97 Don't Know

[ASK IF M1G=1]

MD9. What type of high efficiency water heater was installed, instantaneous or the traditional storage type, with a tank?

Storage

Instantaneous

97 DON'T KNOW

[ASK IF M1I=1]

MD10. How many energy efficient light bulbs were installed?

Lighting Quantity: RANGE 0-95 [NUMBER BOX]

97 DON'T KNOW

[ASK IF MD10=1-95]

[MUL=5]

MD11. What type of energy efficient bulbs were installed? Select all that apply.

LED

Smart LEDs

CFL

Linear fluorescent

Other [TEXT BOX]

[ASK IF M1E=1]

MD12. Was the cooling system you installed as efficient, more efficient, or less efficient than what was recommended in the report?

As efficient

More efficient

Less efficient

97 DON'T KNOW

[ASK IF MD12=2 OR 3]

MD12a. What was the efficiency of the cooling system you installed?

80%

80% - 85%

85% - 90%

>90%

97 Don't Know

[TEXT BOX]

97 Don't Know

[ASK IF M1H=1]

MD13. How many low flow showerheads were installed?

Low Flow Showerhead Quantity: RANGE 0-95 [NUMBER BOX]

97 Don't Know

[ASK IF M1J=1]

MD14. Please describe in a few words the additional energy efficiency measure you installed.

[TEXT BOX]

97 Don't Know

EARLY REPLACEMENT

[ASK IF M1D=1 OR M1G=1 OR M1E=1]

INTRO_ER. The next series of questions is about the condition of the equipment you replaced.

[ASK IF M1D=1]

ER1_HEAT. Did the new high efficiency heating system or heat pump replace your previous heating system or heat pump?

1 Yes

2 No

97 Don't Know

[ASK IF ER1_HEAT=1]

ER2_HEAT. To the best of your recollection, how old was the original heating system or heat pump prior to the installation of your new high efficiency heating system or heat pump?

AGE IN YEARS: RANGE 1-70 [NUMBER BOX]

97 Don't Know

[ASK IF ER1_HEAT=1]

[RANDOMIZE 1,2,3,4,5]

ER3_HEAT. Which of the following best describes the condition of the original equipment that was replaced?

1 It was in good working condition.

2 It worked well but was old and inefficient.

3 It required frequent maintenance.

4 It had serious defects and would probably have been replaced within the next couple of years.

5 It had failed or was about to fail.

6 Or something else? Please specify [TEXT BOX]

97 Don't Know

[ASK IF ER1_HEAT=1]

ER4_HEAT. How does the size of your new high efficiency heating system or heat pump compare to your old heating system or heat pump? Is it ...

- 1 About the same size
- 2 Smaller
- 3 Larger
- 97 Don't Know

[ASK IF M1D=1]

ER5_HEAT. Did your contractor that installed the high efficiency heating system or heat pump advocate for the early replacement of that equipment or provide a prioritized list of recommended measures?

- 1 Yes
- 2 No
- 97 Don't Know

[ASK IF M1G=1]

ER1_WATER. Did the new high efficiency water heater replace your previous water heater?

- 1 Yes
- 2 No
- 97 Don't Know

[ASK IF ER1_WATER=1]

ER2_WATER. To the best of your recollection, how old was the original water heater prior to the installation of your new high efficiency water heater?

AGE IN YEARS: RANGE 1-70 [NUMBER BOX]

- 97 Don't Know

[ASK IF ER1_WATER=1]

[RANDOMIZE 1,2,3,4,5]

ER3_WATER. Which of the following best describes the condition of the original equipment that was replaced?

- 1 It was in good working condition.
- 2 It worked well but was old and inefficient.
- 3 It required frequent maintenance.
- 4 It had serious defects and would probably have been replaced within the next couple of years.

- 5 It had failed or was about to fail.
- 6 Or something else? Please specify [TEXT BOX]
- 97 Don't Know

[ASK IF ER1_WATER=1]

ER4_WATER. How does the size of your new high efficiency water heater compare to your old water heater? Is it ...

