

EM&V Report

Prepared for South Jersey Industries Utility:

Elizabethtown Gas

Program Year 1:

July 1, 2021 -- June 30, 2022

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1 Abstract

Under contract with the South Jersey Industries Utilities (the Company), ADM Associates, Inc., The CADMUS Group, and The Brightline Group (the Evaluator) are providing measurement, evaluation, and verification (M&V) services for the Elizabethtown Gas Company's (ETG) energy efficiency programs. The contract provides for annual M&V reporting covering a three-year period from July 1, 2021 through June 30, 2024, culminating in a final M&V report that covers the triennium and will be delivered to the New Jersey Board of Public Utilities (BPU).

This abstract is intended to provide the reader with the evaluation results including realization rates, program recommendations and evaluability assessments, and potential TRM update information. More detailed information about ETG programs during PY1 and the evaluation results can be found in the main body of the report and associated appendixes.

1.1 Program Descriptions and Evaluation Results

This M&V report covers the first program year July 1, 2021 through June 30, 2022 (PY1) of ETG's active programs including the:

- Residential EE Products program which incentivizes customer purchases of energy-efficient equipment through Downstream and Marketplace channels.
- Residential Existing Homes program which includes subprograms Home Performance with Energy Star (HPwES), Quality Home Energy Check-Up (QHEC), Middle Income (MI) Weatherization, and Home Energy Reports (HER).
- Energy Solutions for Business (ESB) includes Custom and Prescriptive channels, Energy Management, and Engineered Solutions subprograms to serve all potential commercial customers.
- Commercial Direct Install (Com-DI) program provides energy savings solutions and audits to qualified commercial and business customers.
- Multi-Family program which can include participation through the other residential and commercial programs for multi-family buildings.

Table 1-1 and Table 1-2 show the realization rates for both gas and electric savings for ETG programs during PY1, including ex-ante claimed savings, evaluated ex-post savings, and lifetime savings.

Table 1-1: Gas Ex-Ante and Ex-Post Gross Therms Savings for PY1 by Program Including Program Level Realization Rates (RR), Participant Counts, and Lifetime Savings.

Program	Program Participants	Gross Annual Natural Gas Savings (Therms)			
		Ex-Ante	Ex-Post	RR	Ex-Post Lifetime
EE Products	9,519	400,624.46	402,674.05	101%	4,043,677.81
HPwES	11	3,114.50	3,129.87	100%	73,498.44
QHEC	300	6,002.94	6,407.69	107%	60,603.95
MI Weatherization	64	13,297.41	13,008.75	98%	324,610.74
HERs	135,099	682,159.00	630,407.00	92%	1,323,854.70
ESB: Pres & Cust*	9	31,659.92	30,337.92	96%	194,480.40
Energy Management**	-	-	-	-	-
Engineered Solutions**	-	-	-	-	-
Com DI*	17	260.89	260.89	100%	2,629.48
Multi-Family*	292	5,680.95	5,680.95	100%	56,772.07
Total	145,311	1,142,800.07	1,091,907.12	96%	6,080,127.59

* Ex-Ante values reported as these programs did not receive a full evaluation for PY1 due to lower-than-expected participation and late reporting of program tracking data.

** No planned or realized program participation in PY1.

Table 1-2: Electric and Demand Ex-Ante and Ex-Post Gross Savings for PY1 by Program Including Program Level Realization Rates (RR), Participant Counts, and Lifetime Savings.

Program	Program Participants	Gross Annual Electric Savings (kWh)				Gross Annual Peak Demand Savings (kW)		
		Ex-Ante	Ex-Post	RR	Ex-Post Lifetime	Ex-Ante	Ex-Post	RR
EE Products	9,519	1,124,982	1,119,410	100%	8,696,172	10.10	10.28	102%
HPwES	11	5,701	4,100	72%	78,980	0	1.49	-
QHEC	300	50,634	102,712	203%	1,434,020	4.99	7.62	153%
MI Weatherization	64	20,722	17,701	85%	493,592	0.00	6.44	-
HERs	135,099	-	-	-	-	-	-	-
ESB: Pres & Cust*	9	-	-	-	-	-	-	-
Energy Management**	-	-	-	-	-	-	-	-
Engineered Solutions**	-	-	-	-	-	-	-	-
Com DI*	17	-	-	-	-	-	-	-
Multi-Family*	292	6,468	6,468	100%	97,024	0.65	0.65	100%
Total	145,311	1,208,507	1,250,391	103%	10,799,788	15.74	26.48	168%

* Ex-Ante values reported as these programs did not receive a full evaluation for PY1 due to lower-than-expected participation and late reporting of program tracking data.

** No planned or realized program participation in PY1.

1.2 Evaluation and Evaluability Recommendations by Program

The evaluations of PY1 programs revealed improvement opportunities, including data quality issues, program designs, marketing and awareness, and other issues. Table 1-3 lists the PY1 evaluation recommendations by the program.

Table 1-3: Recommendations by Program from the PY1 Evaluation

EE Products
Continue to use bill inserts and marketing emails to promote ETG's programs but focus on middle- and lower-income households by highlighting lower energy bills from energy-efficient equipment.
Consider working with contractors to bolster outreach and enrollment efforts for the EEP Downstream program. There is an opportunity for ETG to increase outreach and enrollment efforts with contractors by holding an in-person training, or webinar, or through distributing additional outreach materials for the contractors to use during their service call and marketing.
Continue to promote the Online Marketplace and Downstream programs through bill inserts and mailing marketing but look into other ways to market to potential participants.
Add messaging or documentation on how to utilize a smart thermostat's energy savings features and reporting of energy savings capabilities to the Online Marketplace purchases.
Consider focused marketing and outreach that highlights not only the available rebates, but the potential gas/energy savings from making upgrades.
Consider marketing programs using specific measures that are popular with ETG customers and messaging that describes how those measures will save on natural gas usage in the home.
HPwES
The PY1 realization rates should not be included in the TRM update because the Evaluator will conduct a pre/post billing analysis for PY2. The results of that analysis will provide a high-rigor estimate of actual program impacts.
ETG should consider program optimization options that include the forthcoming Inflation Reduction Act (IRA) incentives for home weatherization and efficiency measures. The IRA incentives may also impact HPwES program attribution.
ETG should provide the QA/QC data to the Evaluators who will leverage the data collected by PSD to inform the second, enhanced rigor evaluation while reducing customer contact points.
Make the Snugg Pro inputs available for M&V verification.
QHEC
Ensure the QHEC program's auditor explains ETG's other offerings and their applicability thoroughly and clearly.
Different marketing approaches should be considered for QHEC. Bill inserts and marketing emails to customers drove customer awareness for the QHEC program, but the Evaluators have found that across the country utility customers rarely read bill inserts, so there could be a significant number of customers still not aware of the program.
Consider including additional gas-saving measures in the program measure mix, such as exterior door weather stripping, water heater temperature setbacks, thermostatic radiator valves, thermostatic shower valves, window treatments, and smart thermostats.
Have a tracking data field for refused, unavailable, or incompatible measures during Direct Install visits.
MI Weatherization
ETG should implement the following list of tracking data improvements:

- Include the conditioned square footage of each home
 - Include blower door test results
 - Include demand savings for all measures of saving electric energy
 - For each insulation measure, in addition to the square footage of the area treated (was included), the R-value before (this was not provided) and R-value after improvement (this was included inconsistently)
- For the duct sealing measure:
- Percentage of ductwork located in conditioned space, and separate % for supply and return
 - Duct leakage assessment (leaky, average, tight) or actual leakage measurements (at 25 Pa, or preferably Normal System Operating Parameters (NSOP))
 - Duct insulation (existing R-value, final R-value if insulation is added)

Considering the number of ETG MI Weatherization projects to date, an April 2023 TRM update is not advisable. The TRM working group should review the current demand savings for the primary MI Weatherization measures:

- Air sealing (pg. 70, 2020 TRM). This measure primarily saves heating energy, but also saves some cooling energy. However, without explanation, the TRM states: “there are no summer coincident electric peak demand savings estimated at this time.”
- Insulation Upgrades (pg. 75, 2020 TRM). The TRM includes cooling energy savings algorithm, and a coincidence factor is listed in the “Residential Insulation Upgrades” table, however a demand savings algorithm is not included.

ETG should work with the implementer, 3rd-party verification contractor PSD, and the evaluation team, to review findings from QA/QC site visits to identify weatherization measures not addressed through the MI Weatherization program.

ETG should continue to target homes with the highest energy use and closely monitor interest, especially in 2023 when the Inflation Reduction Act efficiency tax credits are available.

HER

Save and store historical billing data for all customers in each wave to ensure future analyses will have one year of billing data prior to the RCT start date for each customer, as well as complete billing data after the intervention.

Investigate why 10 percent of treatment customers in Wave 2 are recorded as not receiving either paper or email HERs reports.

Continue to promote the online portal to increase customer awareness and engagement.

Assume a 1 year measure life for ongoing HERs programs or change the cohorts each year to claim a longer measure life for savings.

ESB: Custom & Prescriptive

Develop communication with implementation groups for electric utilities with overlapping territory to pass over potential projects that may fall heavily on the gas or electric savings side.

For Custom projects we recommend ex-ante analyses use the actual equipment efficiencies when available, instead of deferring to assumed or deemed efficiencies.

Commercial DI

The Evaluator should follow up with ETG and implementation staff in PY2 to report on the program effects of focusing on the project pipeline when approving DI projects.

The Evaluator should review the QA/QC reports for effectiveness and possible inclusion in the M&V verification process in PY2 and beyond. PSD should also provide ETG with solutions and recommendations to issues they find during the site visits.

Continue to request for an exemption for municipalities to wave the bid requirements so that they can participate in the utility run programs.

Continue to ask for a change in the current DI program design, to allow natural gas companies to use a gas bill for program qualification rather than an electric one.

As part of the PY1 minimum rigor evaluation effort, each program was checked to determine if the necessary data was being tracked and made available to perform future enhanced rigor evaluations. Table 1-4 shows the necessary changes for each program to be ready for an enhanced rigor evaluation in the future.

Table 1-4: Evaluability Recommendations by Program for the PY1 Evaluation.

EE Products
Missing quantity field. During the first months of the program, the program tracking data records did not include a quantity field. The Company added the quantity data element mid-cycle.
Incorrect AHRI reference numbers. The 2021 tracking data included several incorrect or incomplete AHRI reference numbers, which prevented ADM from calculating ex-post savings for those records.
Calculate ex-ante savings using actual measure parameter values by record, rather than using deemed parameter averages.
Ensure program tracking data follows the savings algorithms and any calculation modifications agreed on in the Coordinated Measure List.
Disaggregate savings for the “Gas Heater with Water Heater.”
Add the date of purchase to Online Marketplace tracking data.
HPwES
Make Snugg Pro modeling inputs available to the Evaluator. Some specific examples are: <ul style="list-style-type: none"> ■ Include an estimate of home Square Footage in the tracking data to facilitate accurate calculations for Air Sealing. ■ Include baseline SEER and EFLH in the tracking data being used to calculate central AC replacement savings. ■ Include efficiency or capacity for boiler and furnace replacements for new or existing systems in the tracking data.
QHEC
Add Aerator flowrate into the tracking data.
Improve program tracking data quality by adding product model numbers to tracking data.
Improve realization rates by ensuring that program tracking data follows the agreed-on savings algorithms agreed on in the Coordinated Measure List.
Consider the energy savings value of a professionally installed smart thermostat.
MI Weatherization
Include an estimate of building square footage for homes with Air Sealing.
Include all necessary Duct Sealing and Repair information in the tracking data. <ul style="list-style-type: none"> ■ Percentage of duct work found within the conditioned space. ■ Duct leakage evaluation (leaky, average, tight). ■ Duct insulation evaluation (existing R-value).
Include the baseline R-value estimates for Insulation in the tracking data.

Consider Tune-Up and Boiler Reset Controls Measures in the TRM update.
Include location of Ducts that were improved.
<p>Improve data and savings calculation consistency while using the QA/QC process to identify issues. For one project with very high therms savings (957 therms) in the tracking data, an in-depth interview was conducted with the participant who provided the scope of work they received from the auditor. The evaluator did not attempt to work with the implementation team to better understand such discrepancies for several reasons:</p> <ul style="list-style-type: none"> ■ This was one of the first MI Weatherization projects. Subsequent projects' total savings were significantly lower and did not appear to have obvious discrepancies. ■ Billing analysis is planned and will be used to determine evaluated savings in future evaluations. ■ QA/QC site visits by PSD have commenced and these will provide more accurate verification details.
HER
The data for this program supported an enhanced, industry standard billing regression M&V approach in PY1. The Evaluators found the control and treatment tracking data, utility billing data, program documentation, and customer contact information to be complete and was provided quickly by the program implementation contractor.
ESB: Custom & Prescriptive
We recommend ex-ante analyses use the actual equipment efficiencies when available, instead of deferring to assumed or deemed efficiencies.
Consider collecting steam loss factors for future inclusion in the NJ TRM updates. We recommend that the program begin collecting documentation for steam trap leakage designations (plugged/leaking/blowing by) as part of the implementation process.
Commercial DI
The Evaluators found that all necessary information is being collected to perform an enhanced rigor evaluation for this program in the future.

1.3 TRM Updates

While NJ has a Technical Reference Manual (TRM), there are areas where it can be updated for code changes and with NJ specific data collected through evaluation efforts across all utilities and their evaluators. During ETG's PY1 evaluation, data was collected that can be used to update the TRM related to water heaters, clothes washers, faucets, and aerators. This included information on when to apply certain factors in engineering equations, percentages of space and water heating fuel types, and certain demographic assumptions. These suggested TRM updates would affect the EE Products, QHEC, Weatherization, HPwES, and ESB: Custom programs with details found in Table 1-5.

Table 1-5: ETG Program Evaluation Data that May Be Used to Inform NJ TRM Updates

Residential							
<i>Measure (PY1 Count)</i>		<i>Notes</i>					
Water Heater (47)		AHRI lookups found 18.5 percent were 40 gal, 81.5 percent were 50-gal capacity tanks					
Tankless Water Heater (47)		Out of 8 survey responses, 63 percent replaced a tank and 38 percent replaced a tankless heater.					
Clothes Washer (493)		Define multi-family gallons/year as communal or within units. There was confusion by implementation in PY1.					
Faucets and Aerators (666)		Provide clear guidance for when to apply F percentages. Consider increasing the F percentages, even the 2022 addendum may not be high enough for gas water heat.					
Smart Thermostats (7,478)		In other neighboring states, savings for smart thermostats vary based on installation type (professional vs. customer) and added savings from the QHEC auditor’s professional smart thermostat installation could support program savings goals.					
Air Sealing (69)		(pg. 70, 2020 TRM). This measure primarily saves heating energy, but also saves some cooling energy. However, without explanation, the TRM states: “there are no summer coincident electric peak demand savings estimated at this time.”					
Insulation Upgrades (67)		(pg. 75, 2020 TRM). The TRM includes cooling energy savings algorithm, and a coincidence factor is listed in the “Residential Insulation Upgrades” table, however a demand savings algorithm is not included.					
Add Tune-Up (6) option to the Boiler Reset Controls (4) Measures		The 2020 NJ TRM does not include an approach to estimate savings for tune-ups but does include a measure for “boiler reset controls” which assumes 5 percent reduction in annual heating energy if outdoor temperature reset controls are implemented.					
Commercial							
<i>Measure</i>		<i>Notes</i>					
Steam Loss Factors (7)		We recommend that the program begin collecting documentation for steam trap leakage designations (plugged/leaking/blowing by) as part of the implementation process for possibly inclusion in the TRM updates.					
Demographics & Home Characteristics							
<i>PY1 Survey</i>	<i>Home Gas Heat</i>	<i>Water Gas Heat</i>	<i>S.F Home</i>	<i>Own Home</i>	<i>250% FPL</i>	<i>250-400% FPL</i>	<i>Survey N</i>
Downstream	96%	94%	87%	100%	5%	13%	93
Marketplace	91%	86%	71%	88%	6%	18%	69
Non-Participant	84%	80%	51%	68%	25%	10%	80
HER	90%	87%	64%	84%	19%	14%	145
QHEC	95%	84%	75%	96%	23%	7%	56
Weighted Average	91%	87%	69%	87%	16%	13%	443

2 Executive Summary

On May 23, 2018, NJ Governor signed into law the Clean Energy Act of 2018¹ (CEA). It calls for a significant overhaul of New Jersey's energy systems while growing the economy, building sustainable infrastructure, creating well-paying local jobs, reducing carbon emissions, and improving public health to ensure a cleaner environment for current and future residents. The CEA plays a key role in achieving the State's goal of 100 percent clean energy by 2050 by establishing aggressive energy reduction requirements, among other clean energy strategies. Specifically, the CEA directs the Board of Public Utilities (BPU) to require that:

- Each electric public utility achieves annual reductions of at least 2 percent of the average annual electricity usage in the prior three years within five years of implementation of its electric energy efficiency program.
- Each natural gas public utility achieves annual reductions in the use of natural gas of at least 0.75 percent of the average annual natural gas usage in the prior three years within five years of implementation of its gas energy efficiency program.

The CEA requires that evaluation, measurement, and verification activities are used to determine the electric and gas energy usage reductions and peak demand reductions for the utility's energy efficiency programs. A Statewide Evaluator (SWE) was hired by the BPU to coordinate the evaluations for all utilities, they provided guidelines for basic and advanced rigor evaluations that apply to new or changed programs and established programs, respectively. The SWE also required at least two full impact and process evaluations during the first triennium, with the CEA required triannual report due at the end of the first triennium. This report presents basic rigor evaluations for all ETG programs that reported participation during PY1.

2.1 Description of PY1 Programs

ETG's residential programs included:

- The EE Products program, which incentivized customer purchases of energy efficient equipment through Downstream and Marketplace channels. During PY1 the primary measures incentivized through the Downstream channel were Clothes Washers and Dryers, Furnaces, and Combination Heaters. The primary measure in the Marketplace channel was Smart Thermostats.
- The Existing Homes Home Performance with Energy Star subprogram (HPwES) starts with a home energy audit and if the customer qualifies, the contractors use

¹ P.L. 2018, c.17 (N.J.S.A. 48:3-87.8 et seq).