- 1 About the same size
- 2 Smaller
- 3 Larger
- 97 Don't Know

[ASK IF M1G=1]

ER5_WATER. Did your contractor that installed the high efficiency water heater advocate for the early replacement of that equipment or provide a prioritized list of recommended measures?

- 1 Yes
- 2 No
- 97 Don't Know

[ASK IF M1E=1]

ER1_AIR. Did the new central air conditioner replace your previous central air conditioner?

- 1 Yes
- 2 No
- 97 Don't Know

[ASK IF ER2_AIR=1]

ER2_AIR. To the best of your recollection, how old was the original central air conditioner prior to the installation of your new central air conditioner?

RECORD AGE IN YEARS: RANGE 1-70 [NUMBER BOX]

- 97 Don't Know

[ASK IF ER2_AIR=1]

[RANDOMIZE 1,2,3,4,5]

ER3_AIR. Which of the following best describes the condition of the original equipment that was replaced?

- 1 It was in good working condition.
- 2 It worked well but was old and inefficient.
- 3 It required frequent maintenance.
- 4 It had serious defects and would probably have been replaced within the next couple of years.
- 5 It had failed or was about to fail.
- 6 Or something else? Please specify [TEXT BOX]
- 97 Don't Know

[ASK IF ER2_AIR=1]

ER4_AIR. How does the size of your new central air conditioner compare to your old central air conditioner? Is it ...

- 1 About the same size
- 2 Smaller
- 3 Larger
- 97 Don't Know

[ASK IF M1E=1]

ER5_AIR. Did your contractor that installed the new central air conditioner advocate for the early replacement of that equipment or provide a prioritized list of recommended measures?

- 1 Yes
- 2 No
- 97 Don't Know

[ASK IF M1A=1]

MD14A_1. Were you planning to install insulation before receiving the audit?

- Yes
- No
- 97 DON'T KNOW

[ASK IF M1A=1]

MD14B_1. What motivated you to install insulation?

- 1. Comfort
 - 2. Energy-related cost savings
 - 3. Replacement needed
 - 4. Other [Please Describe]: [TEXT BOX]
- 97 DON'T KNOW

[ASK IF M1A=1]

MD14C_1. Did you receive any rebates, tax credits or other incentives to help pay for insulation?

- Yes
 - No
- 97 DON'T KNOW

[ASK IF M1A=1 AND MD14C_1=1]

[MUL=5]

M15_1. Who provided the rebate, tax credit or other incentive for the insulation? Select all that apply.

- Utility company
- New York State Energy Research and Development Authority (aka NYSERDA)
- Federal government
- Manufacturer
- Other (Specify): [text box]

97 DON'T KNOW

[ASK IF M1B=1]

MD14A_2. Were you planning to install air sealing before receiving the audit?

- Yes
- No

97 DON'T KNOW

[ASK IF M1B=1]

MD14B_2. What motivated you to install air sealing?

- 1. Comfort
 - 2. Energy-related cost savings
 - 3. Replacement needed
 - 4. Other [Please Describe]: [TEXT BOX]
- 97 DON'T KNOW

[ASK IF M1B=1]

MD14C_2. Did you receive any rebates, tax credits or other incentives to help pay for air sealing?

Yes

No

97 DON'T KNOW

[ASK IF M1B=1 AND MD14C_2=1]

[MUL=5]

M15_2. Who provided the rebate, tax credit or other incentive for the air sealing? Select all that apply.

Utility company

New York State Energy Research and Development Authority (aka NYSERDA)

Federal government

Manufacturer

Other (Specify): [text box]

DON'T KNOW

[ASK IF M1C=1]

MD14A_3. Were you planning to install energy-efficient windows or doors before receiving the audit?

Yes

No

97 DON'T KNOW

[ASK IF M1C=1]

MD14B_3. What motivated you to install energy-efficient windows or doors?

1. Comfort

2. Energy-related cost savings

3. Replacement needed

4. Other (Please Describe): [TEXT BOX]

97 DON'T KNOW

[ASK IF M1C=1]

MD14C_3. Did you receive any rebates, tax credits or other incentives to help pay for energy-efficient windows or doors?

Yes

No

97 DON'T KNOW

[ASK IF M1C=1 AND MD14C_3=1]

[MUL=5]

M15_3. Who provided the rebate, tax credit or other incentive for the energy-efficient windows or doors? Select all the apply.

Utility company

New York State Energy Research and Development Authority (aka NYSERDA)

Federal government

Manufacturer

Other (Please Specify): [TEXT BOX]

DON'T KNOW

[ASK IF M1D=1]

MD14A_4. Were you planning to install high efficiency heating system or heat pump before receiving the audit?

Yes

No

97 DON'T KNOW

[ASK IF M1D=1]

MD14B_4. What motivated you to install high efficiency heating system or heat pump?

1. Comfort

2. Energy-related cost savings

3. Replacement needed

4. Other (Please Describe): [TEXT BOX]

97 DON'T KNOW

[ASK IF M1D=1]

MD14C_4. Did you receive any rebates, tax credits or other incentives to help pay for high efficiency heating system or heat pump?

Yes

No

97 DON'T KNOW

[ASK IF M1D=1 AND MD14C_4=1]

[MUL=5]

M15_4. Who provided the rebate, tax credit or other incentive for the high efficiency heating system or heat pump? Select all that apply.

Utility company

New York State Energy Research and Development Authority (aka NYSERDA)

Federal government

Manufacturer

Other (Please Specify): [TEXT BOX]

97 DON'T KNOW

[ASK IF M1E=1]

MD14A_5. Were you planning to install new central air conditioner before receiving the audit?

Yes

No

97 DON'T KNOW

[ASK IF M1E=1]

MD14B_5. What motivated you to install new central air conditioner?

1. comfort

2. energy-related cost savings

3. replacement needed

4. Other (Please Describe): [TEXT BOX]

97 DON'T KNOW

[ASK IF M1E=1]

MD14C_5. Did you receive any rebates, tax credits or other incentives to help pay for new central air conditioner?

Yes

No

97 DON'T KNOW

[ASK IF M1E=1 AND MD14C_5=1]

[MUL=5]

M15_5. Who provided the rebate, tax credit or other incentive for the new central air conditioner? Select all that apply.

Utility company

New York State Energy Research and Development Authority (aka NYSERDA)

Federal government

Manufacturer

Other (Please Specify): [TEXT BOX]

97 DON'T KNOW

[ASK IF M1F=1]

MD14A_6. Were you planning to install programmable thermostat before receiving the audit?

Yes

No

97 DON'T KNOW

[ASK IF M1F=1]

MD14B_6. What motivated you to install programmable thermostat?

1. Comfort

2. Energy-related cost savings

3. Replacement needed

4. Other (Please Describe): [TEXT BOX]

97 DON'T KNOW

[ASK IF M1F=1]

MD14C_6. Did you receive any rebates, tax credits or other incentives to help pay for programmable thermostat?

Yes

No

97 DON'T KNOW

[ASK IF M1F=1 AND MD14C_6=1]

[MUL=5]

M15_6. Who provided the rebate, tax credit or other incentive for the programmable thermostat? Select all that apply.

Utility company

New York State Energy Research and Development Authority (aka NYSERDA)

Federal government

Manufacturer

Other (Please Specify): [TEXT BOX]

97 DON'T KNOW

[ASK IF M1G=1]

MD14A_7. Were you planning to install high-efficiency water heater before receiving the audit?

Yes

No

97 DON'T KNOW

[ASK IF M1G=1]

MD14B_7. What motivated you to install high-efficiency water heater?

1. Comfort

2. Energy-related cost savings

3. Replacement needed

4. Other (Please Describe): [TEXT BOX]

97 DON'T KNOW

[ASK IF M1G=1]

MD14C_7. Did you receive any rebates, tax credits or other incentives to help pay for high-efficiency water heater?

Yes

No

97 DON'T KNOW

[ASK IF M1G=1 AND MD14C_7=1]

[MUL=5]

M15_7. Who provided the rebate, tax credit or other incentive for the high-efficiency water heater?
Select all that apply.