Snugg Pro modeling software to calculate the cost and energy savings for the project. Potential measures include but are not limited to insulation (required), air sealing (required), smart thermostats, and HVAC system improvements.

- The Existing Homes Quality Home Energy Check-Up subprogram (QHEC) provides customers with no cost energy efficiency audits and direct installation of free LED bulbs, Showerheads, Aerators, Advanced Power Strips, and Pipe Wrap.
- The Existing Homes Middle Income Weatherization subprogram provides income eligible customers with an in-home audit and based on the results of the audit the participant may receive weatherization measures at no cost.
- The Existing Homes Home Energy Reports program (HER) provides personalized reports to customers on their energy usage, comparisons to peers, and suggestions to save energy through direct mail and email channels.
- The Energy Solutions for Business Prescriptive and Custom subprograms include rebates for lighting, food service equipment, HVAC equipment, appliances, and other measures through the Prescriptive channel. The Custom channel provides performance-based or calculated rebates for large capital investments in electric and/or natural gas measures for commercial and industrial customers.
- Energy Solutions for Business Energy Management and Engineered Solutions subprograms provides a holistic approach to improving energy usage through maintenance, tune-up, and retro-commissioning through the Management channel. The Solutions channel provides energy audits to public service and non-profit entities. Based on the results of the audit, incentives and on bill re-payment are available to complete a variety of energy savings projects. There was no planned participation for this subprogram in PY1.
- The Commercial Direct Install program provides a free energy audit, direct install measures, and suggestions for other ETG commercial programs to complete larger energy saving projects to small businesses, non-profits, faith-based organizations, municipalities, and schools.
- The Multi-Family program is a suite of channels within other program offerings that include Direct Install, Home Performance with Energy Star, Custom and Prescriptive, and Engineered Solutions programs. The residential and commercial channels of the Multi-Family Program will have different implementers who will use surveys to help guide participants into the correct Multi-Family channel.

2.2 Portfolio Level Results and Discussion

The ETG PY1 portfolio of programs achieved the following ex-post results versus goals:

- 60 percent of the PY1 therms savings goals.
- 86 percent of PY1 participation goals, 54 percent when HER participants were excluded.
- 57 percent of lifetime therms PY1 savings goals.
- 33 percent of kWh PY1 savings goals.
- 21 percent of lifetime kWh PY1 savings goals.
- 36 percent of kW demand PY1 savings goals.

Planned goals by program are shown in Table 2-1, ex-post results by program are shown in Table 2-2, and the percentage difference between the two are shown in Table 2-3. All programs had a slower than expected start during PY1 that affected program participation. Only the Commercial DI program exceeded its participation goal. For the DI program, most of the participants received an audit but refused to move forward with a full project which resulted in significantly less than expected therms savings.

While the programs were all slow to start:

- The EE Products downstream and marketplace channels were very productive relative to the period they were active.
- HER was a legacy program and experienced a significant move out rate which resulted in ex-post savings less than the PY1 goal.
- The Weatherization, QHEC, HPwES, and Multi-Family programs were very active near the end of PY1 and look to continue for PY2.
- There are challenges inherent with the CEA for commercial DI, it requires providing the contractor with a current electric bill to qualify for specific tiers of rebates, which ETG does not have access too. Also, NJ municipal buildings are required to get three bids for capital projects which removes many of them from program consideration.
- The Custom and Prescriptive program is in the process of building relationships with the commercial sector, these customers have not had gas efficiency programs available to them until now. ETG expects this program to meet its goals in PY2 as these relationships are built and program awareness expands.
- Energy Management and Engineered Solutions were expected to have a slow start and did not have savings or participation planned for PY1.

Table 2-1: Planned Participation and Savings Goals by Program for PY1

Program	Estimated Participants	Projected Net Annual Natural Gas Savings (therms)	Projected Net Lifetime Natural Gas Savings (therms)	Projected Net Annual Electric Savings (kWh)	Projected Net Lifetime Electric Savings (kWh)	Projected Net Annual Peak Demand Savings (kW)
EE Products	16,375	653,816.00	6,187,009.00	1,251,648	9,415,119	0.00
HPwES	100	32,991.00	560,839.00	95,750	1,627,754	3.00
QHEC	850	24,029.00	183,912.00	721,133	8,341,769	8.00
MI Weatherization	150	24,658.00	452,738.00	134,044	1,787,910	3.00
HERs	150,000	907,885.00	1,944,452.00	-	-	-
ESB: Pres & Cust	1,055	132,900.00	807,262.00	848,713	18,823,731	45.00
Energy Management	0	0.00	0.00	0	0	0.00
Engineered Solutions	0	0.00	0.00	0	0	0.00
Com DI	10	13,809.00	207,133.00	458,584	6,878,764	12.00
Multi-Family	510	20,222.00	304,278.00	258,441	3,452,626	3.00
Total	169,050	1,810,310.00	10,647,623.00	3,768,313	50,327,673	74.00

Table 2-2: Realized Participation and Gross Ex-Post Savings by Program for PY1

Program	Program Participants	Gross Ex-Post Annual Natural Gas Savings (therms)	Gross Ex-Post Lifetime Natural Gas Savings (therms)	Gross Ex-Post Annual Electric Savings (kWh)	Gross Ex-Post Lifetime Electric Savings (kWh)	Gross Ex-Post Annual Peak Demand Savings (kW)
EE Products	9,519	402,674.05	4,043,677.73	1,119,410	8,696,172	10.28
HPwES	11	3,129.87	73,498.44	4,100	78,980	1.49
QHEC	300	6,407.69	60,603.95	102,712	1,434,020	7.62
MI Weatherization	64	13,008.75	324,610.74	17,701	493,592	6.44
HERs	135,099	630,407.00	1,323,854.70	-	-	-
ESB: Pres & Cust*	9	30,337.92	194,480.40	-	-	-
Energy Management**	-	-	-	-	-	-
Engineered Solutions**	-	-	-	-	-	-
Com DI*	17	260.89	2,629.45	-	-	-
Multi-Family*	292	5,680.95	56,772.07	6,468	97,024	0.65
Total	145,311	1,091,907.12	6,080,127.59	1,250,391	10,799,788	26.48

* Ex-Ante values reported as these programs did not receive a full evaluation for PY1 due to lower than expected participation and late reporting of program tracking data.

** No planned or realized program participation in PY1.

Table 2-3: Percent Difference Between the Ex-Post / ETG Plan Therms and Electric Savings

Program	Program Participants (ex-post/plan)	Annual Natural Gas Savings (ex-post/plan)	Lifetime Natural Gas Savings (ex-post/plan)	Annual Electric Savings (ex-post/plan)	Lifetime Electric Savings (ex-post/plan)	Annual Peak Demand Savings (ex-post/plan)
EE Products	58%	62%	65%	89%	92%	--
HPwES	11%	9%	13%	4%	5%	50%
QHEC	35%	27%	33%	14%	17%	95%
MI Weatherization	43%	53%	72%	13%	28%	215%
HERs	90%	69%	68%	--	--	--
ESB: Pres & Cust*	1%	23%	24%	--	--	--
Energy Management**	--	--	--	--	--	--
Engineered Solutions**	--	--	--	--	--	--
Com DI*	170%	2%	1%	--	--	--
Multi-Family*	57%	28%	19%	3%	3%	22%
Total	86%	60%	57%	33%	21%	36%

There were many challenges involved in launching ETGs portfolio of programs during PY1, including:

- Limited marketing budgets and customer awareness of new programs.
- Trade Ally recruitment and training.
- Setting up downstream EE Products program partners.
- Transition from state run programs to individual utility run programs.
- Competing with electric utility programs for the same customers.
- Economic conditions including supply chain restraints and customer inflationary concerns.
- Customers refusing work beyond an audit, which included DI measures across programs.

2.3 Evaluation Methods and Discussion of Results

This section includes a brief description of impact and process evaluation methodology for PY1 programs along with the ex-ante versus ex-post gross therms and electric savings results and recommendations. With the exception of the enhanced rigor HER program evaluation, all PY1 evaluations followed the basic rigor guidelines provided by the SWE.

2.3.1 Residential Programs

Methodology

During the impact evaluation for PY1, the Evaluator:

- Quantified the number of program participants and installed measures.
- Conducted customer surveys to collect additional data needed to calculate program savings.
- Calculated the gas savings (therms/yr) and electric savings (kWh) attributable to the program. For the HER program this involved an industry standard difference-in-difference regression analysis. The rest of the evaluations followed the SWE's basic rigor guidelines which included verifying ex-ante calculations followed the appropriate Coordinated Measures List TRM guidelines, verifying the inputs and variables to the savings calculations, surveying program participants to verify installations and collect process evaluation information, interviewing program and implementation staff.
- Collected NTG data for future development of NTG ratios as the CEA stipulated NTG = 1 for the first triennium.

The process evaluation was designed to explore the EE Products program design, barriers to participation, implementation, and outcomes. To investigate these areas, ADM reviewed program documents, spoke with program staff, conducted interviews with trade allies, and surveyed customers.

EE Products

During PY1 the EE Products program had participation from **5,421 customers**, who purchased **7,987 measures** from the online marketplace channel, and **1,191 customers** received rebates through the downstream program channel for **1,532 qualified products**. The evaluation found that in PY1 the program resulted in gross ex-post savings of **402,674.05 therms (101 percent RR)**, **1,119,410 kWh savings (100 percent RR)**, and **10.28 kW demand savings (102 percent RR)**. With gross lifetime savings of **4,043,677.81 therms** and **8,696,172 kWh**.

The following recommendations were developed from the impact analysis data review, IDIs, and surveys:

- Continue to use bill inserts and marketing emails to promote ETG's programs but focus on middle and lower income households by highlighting lower energy bills from energy efficient equipment.
- Consider working with contractors to bolster outreach and enrollment efforts for the EEP Downstream program.

- Consider focused marketing and outreach that highlights not only the available rebates, but the potential gas/energy savings from making upgrades.
- Consider marketing programs using specific measures that are popular with ETG customers and messaging that describes how those measures will save on natural gas usage in the home.
- Add messaging or documentation on how to utilize a smart thermostat's energy savings features and reporting of energy savings capabilities to the Online Marketplace purchases.

HPwES

During PY1 the HPwES program completed 11 projects with an average savings of 283 therms per home. The evaluation found ex-post gross savings of **3,129.87 therms savings (100.5 percent RR)**, **4,100 kWh savings (72 percent RR)**, **1.49 kW** (no ex-ante). With lifetime savings of **73,498.44 therms** and **78,980 kWh**.

The following recommendations were developed from the impact analysis data review and IDIs:

- Implementation interviews mentioned the forthcoming Inflation Reduction Act (IRA) incentives for home weatherization and efficiency measures may substantively change the home weatherization market. ETG should consider program optimization options that include the forthcoming Inflation Reduction Act (IRA) incentives for home weatherization and efficiency measures.
- Evaluators should leverage data collected by the implementer's 3rd party QA/QC contractor, PSD, to inform the second, enhanced rigor evaluation. PSD is verifying installations and data accuracy for a percentage of projects; these visits are similar to a traditional M&V site visit.
- The tracking database did not include all the details and data necessary to estimate savings using TRM algorithms. This is not a high priority however, because Evaluators expect to conduct pre/post natural gas billing analysis to determine ex-post therms savings. Evaluators and ETG should coordinate with Snugg Pro staff to establish reporting protocols so that the evaluator has access to all model inputs.
- The PY1 realization rates should not be included in the TRM update because the Evaluator will conduct a pre/post billing analysis for PY2. The results of that analysis will provide a high rigor estimate of actual program impacts.
- Make the Snugg Pro inputs available for M&V verification. If the Evaluators need to calculate savings using a TRM-based approach in future program years (e.g., due to low participation or insufficient post-period data), then the Evaluators and

ETG should coordinate with implementation and Snugg Pro staff to establish reporting protocols so that the evaluator has access to all model inputs.

QHEC

During PY1 the QHEC program provided **300 customers** with **2,897 measures** with a total gross savings of **6,407.69 therms savings (107 percent RR)**, **102,712 kWh savings (203 percent RR)**, and **7.62 kW demand savings (153 percent RR)**. With lifetime gross savings of **60,603.95 therms** and **1,434,020 kWh**.

The following recommendations were developed from the impact analysis data review, IDIs, and survey:

- Ensure the QHEC program's auditor explains ETG's other offerings and their applicability thoroughly and clearly.
- Different marketing approaches should be considered for QHEC. Bill inserts and marketing emails to customers drove customer awareness for the QHEC program, but the Evaluators have found that across the country utility customers rarely read bill inserts, so there could be a significant number of customers still not aware of the program.
- Have a tracking data field for refused, unavailable, or incompatible measures during Direct Install visits.
- Consider including additional gas saving measures in the program measure mix, such as window treatments, simple weatherization measures, and professionally installed smart thermostats.

MI Weatherization

During PY1 the MI Weatherization program completed **64 projects** with a reported savings per home of 208 therms. This resulted in ex-post gross savings of **13,008.75 therms savings (98 percent RR)**, **17,701 kWh savings (85 percent)**, and **6.44 kW demand savings**. With lifetime savings of **324,610.74 therms** and **493,592 kWh**.

The following recommendations were developed from the impact and process evaluation:

- Continue to target homes with the highest energy use and closely monitor interest, especially in 2023 when the Inflation Reduction Act efficiency tax credits are available.
- Evaluators should leverage data collected by the implementer's 3rd party QA/QC contractor, PSD, to inform the second, enhanced rigor evaluation. PSD is verifying installations and data accuracy for a percentage of projects; these visits are similar to a traditional M&V site visit.

- ETG should work with the implementer, 3rd-party verification contractor PSD, and the evaluation team, to review findings from QA/QC site visits to identify weatherization measures not addressed through the MI Weatherization program.
- Considering the number of ETG MI Weatherization projects to date, an April 2023 TRM update is not advisable. The evaluation team will expedite the pre/post billing analysis for PY2.

HERs

During PY1 the HER program saved **630,407 therms** for a **92.4 percent realization rate**, with an average savings equal to **0.5 percent** of annual therms consumption. Application of a NTG = 1 for this program with the ETG assumed measure life of 2.1 years for the first year of claimed savings from the behavioral program cohorts, generated lifetime savings of **1,323,854.70 therms**.

The following recommendations were developed from the impact and process evaluation:

- Save and store historical billing data for all customers in each wave.
- Investigate why 10 percent of treatment customers are recorded as not receiving either paper or email HERs reports.
- Continue to promote the online portal to increase customer awareness and engagement.
- Assume a 1-year measure life for ongoing HERs programs or change the cohorts each year to claim a longer measure life for savings.

2.3.2 Commercial Programs

Methodology

The PY1 evaluation was limited due to a slow start to program participation and the four projects with savings were included as part of the M&V sample. Only one of those projects was conducted according to program guidelines, so this limited PY1 evaluation included a single evaluated project. Because of this, no participant interviews were conducted, and the process evaluation was based on interviews with utility and implementation staff.

Program savings were calculated using algorithms in the New Jersey Board of Public Utilities Protocols to Measure Resource Savings FY2020, the 2021 NJ TRM Addendum, and “Coordinated Measure List” developed by the NJ EM&V sub-team.

Several measures installed through the program are included in the Commercial and Industrial Energy Efficient Construction section of the Coordinated Measure List. For some measures, ADM used values from applicable baseline tables for direct install measures that more accurately reflected the project’s baseline conditions.

ESB: Prescriptive and Custom

Nine projects were completed in PY1, of those, two were prescriptive and seven were custom projects. The program resulted in program level ex-post gross annual savings of **30,337.92 therms savings (96 percent RR)** and gross **lifetime savings of 194,480.40 therms**.

The following recommendations were developed from the process evaluation:

- We recommend that the program begin collecting documentation for steam trap leakage designations (plugged/leaking/blowing by) as part of the implementation process.
- Develop communication with implementation groups for electric utilities with overlapping territory to pass over projects that are primarily gas or electric.
- For Custom projects we recommend ex-ante analyses use the actual equipment efficiencies when available.

ESB: Energy Management and Engineered Solutions

There was no planned or realized participation for these subprograms in PY1. ETG worked on marketing the program and building relationships with customers who could be potential participants.

Commercial DI

During the first year of the program, 17 Audits were conducted but 13 of the customers declined DI measures or retrofit projects which resulted in program level ex-ante gross annual savings of **260.89 therms savings (100 percent RR)** and **2,629.48 therms of gross lifetime savings**.

The following recommendations were developed from the process evaluation:

- Continue to request for an exemption for municipalities to waive the bid requirements so that they can participate in the utility run programs.
- Continue to ask for a change in the current DI program design, to allow natural gas companies to use a gas bill for program qualification rather than an electric one.
- The Evaluator should follow up with ETG and implementation staff in PY2 to report on the program effects of focusing on the project pipeline when approving DI projects.
- The Evaluator should review the QA/QC reports for effectiveness and possible inclusion in the M&V verification process in PY2 and beyond. In July 2022, ETG hired Performance Systems Development (PSD) to conduct third-party inspections and check for missed opportunities, and health and safety issues, and verify that documented work has been completed. They are required to perform inspections

for 10 percent of DI projects. PSD should also provide ETG with solutions and recommendations to issues they find during the site visits.

Multi-Family

The Multi-Family program got a late start in PY1 and also had delayed reporting of program data. Thus, the Evaluator, ETG staff, and the SWE jointly decided that the first evaluation of this program should cover PY1 and PY2. During PY1 the program had **292 participants**, gross ex-ante savings of **5,680.95 therms** and **56,772.07 lifetime therms**, electric gross savings of **6,468 kWh** and **0.65 kW**.

2.4 Recommended TRM Adjustments

These suggested TRM updates would affect the EE Products, QHEC, Weatherization, HPwES, and ESB: Custom programs with details found in Table 2-4.