Utility company

New York State Energy Research and Development Authority (aka NYSERDA)

Federal government

Manufacturer

Other (Please Specify): [TEXT BOX]

DON'T KNOW

[ASK IF M1H=1]

MD14A_8, Were you planning to install hot water conservation measures before receiving the audit?

Yes

No

97 DON'T KNOW

[ASK IF M1H=1]

MD14B_8. What motivated you to install hot water conservation measures?

- 1. Comfort
 - 2. Energy-related cost savings
 - 3. Replacement needed
 - 4. Other (Please Describe): [TEXT BOX]
- 97 DON'T KNOW

[ASK IF M1H=1]

MD14C_8. Did you receive any rebates, tax credits or other incentives to help pay for hot water conservation measures?

- Yes
- No
- 97 DON'T KNOW

[ASK IF M1H=1 AND MD14C_8=1]

[MUL=5]

M15_8. Who provided the rebate, tax credit or other incentive for the hot water conservation measures?
Select all that apply.

- Utility company
- New York State Energy Research and Development Authority (aka NYSERDA)
- Federal government
- Manufacturer
- Other (Please Specify): [TEXT BOX]
- 97 DON'T KNOW

[ASK IF M1I=1]

MD14A_9. Were you planning to install energy-efficient lighting before receiving the audit?

- Yes
- No
- 97 DON'T KNOW

[ASK IF M1I=1]

MD14B_9. What motivated you to install energy-efficient lighting?

- 1. Comfort
- 2. Energy-related cost savings
- 3. Replacement needed

4. Other (Please Describe): [TEXT BOX]

97 DON'T KNOW

[ASK IF M11=1]

MD14C_9. Did you receive any rebates, tax credits or other incentives to help pay for energy-efficient lighting?

Yes

No

97 DON'T KNOW

[ASK IF M11=1 AND MD14C_9=1]

[MUL=5]

M15_9. Who provided the rebate, tax credit or other incentive for the energy-efficient lighting? Select all that apply.

Utility company

New York State Energy Research and Development Authority (aka NYSERDA)

Federal government

Manufacturer

Other (Please Specify): [TEXT BOX]

97DON'T KNOW

[ASK IF MD14 = OPEN ENDED RESPONSE]

MD14A. Were you planning to install [MD14] before receiving the audit?

Yes

No

97 DON'T KNOW

[ASK IF MD14 = OPEN ENDED RESPONSE]

MD14B. What motivated you to install [MD14]?

Comfort

Energy-related cost savings

Replacement needed

Other [Please Describe]: [TEXT BOX]

DON'T KNOW

[ASK IF MD14 = OPEN ENDED RESPONSE]

MD14C. Did you receive any rebates, tax credits or other incentives to help pay for [MD14]?

Yes

No

97 DON'T KNOW

[ASK IF MD14 = OPEN ENDED RESPONSE AND MD14C=1]

[MUL=5]

M15. Who provided the rebate, tax credit or other incentive for the [insert measure]? Select all that apply.

Utility company

New York State Energy Research and Development Authority (aka NYSERDA)

Federal government

Manufacturer

Other (Specify): [text box]

DON'T KNOW

[ASK IF MD14A=2, MD14A_1=2, MD14A_2=2, MD14A_3=2, MD14A_4=2, MD14A_5=2, MD14A_6=2, MD14A_7=2, MD14A_8=2, OR MD14A_9=2]

M16. Which of the following best describes the reason you did not utilize NYSERDA for installation incentives for these measures?

A different program provided me more money

The NYSERDA program was too burdensome

I was not aware of the NYSERDA program

I don't know, my contractor handled the incentives

Other (Specify): [TEXT BOX]

97. DON'T KNOW

[Ask if more than one of M1A-M1J=1]

M2a Did you install all of the measures at one time?

Yes [Ask M2c]

No [Ask M2b]

97. DON'T KNOW

[Ask if more than one of M1A-M1J=1]

M2b. What was the order that you installed the measures?

[TEXT BOX]

[Ask if more than one of M1A-M1J=1]

M2c. Based on our records, your audit was completed in [AUDITYEAR]. Thinking about all of the efficiency upgrades you did, when did the work on the first efficiency project begin?

YEAR: [YEAR SELECTION] RANGE 2017-2020

MONTH: [MONTH SELECTION]

97 Don't Know

[Ask if more than one of M1A-M1J=1]

M2d. When was work on the last efficiency upgrade completed?

YEAR: [YEAR SELECTION] < M2A RANGE

MONTH: [MONTH SELECTION]

97 Don't Know

[Ask if only one of M1A-M1J=1]

M2e. Based on our records, your audit was completed in [AUDITYEAR]. When did the work on your efficiency project begin?

YEAR: [YEAR SELECTION] RANGE 2017-2020

MONTH: [MONTH SELECTION]

97 Don't Know

[Ask if only one of M1A-M1J=1]

M2f. When was work on your last efficiency upgrade completed?

YEAR: [YEAR SELECTION] < M2A RANGE

MONTH: [MONTH SELECTION]

97 Don't Know

M3. Did you install any other energy efficiency measures recommended in the home audit besides those already mentioned?

Yes (please specify) [TEXT BOX]

No

97 DON'T KNOW

[Ask all]

M4. Which of the following, if any, are you doing differently as a result of what you learned from your audit?

- Changed thermostat settings
- Use less hot water
- Use smart home controls
- Turn off lights/devices when not in use
- Scheduling regular servicing of my heating system
- Replacing filters as directed by my contractor
- I did nothing differently
- 97 Don't Know

CONTRACTOR INFORMATION

[ASK IF M1A=1 OR M1B=1 OR M1C=1 OR M1D=1 OR M1E=1 OR M1F=1 OR M1G=1 OR M1H=1 OR M1I=1 OR M1J=1]

CON1. Did you hire one or more contractors to perform the work?

- Yes
- No
- 97 DON'T KNOW

[ASK IF CON1=2]

CON2. Did you install the measure yourself?

- Yes
- No
- 97 DON'T KNOW

[ASK IF CON1=1]

CON3. Do you recall the name of the contractor that did all or most of the work?

- Please Enter Name: [TEXT BOX]
- 97 DON'T KNOW

[ASK IF CON1=1]

CON4. Did you hire a second contractor?

- Yes
- No
- 97 DON'T KNOW

[ASK IF CON4=1]

CON5. Do you recall the name of the second contractor?

Please Enter Name: [TEXT BOX]

97 DON'T KNOW

[ASK IF CON4=1]

CON6. Which efficiency upgrades did the second contractor install?

[TEXT BOX]

97 DON'T KNOW

[ASK ALL]

CON7. Have you heard of Building Performance Institute (BPI)?

Yes

No

97 DON'T KNOW

[ASK CON7=1]

CON8. In selecting the contractor, did you look for a Building Performance Institute contractor?

Yes

No

97 DON'T KNOW

[ASK CON7=1]

CON9. Did you use a BPI contractor for this work?

Yes

No

97 DON'T KNOW

CLOSE. Thank you for participating in the survey! The information you provided will be helpful in evaluating and improving the program. To collect your \$10 gift card for completing this survey, please follow the link to confirm your email address below or select the home delivery option to provide your home mailing address if you would prefer a physical card be sent to your home.

1 Confirm email address

2 Home delivery option

[ASK IF CLOSE=1]

EMAIL_X. Is [EMAIL] the correct email for where you'd like the gift code sent:

1 Yes

2 No; The correct email is: [TEXT BOX]

[DISPLAY HOMEDELIVERY THROUGH ZIPCODE ON SAME SCREEN]

[ASK IF CLOSE=2]

HOMEDELIVERY. Please provide your home mailing address for where you'd like the Visa gift card sent.

[ASK IF CLOSE=2]

NAME

Name: [TEXT BOX]

[ASK IF CLOSE=2]

ADDRESS_X

Street Address: [TEXT BOX]

[ASK IF CLOSE=2]

CITY

City: [TEXT BOX]

[ASK IF CLOSE=2]

STATE

State: [TEXT BOX]

[ASK IF CLOSE=2]

ZIPCODE

Zip Code: RANGE 00000-99999 [NUMBER BOX]