Table 2-4: ETG Program Evaluation Data that May Be Used to Inform NJ TRM Updates

Residential							
<i>Measure (PY1 Count)</i>		<i>Notes</i>					
Water Heater (47)		AHRI lookups found 18.5 percent were 40 gal, 81.5 percent were 50-gal capacity tanks					
Tankless Water Heater (47)		Out of 8 survey responses, 63 percent replaced a tank and 38 percent replaced a tankless heater.					
Clothes Washer (493)		Define multi-family gallons/year as communal or within units. There was confusion about implementation in PY1.					
Faucets and Aerators (666)		Provide clear guidance for when to apply F percentages. Consider increasing the F percentages, even the 2022 addendum may not be high enough for gas water heat.					
Smart Thermostats (7,478)		In other neighboring states, savings for smart thermostats vary based on installation type (professional vs. customer) and added savings from the QHEC auditor’s professional smart thermostat installation could support program savings goals.					
Air Sealing (69)		(pg. 70, 2020 TRM). This measure primarily saves heating energy, but also saves some cooling energy. However, without explanation, the TRM states: “there are no summer coincident electric peak demand savings estimated at this time.”					
Insulation Upgrades (67)		(pg. 75, 2020 TRM). The TRM includes cooling energy savings algorithm, and a coincidence factor is listed in the “Residential Insulation Upgrades” table, however a demand savings algorithm is not included.					
Add Tune-Up (6) option to the Boiler Reset Controls (4) Measures		The 2020 NJ TRM does not include an approach to estimate savings for tune-ups but does include a measure for “boiler reset controls” which assumes 5 percent reduction in annual heating energy if outdoor temperature reset controls are implemented.					
Commercial							
<i>Measure</i>		<i>Notes</i>					
Steam Loss Factors (7)		We recommend that the program begin collecting documentation for steam trap leakage designations (plugged/leaking/blowing by) as part of the implementation process for possibly inclusion in the TRM updates.					
Demographics & Home Characteristics							
<i>PY1 Survey</i>	<i>Home Gas Heat</i>	<i>Water Gas Heat</i>	<i>S.F Home</i>	<i>Own Home</i>	<i>250% FPL</i>	<i>250-400% FPL</i>	<i>Survey N</i>
Downstream	96%	94%	87%	100%	5%	13%	93
Marketplace	91%	86%	71%	88%	6%	18%	69
Non-Participant	84%	80%	51%	68%	25%	10%	80
HER	90%	87%	64%	84%	19%	14%	145
QHEC	95%	84%	75%	96%	23%	7%	56
Weighted Average	91%	87%	69%	87%	16%	13%	443

3 Introduction to the M&V Report

The CAC requires an M&V report to be delivered to the BPU that covers the first three years of programs (PY1-3). The SWE guidance suggests each program have at least two full-impact and process evaluations during the first triennium. This report includes full evaluations for the:

- EE Products program
- QHEC program
- HERs program
- MI-Weatherization program

Partial evaluations were conducted for the:

- HPwES program
- ESB: Prescriptive and Custom program
- Commercial DI program

No PY1 evaluations were conducted for the:

- ESB: Energy Management and Engineered Solutions programs
- Multi-Family program

This M&V report for the ETG portfolio of energy efficiency programs is arranged with the individual program reports included in appendices, which follow a traditional M&V report format. The main body of the report includes:

- Discussions of the survey methods and implementation schedules.
- An overview of the basic rigor M&V methodology used for the PY1 evaluations.
- Evaluation results by program, including survey results, realization rates, process findings, and barriers to program participation.
- Recommendations for program design changes, data improvements, marketing, and data collection by program.
- Evaluability of the programs for future enhanced rigor evaluations.
- A benchmarking comparison to several successful gas utility EE programs.
- List of potential NJ TRM updates that resulted from the evaluations.
- Comparison of how PY1 program savings would have changed under the upcoming TRM updates recommended in the 2022 Addendum.

3.1 Surveys and NTG Methodology

Surveys

The M&V data collection process for PY1 included participant and non-participant surveys.

- The surveys were primarily administered online, with the MI weatherization program surveys/interviews conducted over the phone due to the small sample size.
- Program participants were invited to participate in a survey via email addresses and/or phone numbers provided by ETG.
- Non-participants were surveyed through a general population survey in which a random sample of the Company's residential customers (excluding program participants) were invited to participate in a survey.
- Surveys were conducted at the end of PY1, from July through September 2022.
- To ensure statistical significance met the SWE guidelines, survey samples were selected to achieve a relative precision of ± 10 percent at the 90 percent confidence interval at the program level and ± 15 percent at the 85 percent confidence interval at the measure level for high impact measures (greater than 5 percent of program savings).²
- All surveys included demographics and NTG battery of questions that were agreed upon by all NJ utilities and approved by the SWE.
- A \$10 incentive was offered for fully completed surveys, due to the relatively small sample of program participants available for surveying in PY1. The incentive was very successful and may be considered for future survey efforts.

Net-To-Gross

Net savings refer to savings that are attributed to the program efforts after accounting for:

- Free ridership, the portion of gross energy impacts that would have occurred even in the absence of the program.
- Spillover, additional program-induced energy savings, generated by both participants and non-participants, for which the program didn't provide any specific financial incentive.

The NJ Board of Public Utilities stipulated that NTG is set to 1.0 for the first triennium of the program. The data to calculate NTG will be collected using an approved battery of

² If program participation for a specific measure subgroup exceeded 1,000, then the sample size was adjusted to achieve ± 15 percent at the 90 percent confidence interval.

free ridership and spillover questions in customer surveys conducted during the first triennium.

Survey Bias Statement

The Evaluators recognize that various sources of bias may affect surveys, and this justifies caution and care in the design of survey instruments, administration strategies, as well as interpretation of results. Sources of bias include sample bias, survey mode effects, and various types of response bias. These sources of bias are often interrelated and may impact one another.

For PY1, the nonparticipant and HERs surveys were a random sample of the population invited to participate in the survey. For the EE Products Online Marketplace, QHEC, and Downstream participant surveys, the samples were guided by measure-level participation with invitation list sizes determined by measure-level gas savings, to achieve quotas specified in a stratified sampling plan. PY1 surveys were administered via email, with an incentive offered in most cases. ADM sent multiple reminders and collected responses over multiple weeks. **As it stands now, for program participant samples, it is difficult to know whether respondent demographics reflect the demographics of all participants or if non-response bias has resulted in an unrepresentative sample.** In the future, the evaluator may rely on publicly available data to investigate sampling bias for its general population efforts (e.g., nonparticipant and HERs surveys).

ADM has explored survey mode, sample composition, and item-nonresponse in its past evaluations and is willing to explore these issues in future SJI evaluations. As required or deemed necessary, future SJI customer surveys may be conducted via telephone, mail-in paper form, and email. Possibly with or without incentives to increase the reach and to investigate nonresponse bias, data quality issues, or response biases related to issues such as item nonresponse, extreme response, recall, and social desirability biases.

3.2 Impact and Process Evaluation Methodology

This section describes the basic rigor methodology ADM, Brightline Group, and CADMUS (the Evaluators) used to calculate gas and electric savings that resulted from the ETG programs.

3.2.1 Residential Programs

Impact

During the evaluation, the Evaluator:

- Quantified the number of program participants and installed measures using the program tracking data and customer surveys.

- Conducted program participant and non-participant surveys to collect additional data needed to calculate program savings.
- Calculated the gas savings (therms/yr) and electric savings (kWh) attributable to the program. For the HER program this involved an industry standard difference-in-difference regression analysis. The rest of the evaluations followed the SWE's basic rigor guidelines which included verifying ex-ante calculations followed the appropriate Coordinated Measures List TRM guidelines, verifying the inputs and variables to the savings calculations, surveying program participants to verify installations and collect process evaluation information, interviewing program and implementation staff.

The EE Products, QHEC, MI Weatherization, and HPwES program applied the deemed savings values and algorithms from the 2020 and 2021 State of New Jersey Energy Efficiency Technical Reference Manual (NJ TRM) and the Maryland/Massachusetts Technical Reference Manual Version 10 (MD/MA TRM) to determine verified gross energy impacts and lifetime savings. The specific TRM used for each measure was dictated by the Coordinated Measures List³ and a detailed accounting of each approach can be found in the methodology section of each appendix.

The HERs methodology followed an industry standard impact evaluation approach that conforms with the accepted level of rigor for all HERs program evaluations. The Evaluator used participant and control group billing data in the pre-period (before the household starts receiving home energy reports) and in the post-period (after household starts receiving home energy reports) to estimate program impacts for each wave as part of the impact evaluation for the Home Energy Report Program, as detailed in the Uniform Methods Project (UMP) behavioral chapter by the National Renewable Energy Laboratory⁴.

Process

The process evaluations were designed to explore each program's design, barriers to participation, implementation, characteristics of program participants, participant knowledge and enthusiasm for energy efficiency, and program outcomes. To investigate these areas, the Evaluators reviewed program documents, spoke with program staff, conducted interviews with implementation, and surveyed both program participants and non-participants.

³ The Coordinated Measures List is a working document agreed upon by the NJ Utilities and their evaluators that details what TRM should be used for each measure until the NJ TRM can be fully updated.

⁴ <https://www.nrel.gov/docs/fy18osti/70472.pdf>

Low Income Approach

The Evaluators recoded American Community Survey (ACS)⁵ data on household size and income to create a flag that indicated the percentage of households that were at or below 250 percent of the Federal Poverty Level (FPL). ACS data was then summarized at the Public Use Microdata Areas (PUMA) level. The summary was developed by applying the population weight included in the data set and involved summarizing household characteristics based on the individual responses to get totals for the PUMA.

The ACS PUMA data was then mapped to zip codes. The census bureau performs sampling and data collection using a geography known as a Public Use Microdata Areas (PUMAs). The Evaluator used the Missouri Census Data Center's⁶ correspondence engine to map the PUMAs to the zip code tabulation areas (ZCTAs). There is a "many-to-many" relationship between PUMAs and ZCTAs such that more than one ZCTA can map to a PUMA and a single ZCTA can map to more than one PUMA. The correspondence engine provides an allocation factor that functions as a weighting variable in the data set. The allocation factor represents a proportion of the source area (PUMA in this case) to the target area (ZCTA in this case). The evaluators summarized the PUMA data by applying the allocation factor as a weight to develop the ZCTA-level summaries.

Finally, the evaluators mapped the ZCTAs to zip codes within the ETG service territory to estimate the percentage of households served by the utility have incomes below 250 percent FPL. These findings were then compared to customer self-report income data gathered through the program surveys to estimate which programs are likely underserving customers below 250 percent FPL.

Cross Participation Evaluation

The Evaluators compared the provided tracking data from each residential program to determine cross-program participation during the first program year. Additionally, the Evaluators reviewed program participation dates for all cross-program participants that interacted with the QHEC program to appraise the efficacy of the QHEC program as a pipeline for additional program engagement.

⁵ U.S. Census Bureau 2020 American Community Survey (ACS) Five Year Estimates Public Use Microdata Sample (PUMS).

⁶ Missouri Census Data Center Geocorr 2018: Geographic Correspondence Engine. Available via: <https://mcdc.missouri.edu/applications/geocorr2018.html>

3.2.2 Commercial Programs

Impact

Typically, a stratified sampling strategy is used to select sample projects for commercial programs. The low participation numbers in PY1 resulted in near census sampling for DI and ESB projects.

Deemed savings values from the New Jersey protocols (as determined in the statewide Coordinated Measure List) were used to analyze savings for the DI and ESB prescriptive measures. More information on the specific TRMs used for each measure can be found in the methodology sections in the appendices. The custom projects for PY1 all consisted of Steam Trap Repair/Replacements. Desk reviews of the project's savings were based on the NY TRM Algorithms and MA evaluation - "Steam Trap Evaluation Phase 2," March 8, 2017. This reference was from the statewide Coordinated Measure List.

Process

The process evaluation was designed to explore the program's design, barriers to participation, implementation, and outcomes. In PY1, process evaluation activities were limited to program and implementation staff interviews and document review.

4 Evaluation Results

This chapter details each program's PY1 evaluation results, conclusions, recommendations, and evaluability under future enhanced rigor evaluations while referencing the detailed program evaluation appendixes.

4.1 Conclusions by Program

This section summarizes each program's realization rates, sample sizes, survey results, and major process findings.

4.1.1 EE Products

Sampling and Survey Results

For the downstream survey, **93 responses** were collected, which was more responses than required for the overall 90 percent confidence interval with 10 percent precision (90/10). At the measure level, four of the nine downstream measures achieved the number of responses to meet the 85/15 requirement in the SWE's basic rigor guidelines Table 7-8. The marketplace survey achieved **69 responses**, more than was required for 90/10 and more than the measure level 85/15 requirement for each of the three measures Table 7-9. The non-participant survey had **80 responses**. Table 4-1 and Table 4-2 show the survey results for PY1.

Table 4-1: Downstream Sampling Results by Measure Category

Measure Category	Measure Quantity	Ex-Ante Savings (therms)	Percent of Annual Gas Savings	Required responses to meet 85/15	Responses Collected	Final Confidence Interval
Gas Furnace	231	32,785.08	42.00%	21	31	85/5.4
Gas Combination Heater	114	16,081.16	20.60%	19	16	85/16.8
Gas Furnace with Water Heater	31	11,937.93	15.30%	13	6	85/26.8
Gas Boiler	31	5,527.33	7.10%	14	0	--
Clothes Dryer	489	3,760.41	4.80%	22	24	85/14.4
Clothes Washer	493	3,309.63	4.20%	22	29	85/13
Water Heater	94	2,650.13	3.40%	19	19	85/14.8
Smart Thermostat	48	1,937.76	2.50%	16	4	85/35
Reset Controls	1	27.56	0.00%	1	0	--
Total	1,532	78,016.99	100%	147	129	85/6

Table 4-2: Online Marketplace Sampling Results by Measure Category

Measure Category	Measure Quantity	Ex-Ante Savings (therms)	Percent of Annual Gas Savings	Required responses to meet 85/15	Responses Collected	Final Confidence Interval
Smart Thermostat	7,424	299,810.08	92.90%	23	54	85/9.8
Water Savings Kit	173	14,146.21	4.40%	20	69	85/6.7
Low-flow Showerheads	319	7,529.87	2.30%	22	34	85/11.7
Faucet Aerators	71	1,121.31	0.30%	21	46	85/6.3
Total	7,987	322,607.47	100%	86	203	85/5

Impact Results

The **9,519 measures** purchased and installed through the PY1 EE Products program saved **402,674.05 gross ex-post therms** which will have a lifetime savings of **4,043,677.73 therms** since the NTG was deemed at 1 for the first triennium of programs.

Table 4-3: EE Products Gross Annual and Lifetime Gas Savings (Therms)

Measure Category	Quantity	Ex-Ante Savings (therms)	Ex-Post Savings (therms)	Therms RR	EUL	Lifetime Savings (Therms)
Downstream						
Gas Furnace	231	32,785.08	35,289.35	108%	20	705,787.01
Gas Combination Heater	114	16,081.16	27,428.01	171%	20	548,560.17
Gas Boiler	31	5,527.33	5,755.93	104%	20	115,118.62
Clothes Dryer	489	3,760.41	3,760.41	100%	15	92,989.33
Gas Furnace with Water Heater	31	11,937.93	6,199.29	52%	12	45,124.92
Clothes Washer	493	3,309.63	2,962.90	90%	11	32,591.92
Gas Storage Tank Water Heater	74	1,063.67	1,978.65	186%	20	30,722.22
Smart Thermostat	48	1,937.76	1,937.76	100%	11	21,765.14
Tankless Water Heater	47	1,586.46	1,536.11	97%	7.5	14,533.20
Reset Controls	1	27.56	72.38	263%	10	723.75
Online Marketplace						
Smart Thermostat	7,424	299,810.08	288,708.46	96%	7.5	2,165,313.45
Water Saving Kit	173	14,146.21	16,300.78	115%	10	163,007.80
Low-Flow Showerheads	319	7,529.87	9,671.09	128%	10	96,710.90
Faucet Aerators	71	1,121.31	1,072.93	96%	10	10,729.30
Total	9,519	400,624.46	402,674.05	101%	10	4,043,677.73

Some measures in the program also saved electric energy during PY1, the annual ex-post gross energy savings and demand was **1,119,410 kWh** and **10.28 kW** with a lifetime gross savings of **8,696,172 kWh** (Table 4-4). Measure level details can be found in

Table 7-11, Table 7-12, Table 7-27.

Table 4-4: EE Products Gross Annual, Demand, and Lifetime Energy Savings (kWh)

Measure Category	Quantity	Ex-Ante Savings (kWh)	Ex-Post Savings (kWh)	kWh RR	EUL	Lifetime Savings (kWh)	Ex-Ante Savings (kW)	Ex-Post Savings (kW)	kW RR
Downstream									
Central Air Conditioner	14	5,600	5,041	90%	11.0	425,450	7.41	6.56	89%
Smart thermostat	48	5,983	5,983	100%	15.0	75,608	N/A	N/A	N/A
Clothes Washer	493	28,490	38,677	136%	7.5	44,872	2.69	3.72	138%
Online Marketplace									
Water Saving Kit	173	19,532	31,758	163%	7.5	7,640,548	N/A	N/A	N/A
Smart Thermostat	7,424	1,058,016	1,018,740	96%	10.0	317,584	N/A	N/A	N/A
Low-flow Showerhead	319	4,680	16,702	357%	10.0	167,020	N/A	N/A	N/A
Faucet Aerator	71	2,680	2,509	94%	10.0	25,091	N/A	N/A	N/A
Total	8,542	1,124,981	1,119,410	100%	7.8	8,696,173	10.10	10.28	102%

Discussion of Realization Rates

- The realization rates differed from 100 percent for **gas furnaces, heaters, boilers, and water heaters** were due to each measures model specific parameters used in the ex-post calculations versus average estimates used in the ex-ante estimates.

Detailed discussions of the realization rates can be found in Section 7.3.

Process Evaluation Results

During the in-depth interviews (IDI) ADM found the following results:

- The transition from NJCEP to utility-run energy efficiency programs required significant coordination and resources.
- Utility and implementation staff indicated that internal and coordinated data tracking systems are sufficient, but they have experienced some challenges collaborating and ensuring timely and accurate data management.
- SJI’s director of energy efficiency said that recruiting customers to participate in programs other than EEP Downstream has been a challenge, as they are still building awareness, and electric utilities have the same offerings and may have more aggressive marketing or deeper connections to their customers.
- The existence of past programs set a strong foundation for operational success for the EEP Downstream offerings.

- The ETG energy efficiency manager noted that on-bill financing or on-bill repayment plan (OBRP) had “sweetened the deal for customers” and it had been especially attractive for moderate income customers.
- The EEP Downstream offering required paper or PDF forms in PY1; a contractor portal had recently launched at the time of ADM’s call.
- ETG’s Online Marketplace did not meet its budget spending expectations in PY1; this was attributed to initially limited marketing, a limited range of products, and the launch date of the program website.
- Broader economic conditions and lingering impacts from the COVID-19 pandemic were noted as having varying impacts on the EEP program.

The Downstream survey analysis results can be found in Section 7.4.2, highlights from the results were:

- All respondents were homeowners, and most were living in single-family homes, with gas home (96 percent) and water (94 percent) heating.
- Ninety-one percent of respondents said they lived with no more than three other people.
- Downstream participants tend to learn about the program from contractors or on their own through the program website. Though 63 percent of respondents worked with a contractor, only one-third indicated they learned about the program from a contractor.
- The Downstream rebate process is generally easily understood and uncomplicated to navigate.
- Downstream rebate customers were satisfied with the program overall and experience with ETG. Sixty-five percent said they had recommended the program to someone else and of those who had not recommended the program 70 percent said they would recommend it.
- Most respondents were not aware of ETG’s energy efficiency offerings beyond its Downstream program.
- Though most ETG downstream respondents did not utilize the On-Bill Repayment Program (OBRP), it is enabling ETG customers to finance eligible equipment.

The Marketplace survey analysis results can be found in Section 7.4.3, highlights from the results were as follows:

- Eighty-eight respondents were homeowners, and 71 percent were living in single-family homes, with gas home (91 percent) and water (86 percent) heating.

- The Online Marketplace serves ETG customers with varying demographic characteristics.
- Most smart thermostat customers installed and learned about their new thermostat independently.
- Over half of smart thermostat customers have not noticed savings since installing them.
- The majority of participants indicated satisfaction with the measures they received, variety of measures offered, time to receive the product they purchased, and the program overall.
- Sixty-seven percent said they had recommended the program to someone else and of those who had not recommended the program 70 percent said they would recommend it.
- Most Online Marketplace customers had not participated in other ETG offerings.

Conclusions and Recommendations

Conclusion: EEP Downstream participants tend to have higher incomes, suggesting opportunities to promote the program's OBRP to engage with a more diverse range of ETG's customer base. Over half of survey respondents said their income was more than 400 percent of the Federal Poverty Level (FPL).

Recommendation: Continue to use bill inserts and marketing emails to promote ETG's programs but focus on middle and lower income households by highlighting lower energy bills from energy efficient equipment. Customers noted ETG emails and bill inserts as well as internet searches as the primary sources of information for energy efficiency.

Conclusion: General awareness of the Downstream program may be raised by emails, mail, and other forms of outreach, but participants tend to report learning about the program from contractors or on their own through the program website. One-third of customers said they learned about the program from a contractor and 28 percent from the website, suggesting awareness is either contractor-driven or customer-motivated.

Recommendation: Consider working with contractors to bolster outreach and enrollment efforts for the EEP Downstream program. Downstream participants tend to learn about the program from contractors or on their own through the program website. Though 63 percent of respondents worked with a contractor, only one-third indicated they learned about the program from a contractor. Moreover, it was uncommon for customers who learn about the program through a contractor to report completing the program's application on their own. This may suggest an opportunity for ETG to increase outreach

and enrollment efforts with contractors by holding an in-person training, webinar, or through distributing additional outreach materials for the contractors to use during their service call and marketing.

Conclusion: **Direct outreach from ETG is driving customer awareness of the Online Marketplace.** Seventy-one percent of customers indicated they learned about the Online Marketplace from either a bill insert, email from ETG, or other mailing.

Recommendation: **Continue to promote the Online Marketplace and Downstream programs through bill inserts and mailing marketing.** Bill inserts and mailings are drivers of Online Marketplace participation and may provide a way for ETG to continue to build awareness and engagement with its EEP programs.

Conclusion: **Over half of smart thermostat customers have not noticed savings since installing them.** Sixty-five percent of smart thermostat customers said they either had not noticed savings on their gas bill or did not know if they had noticed savings since installing the items; however, this may correlate to installation and heating/cooling season timing and customer awareness and does not directly reflect actual gas savings.

Recommendation: **Add messaging or documentation on how to utilize a smart thermostat's energy savings features and reporting of energy savings capabilities to the Online Marketplace purchases.**

Conclusion: **Sixty-eight percent of respondents were unaware that Elizabethtown Gas offered rebates; awareness was highest for ETG's appliance rebate and QHEC programs.** No respondents indicated being aware of ETG's on bill repayment program or instant home energy analysis survey.

Recommendation: **Consider focused marketing and outreach that highlights not only the available rebates, but the potential gas/energy savings from making upgrades.** Survey findings indicated an opportunity to improve awareness and knowledge about energy efficiency as well as the possibility of increasing customer interest in participation. Highlighting potential energy savings for specific equipment upgrades in mail insert and email outreach could foster increased interest and participation.

Conclusion: **Survey respondents' attitudes indicate an opportunity to improve awareness and knowledge about energy efficiency and that customers were interested in various ETG offerings.** Though 79 percent of respondents agreed with the statement that "Energy efficiency saves money", 39 percent said they knew of steps they could take to reduce their energy use. About one-third of respondents stated they were interested in programs that offered incented high efficiency showerheads, LED lightbulbs, faucet aerators, advanced power strips, smart thermostats, and ENERGY STAR water heaters.

Recommendation: Consider marketing programs using specific measures that are popular with ETG customers and messaging that describes how those measures will save on natural gas usage in the home.

Barriers to Participation

Downstream and Marketplace customers' lack of awareness and time are barriers to participation in other ETG programs. Most respondents were not aware of ETG's energy efficiency offerings beyond the program they had participated in. Of the customers who were aware of other offerings, a lack of time and a perceived lack of applicability were other reasons they noted for not having participated.

Downstream participants are generally aware of the OBRP, though awareness could be improved and potentially enable additional high efficiency equipment installations. Of those who did not apply for OBRP, 34 percent said they did not know a financing option was able through their utility (n=44). Further, 43 percent of the customers who were not aware of the OBRP (n=14) said they would have installed additional equipment if they knew about the financing option.

Customer awareness is a barrier to participation and the level of awareness differs by age group. Sixty-eight percent of respondents were unaware that Elizabethtown Gas offered rebates for energy efficient equipment and home improvements. The Evaluator compared the manner in which customers learned about the program across age groups and found that older customers tended to be aware of ETG's offerings at a higher rate, compared to younger customers. Fifty-one percent of respondents over 55 years old were aware of ETG's offerings, compared to 26 percent of respondents between 35-55 years old. None of the respondents identified as under 35 years old.

Non-participants that were aware of ETG's programs said they had not participated because of the time commitment, a lack of financial ability, and a lack of interest. Other non-participants that were aware of the ETG programs said they did not know why they had not participated. Survey respondents' attitudes regarding energy efficiency and lack of interest in participation may indicate an opportunity to improve awareness and knowledge about energy efficiency and its benefits.

The transition from NJCEP to utility-run energy efficiency programs required significant coordination and resources. Utility staff noted that though generally the programs had "not changed much" from the customer perspective, there were back-end challenges as well as issues related to contractor engagement and awareness. From an administrative perspective, SJI's director described the transition as a "painstaking process" and observed that not all utilities had their programs ready at the same time. Honeywell's program manager noted that the programs had been "in flux" and alluded to start-up efforts and coordination with other utilities as having required time and resources. Honeywell's marketing manager noted that the most significant challenge in PY1 had

been the development, coordination and revision of application forms and website materials to align and ensure consistency across gas and electric utilities.

Awareness and other utility programs, coupled with a limited marketing budget are perceived as barriers to success. SJI’s director of energy efficiency said that recruiting customers to participate in programs other than those driven by HVAC contractors was initially a challenge, as they are still building awareness for programs, and electric utilities have the same offerings and may have more aggressive marketing or deeper connections to their customers. Honeywell’s marketing manager noted the program’s budget limits the amount of outreach that can be performed, further he indicated the need for reduced spending and marketing activities in PY2.

4.1.2 HPwES

Sampling and Survey Results

Because the program didn’t kick off until late PY1, all 11 projects were subject to M&V review. There were no surveys or participant interviews conducted in PY1 due to the low participation.

Impact Results

The 11 completed projects had an average savings of 283 therms per home. The evaluation found ex-post gross savings of **3,129.87 therms** for a **100.5 percent realization rate**, along with **4,100 kWh**, **1.49 kW**, and lifetime savings of **73,498 therms** and **78,980 kWh** since the NTG was deemed at 1 for the first triennium of programs.

Table 4-5: HPwES Gross Annual and Lifetime Gas Savings (Therms)

Measure Category	Quantity	Ex-Ante Savings (therms)	Ex-Post Savings (therms)	Therms RR	EUL	Lifetime Savings (Therms)
Air Sealing	11	616.00	382.10	62%	15	5,731.50
Insulation	11	1,462.00	1,461.60	100%	30	43,848.00
Furnace	5	608.00	838.60	138%	20	16,772.00
Boiler	2	126.00	174.50	138%	20	3,490.00
Boiler Combi	0	-	-	-	20	-
Storage DHW (< 55gal)	6	214.00	203.30	-	11	2,236.30
Storage DHW (> 55gal)	1	13.00	-2.80	-21%	11	-30.80
Tankless DHW	2	75.00	72.60	96%	20	1,452.00
CAC	4	-	-	-	15	-
Heat Pump	0	-	-	-	15	-
Duct Sealing	0	-	-	-	18	-
Total	11	3,114.50	3,129.87	101%	23.5	73,498.44

Some measures in the program also saved electric energy during PY1, the annual ex-post gross energy savings and demand was **4,100 kWh** and **1.49 kW** with a lifetime gross

savings of **78,980 kWh** (Table 4-6). Measure level details can be found in Table 8-5, Table 8-6, Table 8-7, and Table 8-8.

Table 4-6: HPwES Gross Annual and Lifetime Energy Savings (kWh)

Measure Category	Quantity (Homes w/ Measure)	Ex-Ante Savings (kWh)	Ex-Post Savings (kWh)	kWh RR	EUL	Lifetime Savings (kWh)
Air Sealing	11	274	502	183%	15	7,530
Insulation	11	1,165	1,165	100%	30	34,950
Duct Sealing	4	4,269	2,434	57%	15	36,510
Total	11	5,708	4,101	71.9%	19.3	78,990

Discussion of Realization Rates

- Homes had an average of 1,336 ft² of **insulation** added, saving 133 therms per home, 0.099 therms/ ft². This savings value was due to a single home with significantly higher savings than the others increasing the average value. This is comparable to the savings estimated using the TRM methodology for improving R-8 insulation to R-18. This value (0.099 therms/ ft²) is relatively high – it cannot be achieved,⁷ for example, by improving insulation having existing R-value greater than about R-15. The Evaluator chose to apply a realization rate of 1.0 for all homes’ insulation savings because all but one project had reasonable therms savings estimates. The Evaluator will reexamine these homes using a billing analysis along with gaining access to the Snugg Pro model inputs in PY2.
- The average modeled therms savings for **Air Sealing** was about 30 percent higher than the TRM estimate based on looked up home square footage.⁸
- **Central AC Replacement** modeled savings were higher than expected. The Evaluator back calculated the baseline SEER and EFLH required to achieve the reported energy savings, the results were unrealistic (section 8.3.4). A realization rate of 57 percent was applied to the program. The Evaluator will have access to Snugg Pro inputs in PY2 which will be used to examine these savings estimates in more detail.

⁷ Typical R-value of insulated 2x4 wall (~R-15) cannot achieve savings of this magnitude. The maximum possible savings, by improving by an infinitely high R-value, for home in ETG climate zone, is about 0.1 therms/ft²

⁸ <https://njpropertyrecords.com/> and <https://zillow.com>

- **Boiler and Furnace Replacement** modeled savings was found to be conservative, so a realization rate of 138 percent was applied based on TRM calculations.
- **Water heaters** also had modeled savings that didn't match the TRM results, a realization rate of 115 percent was applied to these measures.

Process Evaluation Results

- The PY1 HPwES program did not meet the target, with 11 completed projects reported. This shortfall was unexpected. ETG staff's initial expectations were that the Moderate-Income Weatherization (MI-Wx) program would have less participation than HPwES. Staff assumed MI-Wx would have excess budget and HPwES participation would be limited due to budget constraints. By the end of PY1, the opposite had occurred.
- In response to low HPwES program participation, ETG staff planned to prioritize the program in their marketing materials. For example, at the end of July 2022, ETG sent out an email which focused on HPwES.
- Three contractors participated in the program in PY1 and ETG staff did not identify any constraints in their approved contractors' bandwidth or general ability and readiness to support the HPwES program.
- Follow ups with QHEC participants to gauge interest in participation in the HPwES program are being performed by implementation.

Conclusions and Recommendations

Conclusion: The average savings per home (283 therms, around 24 percent of annual therms consumption) is reasonable, considering the high rate of replacement of heating systems in addition to weatherization measures. However, the ex-post savings estimates, and realization rates are not based on empirical data, meaning the realization rate (100.4 percent for therms savings) is subject to change.

Recommendation: The PY1 realization rates should not be included in the TRM update because the Evaluator will conduct a pre/post billing analysis for PY2. The results of that analysis will provide a high rigor estimate of actual program impacts.

Conclusion: Participation was lower than expected, possibly because the program was not aggressively marketed.

Recommendation: ETG should consider program optimization options that include the forthcoming Inflation Reduction Act (IRA) incentives for home weatherization and efficiency measures. The IRA incentives may also impact HPwES program attribution.

Conclusion: **ETG has recently hired a 3rd party contractor, PSD, to address QA/QC needs.** Additional data, insights, and observations from PSD will support the next evaluation.

Recommendation: **ETG should provide the QA/QC data to the Evaluators, who will leverage the data collected by PSD to inform the second, enhanced rigor evaluation while reducing customer contact points.**

Conclusion: **The tracking database did not include all details and data necessary to estimate savings using NJ TRM algorithms.** This is not a high priority however, because Evaluators expect to conduct pre/post natural gas billing analysis to determine ex-post therms savings. However, they could calculate a more accurate estimate of electric savings if additional details were reported.

Recommendation: **Make the Snugg Pro inputs available for M&V verification.** If the Evaluators need to calculate savings using a TRM-based approach in future program years (e.g., due to low participation or insufficient post-period data), then the Evaluators and ETG should coordinate with implementation and Snugg Pro staff to establish reporting protocols so that the evaluator has access to all model inputs.

Barriers to Participation

The lack of program recognition by ETG customers was likely due to a lack of effective marketing. This is actively being addressed for PY2 through highlighting the program in all customer marketing materials.

4.1.3 QHEC

Sampling and Survey Results

The Evaluator completed a census review of all measures listed in the tracking system to ensure appropriate use of deemed savings values, to check that all variables were being tracked that were required to calculate both gross and net savings, and to identify key issues.

A random sample of participants was drawn and invited to participate in a participant follow-up survey. The sample included customers who received measures that make up at least 80 percent of the overall program savings and measures that account for five percent or more of the program level savings. Data collected via the follow-up surveys informed the impact evaluation as well as process evaluation activities.

For the QHEC survey, **56 responses** were collected, which was a response rate of 21 percent. All measures met the 85/15 requirement in the SWE's basic rigor guidelines (Table 4-7).

Table 4-7: QHEC Sampling Results by Measure Category

Measure Category	Participants	Measure Quantity	Ex-Ante Savings (therms)	Percent of Annual Gas Savings	Required responses to meet 85/15	Responses Achieved	Final Confidence Interval
Showerheads	114	134	4,569.73	76%	21	23	85/13.5
Faucet Aerators	101	142	723.36	12%	21	22	85/13.6
Pipe Insulation	207	966	709.85	12%	22	38	85/10.6
Advanced Power Strips	147	147	N/A	N/A	N/A	25	85/13.1
LEDs	514	1,508	N/A	N/A	N/A	45	85/10.3
Total	1,083	2,897	6,002.94	100%	64	153	85/5.4

Impact Results

The **2,897 measures** installed during the home energy consultations saved **6,407.69 gross ex-post therms** for a realization rate of **107 percent** and will have a lifetime savings of **60,603.95 therms** since the NTG was deemed at 1 for the first triennium of programs.

Table 4-8: QHEC Gross Annual and Lifetime Gas Savings (Therms)

Measure Category	Quantity	Ex-Ante Savings (therms)	Ex-Post Savings (therms)	Therms RR	EUL	Lifetime Savings (Therms)
Advanced Power Strips	147	--	--	--	8	--
Aerators and Showerheads	276	5,293.09	4,147.38	78%	10	35,740.61
LEDs	1,508	--	--	--	15	--
Pipe Insulation	966	709.85	2,260.30	318%	11	24,863.33
Total	2,897	6,002.94	6,407.69	107%	9	60,603.95

The program measures also saved electric energy during PY1, the annual gross energy savings and demand was **102,711 kWh** and **7.61 kW** with a kWh **realization rate of 203 percent** and lifetime gross savings of **1,434,020 kWh** (Table 4-9). Measure level details can be found in Table 9-7 and Table 9-17.

Table 4-9: QHEC Gross Annual, Demand, and Lifetime Energy Savings (kWh)

Measure Category	Quantity	Ex-Ante Savings (kWh)	Ex-Post Savings (kWh)	kWh RR	EUL	Lifetime Savings (kWh)	Ex-Ante Savings (kW)	Ex-Post Savings (kW)	kW RR
Advanced Power Strips	147	15,112	12,089	80%	8	96,714	1.76	1.41	80%
Faucet Aerators	142	260	1,322	508%	10	13,223	N/A	N/A	N/A
LEDs	1,508	32,373	86,574	267%	15	1,298,604	3.23	6.2	192%
Pipe Insulation	966	321	1,437	449%	11	15,812	N/A	N/A	N/A
Showerheads	134	2,569	1,289	50%	7.5	9,667	N/A	N/A	N/A
Total	2,897	50,635	102,711	203%	14.0	1,434,020	4.99	7.61	153%

Discussion of Realization Rates

- The Evaluator calculated the savings generated from low flow aerator measures using variables in the 2020 TRM for residential installation (pg.182). However, the ex-ante savings were derived from the algorithm listed for aerator installations in low-income homes (pg.35 of the TRM), which results in higher savings per aerator. The realization rates for bathroom faucet aerators were also impacted by the survey-derived in-service rate, which the Evaluator found to be 95 percent (the in-service rate for kitchen faucet aerators was 100 percent).
- The Evaluator calculated the savings generated from low-flow efficient showerhead measures using variables in the 2021 TRM as specified in the coordinated measure list. The evaluator used the default efficient flow rate of 2.0 gallons per minute since the actual flowrate of the showerheads installed was not available. The Evaluator was unable to verify ex-ante per unit savings.
- The Evaluator calculated the savings generated from pipe insulation using variables in the 2020 NJ TRM (pg. 186) for residential installations as specified in the coordinated measure list. The ex-ante savings used the calculation for installations in low-income homes (2020 NJ TRM, pg. 38).
- Realization rates for electric savings ranged from 124 percent to 286 percent. TRM equations for lighting measures changed in the Coordinated Measure List during the evaluation period, affecting ex-ante HOU values.

Process Evaluation Results

During the in-depth interviews (IDI) ADM found the following results:

- The transition from NJCEP to utility-run energy efficiency programs required significant coordination and resources.

- Multiple parties are involved in marketing, using a variety of methods. ETG, Honeywell, and Uplight use a variety of strategies including emails, bill inserts, and search engine optimization to promote the residential programs.
- Data tracking and reporting requires coordination from utility and implementation staff. Utility and implementation contacts indicated that internal and coordinated data tracking systems are sufficient, but they have experienced some challenges collaborating and ensuring timely and accurate data management.
- Awareness and other utility programs, coupled with a limited marketing budget are perceived as barriers to success. Recruiting customers to participate in programs other than EEP Downstream has been a challenge, as they are still building awareness, and electric utilities have the same offerings and may have more aggressive marketing or deeper connections to their customers.
- There is an opportunity to increase customer engagement with other programs after their QHEC participation.

The survey analysis results can be found in Section 9.4.2. Highlights of the results were as follows:

- QHEC is serving ETG customers from various demographic groups, though half of respondents identified as white and nearly half said their income was more than 400 percent of the Federal Poverty Level (FPL).
- Bill inserts and marketing emails to customers drive customer awareness for the QHEC program.
- Reasons for signing up varied, though learning about home energy use was a primary motivation.
- The QHEC program is providing a consistent participation experience.
- Customers were satisfied with the QHEC measures and the program overall.
- There is an opportunity to better inform QHEC participants about ETG's other energy efficiency offerings.

Conclusions and Recommendations

Conclusion: Customers that participate in QHEC tend to go on to complete additional energy efficiency actions that are recommended during the visit. The Evaluator asked respondents if they had completed actions from a list provided by ETG that is used by QHEC auditors. Eighty percent of respondents said they had taken one or more additional actions related to energy efficiency after participating in the QHEC program. These actions did not include making large changes through other ETG residential programs.

Recommendation: Ensure the QHEC program's auditor explains ETG's other offerings and their applicability thoroughly and clearly. QHEC participants noted being unaware of other offerings or perceiving other offerings as not applicable to their homes, suggesting an opportunity for enhancing explanations and outreach provided by the QHEC auditor to customers during the visits.

Conclusion: There is an opportunity to better inform QHEC participants about ETG's other energy efficiency offerings. Of customers who had not participated in another program (n=35), 49 percent said they were aware of other programs.

Recommendation: Different marketing approaches should be considered for QHEC. Bill inserts and marketing emails to customers drove customer awareness for the QHEC program, but the Evaluators have found that across the country utility customers rarely read bill inserts, so there could be a significant number of customers still not aware of the program.

Conclusion: The QHEC Program will not meet its energy saving goals in PY1. The program is enrolling a sufficient number of customers, but it is not finding enough measure installation opportunities per home. ETG staff stated that the QHEC program measures do not offer substantial opportunities to generate savings. Similarly, Honeywell's program manager observed that the program does not garner gas savings specifically.

Recommendation: Consider including additional gas saving measures in the program measure mix. Since the program is not finding enough measure installation opportunities per home, additional measures such as exterior door weather stripping, water heater temperature setbacks, thermostatic radiator valves, thermostatic shower valves, window treatments, and smart thermostats could provide additional savings opportunities for the program.

Conclusion: Customer cancellations, measure-level refusals, and supply chain issues are minor barriers to implementation success for the QHEC program. Occasionally fixture compatibility and measure refusals were noted, though staff found that the program implementation contractor does not identify specific products that are refused. Implementation staff observed that the cancellation and reschedule rates were similar to other direct install/audit programs. Supply chain issues were noted during the call with ETG staff as having had minor effects on the QHEC program as Honeywell had not been able to maintain an inventory of handheld low-flow showerheads during PY1.

Recommendation: Have a tracking data field for refused, unavailable, or incompatible measures during Direct Install visits. With lower-than-expected therms savings and measure installs in PY1, this type of accountability could provide ETG and the implementation contractor with invaluable information on why some measures are not being installed.

Barriers to Participation

Most QHEC participants do not go on to participate in other ETG residential programs. Awareness is a significant barrier to additional program participation. Regarding participation in other programs, 36 percent said they had participated in some other ETG offering after QHEC participation. Only 11 QHEC participants participated in the Moderate Income program following their QHEC visit and all other cross program participation between the QHEC and EEP programs was either un-tracked or prior to the QHEC energy assessment.

The transition from NJCEP to utility-run energy efficiency programs required significant coordination and resources. Utility staff noted that though generally the programs had “not changed much” from the customer perspective, there were back-end challenges as well as initial issues related to contractor engagement and awareness as the program transitioned from NJCEP. From an administrative perspective, SJL’s director observed that not all utilities had their programs ready at the same time. Honeywell’s program manager noted that the programs had been “in flux” and alluded to start-up efforts and coordination with other utilities as having required time and resources. Honeywell’s marketing manager noted that the most significant challenge in PY1 had been the development, coordination and revision of application forms and website materials to align and ensure consistency across gas and electric utilities.

Awareness and other utility programs, coupled with a limited marketing budget are perceived as barriers to success. SJL’s director of energy efficiency said that recruiting customers to participate in programs was initially a challenge, as they are still building awareness for programs, and electric utilities have the same offerings and may have more aggressive marketing or deeper connections to their customers. Honeywell’s marketing manager noted the program’s budget limits the amount of outreach that can be performed, further he indicated the need for reduced spending and marketing activities in PY2.

Customer cancellations, measure-level refusals, and supply chain issues are minor barriers to implementation success for the QHEC program. Occasionally fixture compatibility and measure refusals were noted, though staff noted that the program implementation contractor does not note specific products that are refused. Contacts confirmed that occasionally fixtures were not compatible with the program’s high efficiency faucet aerators, but generally noted customer satisfaction with the audit and direct installation measures. Honeywell staff observed that the cancelation and reschedule rates were similar to other direct install/audit programs. Supply chain issues were noted during the call with ETG staff as having had minor effects on the QHEC program as Honeywell had not been able to maintain an inventory of handheld low-flow showerheads during PY1.

4.1.4 MI Weatherization

Sampling and Survey Results

The sampling plan was not designed to meet SWE guidelines, which require a sample size sufficient to determine savings with relative precision of ±10 percent at the 90 percent confidence interval at the program level and ±15 percent at the 85 percent confidence interval at the measure level. The impact evaluation activities were limited because a pre/post billing analysis is planned for the subsequent evaluation, as this is the preferred method to estimate actual program impacts. Additionally, the number of completed projects was relatively low, so program experience and satisfaction may not yet reflect the experience of typical program participants.

The evaluator chose to conduct five in-depth participant interviews, which does not yield statistically significant outcomes, but can provide invaluable insights to support future evaluation efforts (e.g., survey design, EM&V approach).

Impact Results

The 64 projects resulted in ex-post gross savings of **13,008.75 therms** for a realization rate of **98 percent** which will have a lifetime savings of **324,610.74 therms** since the NTG was deemed at 1 for the first triennium of programs.

Table 4-10: MI Weatherization Gross Annual and Lifetime Gas Savings (Therms)

Measure Category	Quantity	Ex-Ante Savings (therms)	Ex-Post Savings (therms)	Therms RR	EUL	Lifetime Savings (Therms)
Insulation	56	8,529.46	8,529.46	100%	30	255,883.66
Air Sealing	58	2,366.25	2,077.59	88%	15	31,163.82
Duct Sealing	19	1,693.27	1,693.27	100%	18	30,478.87
Tune-up	6	710.14	710.14	100%	10	7,101.41
Boiler Reset Controls	4	-1.70	-1.70	100%	10	-17.02
Total	64	13,297.41	13,008.75	98%	25	324,610.74

The program also saved electric energy during PY1, the annual gross energy savings and demand was **17,701 kWh** and **6.44 kW** with a kWh **realization rate of 85 percent** and lifetime gross savings of **493,592 kWh** (Table 4-11). Measure level details can be found in Table 10-6, Table 10-7, Table 10-8.

Table 4-11: MI Weatherization Gross Annual and Lifetime Energy Savings (kWh)

Measure Category	Quantity	Ex-Ante Savings (kWh)	Ex-Post Savings (kWh)	kWh RR	EUL	Lifetime Savings (kWh)
Insulation	56	11,223	11,223	100%	30	336,689
Air Sealing	58	4,462	1,442	32%	15	66,936
Duct Sealing	19	4,950	4,950	100%	18	89,104
Tune-up	6	100	100	100%	10	1,001
Boiler Reset Controls	4	-14	-14	100%	10	-138
Total	64	20,722	17,701	85%	27.9	493,592

Discussion of Realization Rates

- **Air Sealing:** Building square footage was not included in the tracking data so the evaluator used publicly available tax records to estimate building conditioned square footage for a sample of participants (n=21). The average size of homes receiving some type of air sealing measure was 1,965 ft². Following the NJCEP, this results in average savings of 35.8 therms. Though the NJCEP was not used to estimate savings, the average reported savings (40.8 therms per home with air sealing) was comparable.
- **Duct Sealing and Repair:** The information needed to use the NJCEP protocols to calculate duct sealing savings was not available in the tracking data. The 2020 NJCEP (pg. 71) includes a savings methodology to estimate duct sealing which requires estimates of:
 - Percentage of duct work found within the conditioned space.
 - Duct leakage evaluation (leaky, average, tight).
 - Duct insulation evaluation (existing R-value).

The evaluator compared the reported therms savings (89 therms/home, see Table 9.3) to various estimates using the TRM method and common assumptions. The average savings is comparable to ducts located in an attic, with insulation added to improve the R-value from R-2 to R-8.

- **Insulation:** The tracking data includes treated area (in ft²) or linear footage, the R-value of insulation added, and an estimate of savings per square foot. The baseline R-values were not included in the tracking data, so the evaluator was unable to estimate savings using the NJCEP protocol. The evaluator reviewed the savings to ensure the reported estimates were reasonable and within range of expected savings. Homes had an average of 856 ft² of insulation added, saving 152 therms per home, which equates to a relatively high 0.18 therms/ ft². This is

comparable to the savings estimated using the TRM methodology for improving R-5 insulation to R-30.

- **Tune-Up and Boiler Reset Controls Measures:** The TRM does not include an approach to estimate savings for tune-ups but does include a measure for “boiler reset controls” which assumes 5 percent reduction in annual heating energy if outdoor temperature reset controls are implemented. The average boiler reset control savings was near zero therms because one project reported negative therms savings nearly equal to the total savings from the other three projects. The average tune-up savings was 118 therms per home which is likely at least 10 percent of annual heating therms use.

Process Evaluation Results

- Participants talked about the weatherization measures they received, and they offered some perspective on additional weatherization opportunities not addressed by the program. Windows and areas of the home mentioned in the audit for insulation but not addressed when the weatherization work took place.
- The level of effort required to participate was not an issue for the participants interviewed.
- According to the participants interviewed, none of the program staff (auditor or installation contractors) that they interacted with encouraged them to participate in any of the other ETG energy efficiency programs.
- Program awareness, one program participant agreed the mailer was the best way to get their attention. Two said email or text messaging would be more effective for them personally.
- The program uses just one home performance contracting company who is prohibited from offering additional services (at a cost above the incentive cap). This approach is designed to maintain trust between participants and contractors.
- Participants were impressed with the knowledge and professionalism of the auditor and installation contractors.
- Also of note is the Inflation Reduction Act, which will provide federal income tax credits related to many of the MI Weatherization measures beginning 2023.

Conclusions and Recommendations

Conclusion: The ex-post savings and realization rates are not based on empirical data. The average savings per home (208 therms) is not unreasonable but may be high. The evaluation team independently calculated savings for air sealing, which impacted the realization rate, but accepted savings for other measures (i.e., assumed ex-ante = ex-post) because the tracking data did not include information required by the 2020

TRM protocols. Savings of 208 therms per home equates to a heat loss reduction or efficiency improvement of about 20 percent.

Baseline R-values were not reported so evaluators could not use the 2020 TRM algorithm to re-calculate insulation savings. Many of the reported insulation savings estimates (average insulation savings was ~0.18 therms/ft² area treated) can only be achieved⁹ if in situ R-value is less than R-3.5.

The average reported savings for duct improvement (89 therms/home) is comparable to ducts located in an attic, with insulation added to improve the R-value from R-2 to R-8. Duct location was not recorded, but if ducts are located in conditioned or partially conditioned space (basements) the reported savings are undoubtedly too high because most supply air leakage and return air infiltration occurs within the home’s thermal boundary.

Recommendation: **ETG should implement the following list of tracking data improvements:**

- Include conditioned square footage of each home
- Include blower door test results
- Include demand savings for all measures saving electric energy
- For each insulation measure, in addition to square footage of area treated (was included), the R-value before (this was not provided) and R-value after improvement (this was included inconsistently)
- For the duct sealing measure:
 - Percentage of duct work located in conditioned space, and separate percentage for supply and return
 - Duct leakage assessment (leaky, average, tight) or actual leakage measurements (at 25 Pa, or preferably Normal System Operating Parameters (NSOP))
 - Duct insulation (existing R-value, final R-value if insulation is added)

Conclusion: **The results of pre/post monthly therms consumption billing analysis will provide a different estimate of actual program impacts per home.** However, the number of MI Weatherization projects is too low¹⁰ and the time to conduct pre/post billing

⁹ 2020 TRM Insulation Protocol, pg. 75: $\frac{\left(\frac{1}{R_b} - \frac{1}{R_q}\right) \times 5,160 \text{ HDD} \times 24 \times \text{Area}}{100,000 \frac{\text{Btu}}{\text{therm}} \times 80\% \text{ AFUE}}$

¹⁰ Typically, a sample of 500+ homes would be necessary to determine weather-related therm reduction of ~10%.

analysis using 2023 winter billing data is insufficient. Consequently, at this time, evaluators do not plan to incorporate billing analysis results in the April 2023 TRM update.

Recommendation: Considering the number of ETG MI Weatherization projects to-date, an April 2023 TRM update is not advisable. However, Evaluators should coordinate with other utility evaluators to determine if billing analysis results could be combined to increase the population and improve precision. Evaluators may be able to use billing data through February 2023 to estimate pre/post impacts in time for a TRM update. Or they could use only the billing data prior to participation to determine annual heat load, which could be used to validate or update the insulation algorithm (pg. 75 of 2020 TRM).

The TRM working group should review the current demand savings for the primary MI Weatherization measures:

- **Air sealing** (pg. 70, 2020 TRM). This measure primarily saves heating energy, but also saves some cooling energy. However, without explanation, the TRM states: *“there are no summer coincident electric peak demand savings estimated at this time.”*
- **Insulation Upgrades** (pg. 75, 2020 TRM). The TRM includes cooling energy savings algorithm, and a coincidence factor is listed in the “Residential Insulation Upgrades” table, however a demand savings algorithm is not included.

Conclusion: The average HPwES project cost (\$18,000) was three times the MI Weatherization program incentive cap. Participants mentioned some weatherization measures were identified but not addressed. Additionally, most projects met the incentive cap. These findings suggest that the annual allocated program budget and per-home budget cap may limit program participation and impacts. Assuming ETG cannot increase the per-home incentive cap, participants may have more energy savings opportunities. Therefore, other programs (HPwES, Energy Efficient Products) may be of interest to participants.

Recommendation: ETG should work with the implementer, third-party verification contractor PSD, and the evaluation team, to review findings from QA/QC site visits to identify weatherization measures not addressed through the MI Weatherization program. When pre/post billing analysis results are available, this information could also be used estimate the magnitude of missed savings opportunities (by comparing HPwES savings per home to MI Weatherization program savings) to optimize future program design and cross-program marketing.

Conclusion: Low PY1 participation volume does not reflect program participation potential. The PY1 volume (64 completed projects by July 1, 2022) was lower than target (150 homes) but this was primarily due to program start-up delays. The program launched in July 2021, but initial audits and weatherization projects did not begin until early 2022.

Recommendation: **ETG should continue to target homes with the highest energy use and closely monitor interest, especially in 2023 when the Inflation Reduction Act efficiency tax credits are available.** ETG should consider ways to help participants take advantage of personal federal income tax credit for measures not addressed due to the MI Weatherization budget cap. For example, MI Weatherization participants could subsequently participate in the HPwES program, incur some upfront cost but would be able to take advantage of the \$1,200 annual tax credit.

Barriers to Participation

The evaluator asked participants for their perspective on why someone might not want to participate in the program. Some of the noteworthy suggestions were:

- Some people may not be comfortable with an unknown contractor in their home.
- Skepticism the program is actually free, or concern this sounds like a scam.
- Owners of rental homes have little incentive to participate if tenet pays the utility bills.
- The size of the incentives available through the program were not always sufficient to cover the total cost of needed weatherization work.

4.1.5 HERs

Sampling and Survey Results

The HER Program implementer provided the following M&V sample data in a timely manner:

- Pre- and post-treatment monthly gas billing data for participants (185,985) and non-participants (42,988). The data started in July 2016 and ended May 2022.
- HERs customer information, including date of first sent paper and email HERs report by Uplight, email contact information, and opt-out date.
- HERS report delivery dates and content for each customer.
- List of tips and suggestions for reducing gas usage contained in HERs reports.

The survey was administered in July and August 2022. The evaluator sent 5,175 customers that received HERs an email invitation. **Seventy-three participants** and **72 non-participants** completed the survey.

Impact Results

The ETG HER program began before the launch of the CEA programs in PY1, Legacy Wave 1 began in 2017 and Legacy Wave 2 began in 2019. Both waves experienced higher than typical move-out rates, nearly 26 percent, leaving the final PY1 count at

135,099 participants. The program saved **630,407 therms** for a **92.4 percent realization rate**, with an average annual savings of **0.5 percent** of overall therms usage.

Table 4-12: HER Gross Annual Therms Savings per Household, by Waves, and Percentage of Household Energy Usage

Program Waves	Participants	Ex-Ante Savings (Therms)	Ex-Post Savings (Therms/home)	Ex-Post Savings (Therms)	Ex-Post Savings (% Annual Therms)	RR
Legacy Wave 1	124,352	-	4.52	562,422.00	0.49%	-
Legacy Wave 2	10,746	-	6.34	67,985.00	0.64%	-
Total	135,099	682,159.00	4.67	630,407.00	0.50%	92.4%

Note: The measure life for HERs program savings is set to 1 year, which means the Lifetime Savings = Annual Savings.

Because the ETG HER program only recommends gas saving measures, there are no electric savings associated with this program.

Process Evaluation Results

During the in-depth interviews (IDI) ADM found the following results:

- The HER program has a design that is consistent with industry standards.
- Customer fatigue or over-exposure to HERs was cited as a potential barrier to success by the program managers. The ETG energy efficiency manager observed that customers have received HERs for years, from both electric and gas utilities. This is an area for further research with this program.
- The Behavioral program provides cross-promotion for residential programs, although the PY1 surveys from other ETG programs did not mention Home Energy Reports as a source of awareness for other programs.
- The Behavioral program’s summary reports show HERs click through rates and the assessment tool usage followed similar patterns. There was relatively stable usage throughout the year with usage spiking in winter months.

The participant and control group survey provided the following results:

- Typically, one person per household reads the HERs, though engaged households may have multiple readers.
- The perceived relevance and a lack of time are the primary reasons customers do not read more of the reports.
- Most survey respondents found the HER information on their home’s energy use easy to understand.

- Survey respondents largely found the information on their home's energy use to be accurate.
- Most respondents were satisfied with the reports and their various components. Eighteen percent of respondents indicated dissatisfaction with one or more aspects of their report.
- HERs participants rated the usage history and tip/recommendation sections as most valuable.
- HERs participants generally have not visited the online portal, primarily because they are unaware of it.
- Participants and non-participants had similar home and demographic characteristics.
- Participants and non-participants indicated taking one-time energy saving actions at similar rates. ADM asked respondents if they had completed any of eight one-time energy saving actions that have been suggested to ETG HER recipients.

Conclusions and Recommendations

Conclusion: HER Program verified annual savings of 630,407 Therms for PY1 are positive and statistically significant for both Legacy waves.

- All the evaluated waves had valid control groups for each program year which suggests that the creation of the original RCT waves by the implementer was done in accordance with industry standards.
- All evaluated waves displayed average annual gas savings between 0.5 percent and 0.6 percent of annual billed use in PY1. Typical behavioral programs display average annual gas savings between 0.25 percent and 2 percent.
- Downstream and upstream double counted savings were 314 Therms for PY1. The double counted savings were removed from the estimated savings from the regression results. The double counted savings represent 0.05 percent of program savings before double counting, therefore, the impact on final program savings is relatively small.
- The total attrition for the program since inception is 26 percent for the treatment group and 25 percent for the control group. In addition, the annual attrition rate in PY1 is roughly 7 percent across waves for both the treatment and control groups.

Recommendation: Save and store historical billing data for all customers in each wave to ensure future analyses will have one year of billing data prior to the RCT start date for each customer, as well as complete billing data after the intervention.

Conclusion: Ten percent of customers in Wave 2 did not receive any HERs reports, which may indicate a data issue either in recording HERs report type or in obtaining customer contact information.

Recommendation: Investigate why ten percent of treatment customers in Wave 2 are recorded as not receiving either paper or email HERs reports. If customer contact information can be obtained for some of these customers, program savings will likely increase.

Conclusion: Most participant survey respondents reported receiving paper reports and reading all or most of them. Eighty-one percent of participants said they received paper reports, while 43 percent said they received email reports. Seventy-nine percent of participants said they read most or all the reports.

Recommendation: Continue to promote the online portal to increase customer awareness and engagement. HERs participants that had engaged with the portal generally found it interesting, helpful, and easy to navigate. However, two-thirds of participants did not recall logging into the online portal, indicating an opportunity to increase engagement.

Conclusion: A measure life greater than one year was assumed for PY1, care must be taken by ETG to not double count savings in consecutive years.

Recommendation: Assume a one year measure life for ongoing HERs programs or change the cohorts each year to claim a longer measure life for savings.

Barriers to Participation

The perceived relevance and a lack of time are the primary reasons customers do not read more of the reports. Participants often cited lack of time, tips not being applicable, and information not being valuable as reasons they did not read more of the reports.

Barriers to additional energy saving actions and purchases may include a lack of knowledge about the steps to take and awareness about household energy use. Responses to the level of agreement questions regarding energy attitudes and behaviors indicated that these factors were barriers, as well as being too busy to make energy-related improvements and not being concerned about energy though to a lesser extent.

HERs participants generally have not visited the online portal, primarily because they are unaware of it. One-third of participants recalled logging onto ETG's online portal.

4.1.6 ESB: Prescriptive and Custom

Sampling and Survey Results

For PY1, the evaluator included all participants in the M&V sample. The requested data included all requested applications, models, engineering calculations, assessment reports, and savings calculations.

Impact Results

Nine projects were completed in program year one (PY1). Of those, two were prescriptive and seven were custom projects. The program resulted in program level ex-post gross annual savings of **30,337.92 therms** for a realization rate of **96 percent** and **186,548.40 lifetime therms**.

Table 4-13: ESB PY1 Program Gross Ex-Ante Therms Savings by Measure

Measure Name	Quantity	Annual Therms	Total Annual Therms	Measure Life	Lifetime Therms
Prescriptive Combination Boiler	2	161.46	322.92	20	6,458.40
Custom Steam Traps*	7	--	31,337.00	6	188,022.00
Total	9	--	31,659.92	6.14	194,480.40

* These measures have custom savings calculations which is why there are no Annual Therms by measure.

Table 4-14: ESB M&V Sampled Site Gross Ex-Ante and Ex-Post Therms by Measure including Realization Rates

Measure	Ex-Ante Therms	Ex-Post Therms	RR Therms
Prescriptive Combination Boiler	322.92	322.92	100%
Custom Steam Traps	31,337.00	30,015.00	96%
Total	31,659.92	30,337.92	96%

For PY1 there were no electric savings associated with the ESB Prescriptive and Custom program.

Discussion of Realization Rates

The overall savings for the custom sub-program was 30,015 therms resulting in a 96 percent realization rate. The difference in expected and realized savings were due to two identified factors:

- The low realization rate can mostly be attributed to the boiler efficiencies assumed in calculations. The initial ex-ante assessment assumed 80 percent thermal efficiency for all the boilers, but the ex-post assessment used site-specific boiler efficiencies which ranged from 80 percent to 86 percent. As boiler efficiency

increases, the savings for each steam trap repair or replacement decreases, deflating the realized savings.

- One Project had a change to the operating pressure which also affected savings. The ex-ante assumed 5 psig but this exceeds the pressure documented at the boiler. The ex-post used 4 psig in savings calculations which lowered the realized savings.

Process Evaluation Results

During the in-depth interviews (IDI) program and implementation staff noted the following:

- An easy application process is perceived as a program strength.
- There has been extensive collaboration between the state's electric and natural gas utilities. There had been limited market confusion because New Jersey's utilities had done a significant amount of background work.
- Supply chain issues were noted as having affected the Prescriptive and Custom program in PY1.
- There are efforts to improve customer engagement with the Prescriptive and Custom program.
- It is premature to assess the effectiveness of third-party QA/QC procedures due to limited participation and the recent start-date of the third-party inspector contract.

Conclusions and Recommendations

Conclusion: There was a lack of communication about shared projects with electric utilities whose territory overlaps with ETG. At the time of the Evaluator's call there had not been any contact about shared projects.

Recommendation: Develop communication with implementation groups for electric utilities with overlapping territory to pass over potential projects that may fall heavily on the gas or electric savings side. Shared electric and gas projects are a hallmark of successful commercial energy efficiency programs across the country and with the unique structure of shared savings for overlapping customers in NJ, there is an opportunity here to develop strong gas and electric programs that benefit NJ rate payers.

Conclusion: The types of projects seen so far have been prescriptive combination boilers and steam trap repairs, which is a small representation of the overall variety of potential projects. In future years we expect to see an increase in other project types being completed as awareness of the program increases.

Recommendation: For Custom projects we recommend ex ante analyses use the actual equipment efficiencies when available, instead of deferring to assumed or deemed efficiencies.

Barriers to Participation

Staff interviews indicated that the main barrier to implementation of the Prescriptive and Custom program is marketing and customer engagement. The AEG contacts indicated the Custom and Prescriptive programs would not meet their savings targets in the first year but would fulfill year one savings targets early in year two. AEG staff noted that ETG's lack of legacy programs was a barrier to the program's implementation as customers and contractors are not as familiar with it. ETG staff suggested the programs were building awareness and developing marketing and engagement strategies to build interest in the upcoming program year.

Interview findings indicate differing perspectives regarding the appropriateness of incentive level for the Prescriptive and Custom program. ETG contacts observed that the program incentives were sufficient, while the AEG contacts said that the incentive levels were a barrier to implementation success.

There is an opportunity to further develop ETG's relationships with Prescriptive and Custom trade allies. The Prescriptive and Custom program requires customers to independently engage with contractors; ETG contacts noted that there is less active management of Trade Ally relationships on the commercial compared to the residential side of ETG's energy efficiency programs. The AEG program manager noted that contractors may not be interested in participating in the Prescriptive and Custom program as the incentives are not as robust as the Direct Install program.

There are opportunities to streamline the program website and improve navigability. The lead engineer observed that there had been one project application through the online service provider portal to date. ADM visited the ETG website and found opportunities to improve the ease of navigation and user design for customers and trade allies.

4.1.7 Commercial DI

Sampling and Survey Results

Seventeen audits were completed in PY1. Thirteen customers declined DI measures and chose not to initiate proposed retrofit projects. Four customers decided to move forward with project plans recommended by the auditor. Three of these site projects were completed before program contractor training was complete and were not representative of the program design.

Impact Results

During the first year of the program, 17 Audits were conducted which resulted in program level ex-post gross annual savings of **260.89 therms** with a realization rate of **100 percent** and **2,629.45 therms of lifetime savings**. Because the number of completed projects was limited during this ramp-up year, the bulk of ADM’s evaluation of the program focused on a process evaluation.

Table 4-15: DI PY1 Program Gross Ex-Ante Therms Savings by Measure

Measure Name	Quantity	Annual Therms	Total Annual Therms	Measure Life	Lifetime Therms
Assessment Fee	17	--	--	--	--
Low Flow Faucet Aerators	9	26.7	240.34	10	2,403.40
Domestic Hot Water Pipe Insulation	6	3.43	20.55	11	226.05
Total	32.00	30.13	260.89	10	2,629.45

Table 4-16: DI M&V Sampled Site Gross Ex-Ante and Ex-Post Therms by Measure including Realization Rates

Measure	Ex-Ante Therms	Ex-Post Therms	RR Therms
Pipe insulation	20.55	20.55	100%
Low flow aerator	240.34	240.34	100%
Total	260.89	260.89	100%

For PY1 there were no electric savings associated with the DI program.

Process Evaluation Results

During the in-depth interviews (IDI) program and implementation staff noted the following:

- Staff noted budgetary concerns because of significant past participation in the NJCEP DI program and customer interest developed during PY1. ETG’s energy efficiency manager emphasized that the DI Program’s main focus needs to be on the pipeline to see what is coming because project sizes vary and in some cases one project could allow the program to meet its targets.
- It is premature to assess the effectiveness of third-party QA/QC procedures due to limited participation and the recent start-date of the third-party inspector contract.
- Findings from the ETG staff interview indicate sufficient communication with implementation staff, despite some challenges effectively communicating in PY1.

Conclusions and Recommendations

Conclusion: Staff noted budgetary concerns because of significant past participation in the NJCEP DI program and customer interest developed during PY1. ETG's energy efficiency manager emphasized that the DI Program's main focus needs to be on the pipeline to see what is coming because project sizes vary and in some cases one project could allow the program to meet its targets.

Recommendation: The Evaluator should follow up with ETG and implementation staff in PY2 to report on the program effects of focusing on the project pipeline when approving DI projects.

Conclusion: It is premature to assess the effectiveness of third-party QA/QC procedures due to limited participation and the recent start-date of the third-party inspector contract. AEG and ETG contacts noted that internal procedures are in-place and being effectively implemented, though there has been limited participation to require substantial QA/QC. In July 2022, ETG hired Performance Systems Development (PSD) to conduct third-party inspections and check for missed opportunities, and health and safety issues, and verify that documented work has been completed. They are required to perform inspections for 10 percent of DI projects; after their inspections, PSD compiles a report and uploads the QA/QC information to Vision. CMC conducts pre-assessments of each participating facility as well as post-inspections.

Recommendation: The Evaluator should review the QA/QC reports for effectiveness and possible inclusion in the M&V verification process in PY2 and beyond. PSD should also provide ETG with solutions and recommendations to issues they find during the site visits.

Conclusion: The current DI program design and state procurement law prevent municipalities from participating in the program. The state of New Jersey has a procurement law which requires municipalities to receive bids from three contractors before purchasing equipment. When the program was designed, utility staff thought that an exemption would be granted to allow municipalities to participate in the program, as was the case when the program was run by NJCEP. However, the state BPU and Division of Law have not yet decided on the exemption.

Recommendation: Continue to request for an exemption for municipalities to wave the bid requirements so that they can participate in the utility run programs.

Conclusion: The requirement to submit electric utility bills may hinder or halt participation for some customers. AEG's program manager noted that the electric utility bill requirement had been a barrier to participation for ETG DI customers, as there was some reluctance to provide their electric bill to ETG. ETG contacts posited that this step may spur internal conversations at customers' companies which in turn lead them not to participate.

Recommendation: Continue to ask for a change in the current DI program design, to allow natural gas companies to use a gas bill for program qualification rather than an electric one.

Barriers to Participation

The current DI program design and state procurement law prevent municipalities from participating in the program. The state of New Jersey has a procurement law which requires municipalities to receive bids from three contractors before purchasing equipment. When the program was designed, utility staff thought that an exemption would be granted to allow municipalities to participate in the program, as was the case when the program was run by NJCEP. However, the state BPU and Division of Law have not yet decided on the exemption.

The requirement to submit electric utility bills may hinder or halt participation for some customers. AEG's program manager noted that the electric utility bill requirement had been a barrier to participation for ETG DI customers, as there was some reluctance to provide their electric bill to ETG. ETG contacts posited that this step may spur internal conversations at customers' companies which in turn lead them not to participate.

Auditor training and initially limited marketing led to a slow start to the DI Program. The DI Program will meet its PY1 goals early in PY2. Utility staff noted that the DI Program was training its auditors for the first six months of the program year and noted that this may have caused a delay or slow start for DI projects. Auditors were fully trained by the beginning of May 2022. Staff indicated that the DI program will not meet its goals in year one, though they anticipate meeting year one targets early in year two.

4.2 Cross Participation

Approximately two percent of PY1 program participants engaged with more than one program during the program year.

Table 4-17 provides details on the number of program participants that interacted with one or more programs. Table 4-18 shows the rate at which participants from each program cross participated in other programs.

Since the QHEC program is specifically meant to encourage customers to participate in additional programs, the evaluators also reviewed which programs QHEC participants interacted with following their energy assessment. All 11 cross participants between the QHEC and MI Weatherization programs received their home energy assessments first. All other cross program participation between the QHEC and EE Products programs was either un-tracked¹¹ or prior to the QHEC energy assessment.

¹¹ Purchase dates were not included in the Online Marketplace program tracking data.

Table 4-17: Cross Participation PY1

Description	Metric
Unique participant count across all programs	148,858
Percent of participants in multiple programs	2.4%
Count of participants in 1 program	145,277
Count of participants in 2 programs	3,503
Count of participants in 3 programs	77
Count of participants in more than 3 programs	1

Table 4-18: Cross Participants by Program

Program	Percent in Multiple Programs	Count of Cross Program Participants							
		QHEC	HPwES	EEP - HVAC	EEP - Appliance	EEP - Online Marketplace	Moderate Income	Multi Family	Behavioral
QHEC	66%	-	0	3	6	41	11	0	169
HPwES	36%	0	-	0	1	1	0	0	2
EEP - HVAC	52%	3	0	-	19	37	0	0	233
EEP - Appliance	62%	6	1	19	-	45	1	0	401
EEP - Online Marketplace	51%	41	1	37	45	-	7	0	2,717
Moderate Income	73%	11	0	0	1	7	-	0	46
Multi Family	0%	0	0	0	0	0	0	-	0
HER	2%	169	2	233	401	2,717	46	0	-

4.3 Low Income Participation

The evaluator determined that an estimated 27 percent of households served by ETG have incomes below 250 percent FPL.

In each of the program surveys, the Evaluator asked respondents about the number of people living in the home and the estimated annual household income to determine participants' income levels (see Table 4-19). Based on customers' self-reported data, the EE Products program may be underserving the low-income communities in ETG's service territory while the QHEC and HER programs are serving these communities in proportions closer to estimated demographics.

Table 4-19: Customer Self-Report Income Data

Program	Below 250% FPL	Between 250-400% FPL	n
Non-Participant Survey	25%	10%	80 ¹²
QHEC	23%	7%	56 ¹³
EEP - HVAC and Appliances	5%	13%	93 ¹⁴
EEP - Online Marketplace	6%	18%	69 ¹⁵
HER ¹⁶	24%	17%	72 ¹⁷

4.4 Evaluability of Programs

Under the basic rigor guidelines provided by the SWE, ETG's programs were to be evaluated using basic rigor methods until they become mature, established programs. A part of these basic rigor evaluations was to ensure that all measure information, billing data, and ancillary data that will be needed for future enhanced rigor evaluations is available for the programs. The following section details the evaluability of the programs based on PY1 data and any changes or shortcomings in the data that were identified as potentially problematic for future evaluations.

4.4.1 EE Products

The Evaluator reviewed program design and tracking data for all measures included in Program Year 1 (2021) as part of its first year in a multi-year evaluation cycle. There were several issues with the tracking data that once corrected or improved, will allow for a more complete evaluation under the SWE's enhanced rigor guidelines.

Missing quantity field. During the first months of the program, the program tracking data records did not include a quantity field. As a result, ex-ante savings were incorrectly

¹² Twenty-nine percent said their income was more than 400% of the FPL. Thirty-six percent of respondents either preferred not to state (29%) or did not know (8%) their household income (does not sum to 36% due to rounding).

¹³ Forty-six percent said their income was more than 400% of the FPL. Twenty-three percent of respondents either preferred not to state (18%) or did not know (5%) their household income.

¹⁴ Fifty-five percent said their income was more than 400% of the FPL. Twenty-seven percent of respondents either preferred not to state (25%) or did not know (2%) their household income.

¹⁵ Fifty-five percent said their income was more than 400% of the FPL. Twenty-six percent of respondents either preferred not to state (23%) or did not know (3%) their household income.

¹⁶ Values in the table are for customers receiving Home Energy Reports. Surveyed control group customers indicated 14% of homes have incomes below 250% FPL and 11% of homes have incomes between 250-400% FPL (n=73).

¹⁷ Thirty-six percent said their income was more than 400% of the FPL. Twenty-three percent of respondents either preferred not to state (22%) or did not know (1%) their household income.

calculated for records with a measure quantity other than one. The Company added the quantity data element mid-cycle.

Incorrect AHRI reference numbers. AHRI reference numbers are included in the program tracking data records for several measures. ADM uses the reference number to access measure specifications for the exact model product the customer has purchased. The 2021 tracking data included several incorrect or incomplete AHRI reference numbers, which prevented ADM from calculating ex-post savings for those records. Realization rates were negatively impacted by incorrect or incomplete AHRI reference numbers.

Calculate ex-ante savings using actual measure parameter values by record, rather than using deemed parameter averages. When actual parameter values vary, realization rates also vary. When measure specifications are available (for example, using the AHRI reference number), ex-ante savings can be calculated that result in realization rates closer to 100%.

Ensure program tracking data follows the savings algorithms and any calculation modifications agreed on in the Coordinated Measure List. Updating the program data savings calculations to adhere to modifications in the Coordinated Measure List methodologies will improve realization rates.

Disaggregate savings for the “Gas Heater with Water Heater.” Disaggregation of the two components of this measure is likely to result in more accurate savings calculations.

Add the date of purchase to Online Marketplace tracking data. This additional information could help develop a more nuanced understanding of participants’ perception of savings since installing their program measures and also in-service rate calculations.

4.4.2 HPwES

Make Snugg Pro modeling inputs available to the Evaluator. The Evaluator was not able to verify the savings for most measures in the program in PY1 due to there not being enough homes for a regression analysis and the modeling inputs not being available. Some specific examples are:

- **Include an estimate of home Square Footage in the tracking data** to facilitate accurate calculations for Air Sealing.
- **Include baseline SEER and EFLH in the tracking data** being used to calculate central AC replacement savings.

Include efficiency or capacity for boiler and furnace replacements for new or existing systems in the tracking data.

4.4.3 QHEC

For the basic rigor evaluation performed for the QHEC program in PY1, the tracking data was sufficient to calculate ex-post savings using TRM assumptions. Typical enhanced rigor impact evaluation programs for DI measures in residential programs involves looking up the manufacture specs for a sample of each measure type to get unique inputs for the savings calculations.

Add Aerator flowrate into the tracking data. The Evaluator was unable to verify ex-ante per unit savings due to the lack of reported flowrate for the new aerators in the tracking data. The evaluator used the default efficient flow rate of 2.0 gallons per minute since the actual flowrate of the showerheads installed was not available.

Improve program tracking data quality by adding product model numbers to tracking data. Program tracking data did not include product model numbers to verify products specifications. In the absence of product specifications, ex-post savings were calculated with deemed average values that are less accurate than actual specification values.

Improve realization rates by ensuring that program tracking data follows the agreed-on savings algorithms agreed on in the Coordinated Measure List. Realization rates were the most impacted by differences in savings methodology calculations. Updating the program data savings calculations to adhere to the agreed upon Coordinated Measure List methodologies will improve realization rates.

Consider the energy savings value of a professionally installed smart thermostat. Though the QHEC program did claim savings for smart thermostat installations, 6 thermostats were installed by QHEC auditors (3 of which were purchased through the online marketplace during the program year). In other neighboring states, savings for smart thermostats vary based on installation type (professional vs. customer)¹⁸ and added savings from the QHEC auditor's professional smart thermostat installation could support program savings goals.

4.4.4 MI Weatherization

Include an estimate of building square footage for homes with Air Sealing. Building square footage was not included in the tracking data so the Evaluator used publicly available tax records to estimate building conditioned square footage. The average size of homes receiving some type of air sealing measure was 1,965 ft². Following the NJCEP, this results in average savings of 35.8 therms. Though the NJCEP was not used to estimate savings, the average reported savings (40.8 therms per home with air sealing) was comparable.

¹⁸ E.g., Pennsylvania Technical Reference Manual, Volume 2: Residential Measures, page 47.

Include all necessary Duct Sealing and Repair information in the tracking data. The information needed to use the NJCEP protocols to calculate duct sealing savings was not available in the tracking data. The 2020 NJCEP (pg. 71) includes a savings methodology to estimate duct sealing which requires estimates of:

- Percentage of duct work found within the conditioned space.
- Duct leakage evaluation (leaky, average, tight).
- Duct insulation evaluation (existing R-value).

Include the baseline R-value estimates for Insulation in the tracking data: The tracking data includes treated area (in ft²) or linear footage, the R-value of insulation added, and an estimate of savings per square foot. The baseline R-values were not included in the tracking data, so the evaluator was unable to estimate savings using the NJCEP protocol. In PY1, homes had an average of 856 ft² of insulation added, saving 152 therms per home, 0.18 therms/ ft². This is comparable to the savings estimated using the TRM methodology for improving R-5 insulation to R-30. This value (0.18 therms/ ft²) is relatively high.

Consider Tune-Up and Boiler Reset Controls Measures in the TRM update. The 2020 NJ TRM does not include an approach to estimate savings for tune-ups but does include a measure for “boiler reset controls” which assumes 5% reduction in annual heating energy if outdoor temperature reset controls are implemented. The average tune-up savings was 118 therms per home which is likely at least 10 percent of annual heating therms use.

Include location of Ducts that were improved. The average reported savings for duct improvement (89 therms/home) is comparable to ducts located in an attic, with insulation added to improve the R-value from R-2 to R-8. Duct location was not recorded, but if ducts are in conditioned or partially conditioned space (basements) the reported savings are undoubtedly too high because most supply air leakage and return air infiltration occurs within the home’s thermal boundary.

Improve data and savings calculation consistency while using the QA/QC process to identify issues. The evaluator identified and selected a sample of projects for review and in-depth participant interview. For one project with very high therms savings (957 therms) in the tracking data, an in-depth interview was conducted with the participant who provided the scope of work they received from the auditor. The evaluator discussed each line item in the work order with the participant and determined that some of the data in the tracking database, including total incentive amount and therms savings, was incorrect. The evaluator reviewed measure-level details for other projects and found that the first group of completed projects (15 of 64) may have similar issues. The evaluator did not attempt to work with the implementation team to better understand such discrepancies for several reasons:

- This was one of the first MI Weatherization projects. Subsequent projects' total savings were significantly lower and did not appear to have obvious discrepancies.
- Billing analysis is planned and will be used to determine evaluated savings in future evaluations.

QA/QC site visits by PSD have commenced and these will provide more accurate verification details.

4.4.5 HERs

The data for this program supported an enhanced, industry standard billing regression M&V approach in PY1. The Evaluators found the control and treatment tracking data, utility billing data, program documentation, and customer contact information to be complete and was provided quickly by the program implementation contractor.

4.4.6 ESB: Prescriptive and Custom

We recommend ex-ante analyses use the actual equipment efficiencies when available, instead of deferring to assumed or deemed efficiencies. For both sampled prescriptive projects, the ex-ante and ex-post analysis methods were the same resulting in the same savings. However, the custom steam trap projects had assumed an 80 percent thermal efficiency while the efficiency ranged from 80-86 percent resulting in realization rates of about 95 percent for most projects.

Consider collecting steam loss factors for future inclusion in the NJ TRM updates. For this program year, we applied the steam loss factors (Floss) reported by the contractor. We recommend that the program begin collecting documentation for steam trap leakage designations (plugged/leaking/blowing by) as part of the implementation process.

1.1.1 Commercial DI

The Evaluators found that all necessary information is being collected to perform an enhanced rigor evaluation for this program in the future.

- The program tracking data was complete, savings were calculated correctly, and uploads appeared to be timely. There was a single difference in the tracking data reports for M&V and what the utility program managers received, the reports for M&V did not provide total savings, only measure counts and measure savings. This issue could result in small differences between the program total savings the Evaluator reports and what ETG reports due to rounding but will be watched closely going forward.
- Program documentation included all requested applications, models, engineering calculations, assessment reports, and savings calculations. The Evaluator found

that the information provided an accurate picture of the Direct Install projects and all the necessary information to perform an enhanced rigor evaluation.

5 Comparisons to Similar Efficiency Programs

As part of the M&V evaluations for the first triennium of NJ Utilities' EE programs, the SWE required a set of benchmarking comparisons to established, similar EE programs across the country. The NJ utilities and their evaluators worked collaboratively to select M&V Reports for exemplary EE Programs throughout the country to provide benchmarking comparisons to the NJ programs. There were six, gas only utilities chosen to benchmark the ETG programs too, these utilities included 2019-2021 program evaluations in New Mexico, Oklahoma, Arkansas, Illinois, and Maryland. In the sections below the Evaluator has included a table that compares program NTG, participation, satisfaction, marketing, delivery type, and M&V approach along with a table that shows the program measures as a percentage of overall program savings. Each program that was evaluated in PY1 is benchmarked separately, with the ETG program data bolded in the tables below.

5.1 Energy Efficient Products

The EE Products program had more participation during PY1 than the other programs (Table 5-1), but the online marketplace component of the program contributed to this difference. NTG values for the other programs ranged from 60-93 percent for the various measures within the programs, the NTG was stipulated at 1 for ETG in PY1 for the portfolio. Program satisfaction was similar to the other programs. ETG participants reported that contractors and mail marketing were the most effective sources of program awareness in PY1, different from the other programs which were driven by the company websites and social media marketing. The program designs for the other programs were also different in that they were upstream programs while ETG's was a downstream and marketplace program.

Table 5-1: Benchmarking Data for Three EE Products Programs and the PY1 ETG Program

PY	State / Region	FR	SP	NTG	Utility Customers	Participant Count	Participant Satisfaction	Program Awareness	Program Design	Savings Methodology
2021	OK	9-47%	NA	60-91%	900,000	7,887	93%	Website and bill inserts	Upstream	TRM Algorithm
2021	AR	7-32%	NA	68-93%	45,000	552	92%	Website and bill inserts	Upstream	TRM Algorithm
2021	AR	5%	NA	93%	16,900	1,431	80%	Social media marketing	Upstream	TRM Algorithm
2022	NJ	NA	NA	100%	300,000	9,519	86%	Contractor and Mail Marketing	Downstream & Marketplace	TRM Algorithm

The measures in the ETG program were dominated by smart thermostats from the marketplace during PY1 but the other measures were similar to the benchmark programs (Table 5-2).

Table 5-2: EE Products Measures by Percentage of Program Savings for the Programs in Table 5-1

PY / State	Measure Group 1	M1 % Therms	Measure Group 2	M2 % Therms	Measure Group 3	M3 % Therms	Measure Group 4	M4 % Therms	Measure Group 5	M5 % Therms
2021 OK	Water Kits	47.6%	Clothes Dryers	26.8%	Water Heaters	23.5%	Ranges	2%		
2021 AR	Furnaces	59.7%	Tankless WH	20.2%	Smart Thermostats	20.1%				
2021 AR	Furnaces	67.7%	Smart Thermostats	23.8%	Water Heaters	8.5%				
2022 ETG	Smart Thermostats	71.7%	Furnace	8.8%	Combination Heater	6.8%	Water Kit	4%	Showerheads	2.4%

5.2 Home Performance with Energy Star

The HPwES program had a very slow start in PY1 with much less participation than the other program (Table 5-3). NTG was 83 percent with spillover of 3 percent for the other program while the NTG was stipulated at 1 for ETG in PY1 for the portfolio. The program design for the other program was similar except that all ETG program participants have a whole home model used to calculate savings before the projects are approved.

Table 5-3: Benchmarking Data for One HPwES Program and the PY1 ETG Program

PY	State / Region	FR	SP	NTG	Utility Customers	Participant Count	Participant Satisfaction	Program Awareness	Program Design	Savings Methodology
2021	MD	25%	3%	83%	NA	14,499	78%	Not reported	Consultation	Regression Analysis
2022	NJ	NA	NA	100%	300,000	11	NA	NA	Engineering Modeling	TRM Algorithm

The measures in both programs were similar but with different percentages of the overall savings (Table 5-4).

Table 5-4: HPwES Measures by Percentage of Program Savings for the Programs

PY / State	Measure Group 1	M1 % Therms	Measure Group 2	M2 % Therms	Measure Group 3	M3 % Therms	Measure Group 4	M4 % Therms	Measure Group 5	M5 % Therms
2021 MD	Building Shell	48%	Air Sealing	37%	HVAC	3%	Water Heating	0%	Duct Improvements	11%
2022 ETG	Insulation	47%	Furnace	27%	Air Sealing	12%	Boiler	6%	Storage DHW	6%

5.3 QHEC

The QHEC program was similar to the other home audit and direct install programs in satisfaction with the program, sources of program awareness, program design, and savings methodology (Table 5-5). The NTG for the two benchmarking programs ranged from 83-92 percent with one of them including spillover.

Table 5-5: Benchmarking Data for Two QHEC Programs and the PY1 ETG Program

PY	State / Region	FR	SP	NTG	Utility Customers	Participant Count	Participant Satisfaction	Program Awareness	Program Design	Savings Methodology
2021	MD	22%	8%	83%	NA	13,882	87%	Not reported	Direct Install	TRM Deemed
2021	IN	8%	0%	92%	821,000	753	72%	Website and Bill Insert	Direct Install	TRM Algorithm
2022	NJ	NA	NA	100%	300,000	300	78%	Bill Insert and Email	Direct Install	TRM Algorithm

The program measures were similar across the programs, although one benchmarking program provided a \$700 rebate for duct sealing if it was identified during the audit as a need (Table 5-6). ETG’s program worked to push participants into the weatherization or HPwES programs if a weatherization type issue was found.

Table 5-6: QHEC Measures by Percentage of Program Savings for the Programs in Table 5-5

PY / State	Measure Group 1	M1 % Therms	Measure Group 2	M2 % Therms	Measure Group 3	M3 % Therms	Measure Group 4	M4 % Therms
2021 MD	Showerheads	77%	Faucet Aerators	10%	Pipe insulation	4%		
2021 IN	Duct Sealing (\$700)	NA	Showerheads	NA	Faucet Aerators	NA	Pipe Wrap	NA
2022 ETG	Aerators & Showerheads	64.7%	Pipe Insulation	35.3%				

5.4 Moderate Income Weatherization

The MI Weatherization program also got off to a slow start in PY1 which is why it’s participation counts are lower than the other programs (Table 5-7). The other programs had high NTG ratios but were also subject to a very low survey count when the ratios were calculated. Program satisfaction was not surveyed in PY1 for ETG but the other programs had values from 70-93 percent in 2021. Program awareness was different for the programs with ETG’s best source being utility mailers.

Table 5-7: Benchmarking Data for Three MI Weatherization Programs and the PY1 ETG Program

PY	State / Region	FR	SP	NTG	Utility Customers	Participant Count	Participant Satisfaction	Program Awareness	Program Design	Savings Methodology
2021	OK	0%	NA	100%	900,000	890	93%	Website	Consultation	TRM Algorithm
2021	AR	7%	NA	93%	45,000	691	70%	Word of Mouth	Consultation	TRM Algorithm
2021	AR	0%	NA	100%	169,000	1,737	80%	Word of Mouth	Consultation	TRM Algorithm
2022	NJ	NA	NA	100%	300,000	64	NA	Mailer	Consultation	TRM Algorithm

The program measures were similar in the programs, although the benchmarking programs had a direct install component which included showerheads and aerators. ETG’s highest savings was from insulation while the other programs were duct sealing (Table 5-8).

Table 5-8: MI Weatherization Measures by Percentage of Program Savings for the Programs

PY / State	Measure Group 1	M1 % Therms	Measure Group 2	M2 % Therms	Measure Group 3	M3 % Therms	Measure Group 4	M4 % Therms	Measure Group 5	M5 % Therms
2021 OK	Duct Sealing	61%	Air Sealing	31.4%	Attic Insulation	7.5%				
2021 AR	Duct Sealing	73.2%	Air Sealing	20.3%	Attic Insulation	6.1%	Low Flow Showerhead	0.1%	Aerators	0.01%
2021 AR	Duct Sealing	75%	Air Sealing	18%	Attic Insulation	3%	Low Flow Showerhead	2.5%	Aerators	1.5%
2022 ETG	Insulation	66%	Air Sealing	16%	Duct Sealing	13%	Tune-Up	5%		

5.5 Home Energy Reports

The HERs program was relatively similar in size to the benchmark program and had a satisfaction of 78 percent in PY1. ETG saw significantly more participants reporting that they read the reports than the other program (Table 5-9). Because the ETG cohorts have been receiving treatment longer than the other program, the annual savings percentage was lower (Table 5-10).

Table 5-9: Benchmarking Data for One HER Program and the PY1 ETG Program

PY	State / Region	FR	SP	NTG	Utility Customers	Participant Count	Participant Satisfaction	Program Awareness	Program Design	Savings Methodology
2021	IL	NA	NA	100%	821,000	248,441	NA	41% opened emails	Behavioral	Regression Analysis
2022	NJ	NA	NA	100%	300,000	135,099	78%	79% read reports	Behavioral	Regression Analysis

Table 5-10: HER Measures by Percentage of Program Savings for the Programs

PY / State	Measure Group 1	M1 % of Therms
2021 IL	HER	0.9% of Annual Usage
2022 ETG	HER	0.5% of Annual Usage

5.6 Energy Solutions for Business - Custom

The custom programs had similar participation even though the ETG program had challenges with marketing the program in PY1 (Table 5-11). Customers weren't surveyed in PY1 by the Evaluator, so satisfaction wasn't known for ETG's program, but the program designs and M&V methodologies were all the same for the programs.

Table 5-11: Benchmarking Data for Three Commercial Custom Programs and the PY1 ETG Program

PY	State / Region	FR	SP	NTG	Utility Customers	Participant Count	Participant Satisfaction	Program Awareness	Program Design	Savings Methodology
2021	OK	3%	NA	97%	900,000	77	86%	Word of mouth	Consultation	Engineering Modeling
2021	AR	0%	NA	100%	45,000	5	NA	NA	Consultation	Engineering Modeling
2021	AR	2%	NA	98%	169,000	8	76%	Contractors	Consultation	Engineering Modeling
2022	NJ	NA	NA	100%	300,000	7	NA	Marketing	Consultation	Engineering Modeling

One program didn't report individual measures in the M&V report, but the others had steam traps as a big part of the program similar to ETG whose only measure in PY1 was steam traps (Table 5-12).

Table 5-12: Commercial Custom Measures by Percentage of Program Savings for the Programs

PY / State	Measure Group 1	M1 % Therms	Measure Group 2	M2 % Therms	Measure Group 3	M3 % Therms	Measure Group 4	M4 % Therms	Measure Group 5	M5 % Therms
2021 OK	Custom									
2021 AR	Waste Heat Recovery	58.5%	Retro-Commissioning	16.3%	Boiler Retrofit	12.6%	Steam Trap	9.1%	Insulation	3.5%
2021 AR	Steam Traps	58.4%	Oil Heater	24.8%	Boiler Replacement	6.4%	Insulation	5.1%	Condensate Return	3.7%
2022 ETG	Steam Traps	100%								

5.7 Energy Solutions for Business - Prescriptive

The PY1 program got off to a slow start due to program awareness, although one of the benchmarking programs also only had two participants (Table 5-13). The NTG for the other programs ranged from 77-98 percent as some of the participants would have had to make repairs to their systems regardless of the program incentives. The Evaluator did not conduct participant interviews in PY1, so there are no satisfaction values to report. Program design and M&V methods were similar across the programs.

Table 5-13: Benchmarking Data for Two Commercial Prescriptive Programs and the PY1 ETG Program

PY	State / Region	FR	SP	NTG	Utility Customers	Participant Count	Participant Satisfaction	Program Awareness	Program Design	Savings Methodology
2021	AR	23%	NA	77%	45,000	2	NA	NA	Consultation	TRM Algorithm
2021	AR	2%	NA	98%	169,000	51	76%	Contractors	Consultation	TRM Algorithm
2022	NJ	NA	NA	100%	300,000	2	NA	Marketing	Consultation	TRM Algorithm

The ETG program included boilers for PY1, while the other two programs included food service items as well as boilers and water heaters (Table 5-14). Food Service could be an area where ETG could look to expand the program in the future.

Table 5-14: Commercial Prescriptive Measures by Percentage of Program Savings for the Programs in Table 5-13

PY / State	Measure Group 1	M1 % Therms	Measure Group 2	M2 % Therms	Measure Group 3	M3 % Therms	Measure Group 4	M4 % Therms
2021 AR	Convection Oven	66.5%	Fryer	33.5%				
2021 AR	Furnaces	36.8%	Boilers	35.3%	Water Heaters	23.7%	Food Service	4.2%
2022 ETG	Combination Boiler	100%						

5.8 Commercial Direct Install

Program participation in the direct install programs was similar, but ETG had an issue with customers accepting DI measures during the audit which limited the programs gas savings. The other programs had NTG values ranging from 83-100 percent (Table 5-15). Contractors drove the program awareness for the other programs, as ETG grows the SBDI program this will likely become an important part of their program awareness as well.

Table 5-15: Benchmarking Data for Four SBDI Programs and the PY1 ETG Program

PY	State / Region	FR	SP	NTG	Utility Customers	Participant Count	Participant Satisfaction	Program Awareness	Program Design	Savings Methodology
2021	OK	0%	NA	100%	900,000	201	98%	Contractor	Direct Install	TRM Algorithm
2021	AR	13%	NA	88%	45,000	6	NA	NA	Direct Install	TRM Algorithm
2021	AR	2%	NA	98%	169,000	20	76%	Contractor	Direct Install	TRM Algorithm
2020	Illinois	NA	NA	83%	NA	45	NA	NA	Direct Install	TRM Deemed
2022	NJ	NA	NA	100%	300,000	17	NA	Marketing	Consultation	TRM Algorithm

While in PY1 ETG only installed aerators and pipe insulation, as trust in the program grows, they should consider pushing weather stripping, spray valve nozzles, and other measures as part of the program (Table 5-16).

Table 5-16: SBDI Measures by Percentage of Program Savings for the Programs in Table 5-15

PY / State	Measure Group 1	M1 % Therms	Measure Group 2	M2 % Therms	Measure Group 3	M3 % Therms	Measure Group 4	M4 % Therms	Measure Group 5	M5 % Therms
2021 OK	Steam Trap	NA	Drysmart Units	NA	Low Flow Spray Valves	NA	Aerators and Showerheads	NA	Weather Stripping-Doors	NA
2021 AR	Weather Stripping	100%								
2021 AR	Weather Stripping	NA	Pre-Rinse Spray Valves	NA	Aerators and Showerheads	NA				
2020 IL	Steam Trap	83.95%	Boiler Tune Up	11.64%						
2022 ETG	Aerators	89%	Pipe Insulation	11%						

6 TRM Updates and Measure Savings Comparison

6.1 TRM Updates

During the PY1 basic rigor evaluation, information was collected through program participant surveys and looking up measure specific information. There were no site visits or monitoring of residential or commercial sites. The SWE directed that evaluation activities in PY1 include the identification of issues and collection of data that can inform the update of the NJ TRM which will occur in February 2023. Table 6-1 presents the items that the evaluator identified as potentially part of these TRM updates.

Table 6-1: ETG Program Evaluation Data that May Be Used to Inform NJ TRM Updates

Residential	
<i>Measure (PY1 Count)</i>	<i>Notes</i>
Water Heater (47)	AHRI lookups found 18.5 percent were 40 gal, 81.5 percent were 50-gal capacity tanks
Tankless Water Heater (47)	Out of 8 survey responses, 63% replaced a tank and 38 percent replaced a tankless heater.
Clothes Washer (493)	Define multi-family gallons/year as communal or within units. There was confusion by implementation in PY1.
Faucets and Aerators (666)	Provide clear guidance for when to apply F percentages. Consider increasing the F percentages, even the 2022 addendum may not be high enough for gas water heat.
Smart Thermostats (7,478)	In other neighboring states, savings for smart thermostats vary based on installation type (professional vs. customer) and added savings from the QHEC auditor's professional smart thermostat installation could support program savings goals.
Air Sealing (69)	(pg. 70, 2020 TRM). This measure primarily saves heating energy, but also saves some cooling energy. However, without explanation, the TRM states: "there are no summer coincident electric peak demand savings estimated at this time."
Insulation Upgrades (67)	(pg. 75, 2020 TRM). The TRM includes cooling energy savings algorithm, and a coincidence factor is listed in the "Residential Insulation Upgrades" table, however a demand savings algorithm is not included.
Add Tune-Up (6) option to the Boiler Reset Controls (4) Measures	The 2020 NJ TRM does not include an approach to estimate savings for tune-ups but does include a measure for "boiler reset controls" which assumes 5 percent reduction in annual heating energy if outdoor temperature reset controls are implemented.
Commercial	
<i>Measure</i>	<i>Notes</i>

Steam Loss Factors (7)		We recommend that the program begin collecting documentation for steam trap leakage designations (plugged/leaking/blowing by) as part of the implementation process for possibly inclusion in the TRM updates.					
Demographics & Home Characteristics							
PY1 Survey	Home Gas Heat	Water Gas Heat	S.F Home	Own Home	250% FPL	250-400% FPL	Survey N
Downstream	96%	94%	87%	100%	5%	13%	93
Marketplace	91%	86%	71%	88%	6%	18%	69
Non-Participant	84%	80%	51%	68%	25%	10%	80
HER	90%	87%	64%	84%	19%	14%	145
QHEC	95%	84%	75%	96%	23%	7%	56
Weighted Average	91%	87%	69%	87%	16%	13%	443

6.1.1 Residential Discussion

- The EE Products program included water heater measures, during the evaluation each measures' AHRI number was pulled to gather specific information to calculate measure specific ex-post savings. The evaluation found that the capacities of installed water heaters were less than the TRM suggested value.
- An important part of the calculation for tankless water heaters was the replaced unit (UEF_b), the downstream survey had eight responses that reported the type of replaced water heaters. If the TRM is going to have an option for unknown replaced unit UEF_b these survey results can be part of an overall data collection effort.
- The TRM equation for clothes washer savings includes an important variable *Cycles/year*, the multi-family value is five-times the single family value. While this is intuitive if the clothes washers are in a communal space in a facility, it is not explicitly stated in the TRM that this is the case. The evaluation found that the ex-ante calculations for this measure were using this value for in-unit multi-family washers resulting in a poor realization rate. It is recommended that clarifying language be added to the TRM for this measure.
- Faucets and aerators are one of the few measure options for residential natural gas utility DI programs such as QHEC. The F percentage multipliers for the type of water heating fuel are:
 - Likely too low for the ETG territory based on the PY1 survey's home characteristics, even the increased percentage in the 2022 Addendum is still lower than the survey results in PY1 for ETG.
 - Not clearly explained for when to apply the F percentages, as the QHEC program ex-ante values applied the percentage multiplier even though the

type of water heating was known in all cases. Better clarification on when to use the F percentages would result in correct implementation of these measures savings algorithms.

- Smart Thermostats, in neighboring state TRMs, there are additional savings for smart thermostats professionally installed could be considered for the NJ TRM updates.
- Consider adding summer coincident demand savings for air sealing and insulation upgrade measures to the TRM.
- Consider adding an approach to estimate savings for tune-ups in relation to boiler reset controls to the TRM.

6.1.2 Commercial Discussion

The ETG commercial programs experienced a slow ramp up in PY1, so there were not a lot of measures to evaluate. The 2022 Addendum changes cover the measures that were part of the DI and ESB: Prescriptive and Custom programs, with one suggestion to collect steam loss factors for future inclusion in the NJ TRM.

6.1.3 Survey Discussion

In PY1, there were five residential surveys across three program channels and a non-participant survey with a total of 443 responses. There are certain home characteristics, types of homes, and demographic information that could be used to update the TRM. Table 6-1 provides a summary of the survey results that may be used to update assumptions in the TRM for various water saving, water heating, and HVAC measures. For the ETG customers, the surveyed percentages of home and water heating that was gas was higher for all the surveys than is included in the current NJ TRM and the 2022 Addendum equations. More detail on the home characteristics results from the surveys can be found in Table 7-44, Table 7-51, Table 7-55, Table 9-18, Table 11-33.

6.2 2022 Addendum Measure Savings Comparison

As part of the NJ TRM update process, the SWE directed the evaluators and utilities to recalculate the savings for certain measures that are a high priority for the February 2023 TRM update. These measures, their updated variable assumptions and energy savings calculations were provided in the 2022 Addendum document. The EE Products downstream and marketplace channels, QHEC, commercial DI, and ESB: Prescriptive programs all contained measures that were included in the 2022 Addendum. It is important to compare the differences at the portfolio and program levels, which includes all the PY1 program savings with the 2022 Addendum recalculations considered as in Table 6-2.

*Table 6-2: Program and Portfolio Level Comparison of Ex-Ante and Ex-Post Therms
PY1 Actuals and 2022 Addendum Recalculations*

Program	Ex-Ante Savings (therms)	2022 Addendum Ex-Ante Savings (therms)	Ex-Ante Ratio (therms)	Ex-Post Savings (therms)	2022 Addendum Ex-Post Savings (therms)	Ex-Post Ratio (therms)
EE Products Downstream	78,016.99	73,264.90	94%	86,920.79	78,545.19	90%
EE Products Marketplace	321,486.16	307,514.49	96%	314,680.33	298,704.62	95%
QHEC	6,002.94	5,227.68	87%	6,407.68	5,046.14	79%
ESB Prescriptive	322.92	353.74	110%	322.92	353.74	110%
Commercial DI	260.89	310.47	119%	260.89	310.47	119%
PY1 Portfolio	1,142,539.18	1,123,070.99	98%	1,091,907.12	1,066,225.10	98%

The recalculations would have dropped the program level ex-post savings to as low as 79 percent for QHEC and increased it to 110 percent for ESB Prescriptive, but at the portfolio level the change would have only been a 2 percent decrease in therms. It was also important to look at the measure level effects of the recalculations, Table 6-3 and Table 6-4 includes the ex-ante and ex-post therms and kWh savings respectively, for each measure along with the 2022 Addendum recalculations. These tables can be used by ETG staff and the NJ TRM committee to plan for the effects the TRM updates will have on future years programs.

Table 6-3: Comparison Between the Ex-Ante and Ex-Post Therms PY1 Actuals and 2022 Addendum Recalculations

Measure	Quantity	Ex-Ante Savings (therms)	2022 Addendum Ex-Ante Savings (therms)	Ex-Ante Ratio	Ex-Post Savings (therms)	2022 Addendum Ex-Post Savings (therms)	Ex-Post Ratio
EE Products Downstream							
Gas Storage Tank Water Heater (<55 gal)	47	1,063.67	623.31	59%	1,978.65	1,631.85	82%
Tankless Water Heater (UEF>=0.87)	47	1,586.46	929.66	59%	1,536.11	884.57	58%
Gas Combi Heat Tier 1 (AFUE 95-96.9)	114	16,081.16	14,344.82	89%	27,428.01	25,668.34	94%
Qualifying Gas Heater w Gas Water Heat (<55 gal)	21	7,961.73	6,539.62	82%	4,240.05	522.90	12%
Qualifying Gas Heater w Gas Water Heat (>=55 gal)	10	3,976.20	3,479.71	88%	1,959.24	58.80	3%
Total	239	30,669.22	25,917.13	85%	37,142.06	28,766.46	77%
EE Products Marketplace							
Lowflow Showerhead	319	7,529.87	3,299.23	44%	9,671.09	4,513.88	47%
Kitchen Faucet Aerator	49	633.57	156.02	25%	584.19	143.34	25%
Bathroom Faucet Aerator	22	487.74	120.11	25%	488.74	120.35	25%
Water Saving Kit	173	14,146.21	5,250.36	37%	16,300.78	6,291.52	39%
Total	563	22,797.39	8,825.72	39%	27,044.80	11,069.09	41%
QHEC							
Bathroom Faucet Aerator	115	639.36	236.76	37%	1,498.77	527.25	35%
Handheld Efficient Flow Showerhead	60	2,051.13	1,908.30	93%	1,029.27	957.60	93%
Kitchen Faucet Aerator	27	84.00	29.55	35%	355.33	125.00	35%
Std Efficient Flow Showerhead	74	2,518.60	2,343.22	93%	1,264.02	1,176.00	93%
Total	276	5,293.09	4,517.83	85%	4,147.39	2,785.85	67%
ESB: Prescriptive							
Combination Boiler	2	322.92	353.74	110%	322.92	353.74	110%
Commercial DI							
Boiler Replacement	1	1,058.93	1,101.29	104%	1,058.93	1,101.29	104%
Boiler Reset Controls	1	180.50	187.72	104%	180.50	187.72	104%
Low Flow Water Items	14	308.13	308.13	100%	308.13	308.13	100%
Pipe Insulation	106	342.56	342.56	100%	342.56	342.56	100%
Total	122	1,890.12	1,939.70	103%	1,890.12	1,939.70	103%
PY1 Total							
Total	1,202	60,972.73	41,554.12	68%	70,547.29	44,914.84	64%

Table 6-4: Comparison Between the Ex-Ante and Ex-Post kWh PY1 Actuals and 2022 Addendum Recalculations

Measure	Quantity	Ex-Ante Savings (kWh)	2022 Addendum Ex-Ante Savings (kWh)	Ex-Ante Ratio (kWh)	Ex-Post Savings (kWh)	2022 Addendum Ex-Post Savings (kWh)	Ex-Post Ratio (kWh)
EE Products Downstream							
Central AC Tier 1	11	3,863.85	3,416.92	88%	3,313.00	3,570.03	108%
Central AC Tier 2	3	1,736.57	1,869.14	108%	1,727.54	1,861.56	108%
Total	14	5,600.41	5,286.06	94%	5,040.54	5,431.59	108%
EE Products Marketplace							
Low flow Showerhead	319	4,679.95	2,832.69	61%	16,701.98	10,143.22	61%
Kitchen Faucet Aerator	49	1,514.59	3,183.63	210%	1,366.00	2,861.19	209%
Bathroom Faucet Aerator	22	1,165.78	1,429.42	123%	1,143.00	1,401.40	123%
Water Saving Kit	173	19,531.70	19,556.73	100%	31,758.00	31,995.77	101%
Total	563	26,892.02	27,002.47	100%	50,968.98	46,401.58	91%
QHEC							
Bathroom Faucet Aerator	115	218	43	20%	979	242	25%
Handheld Efficient Flow Showerhead	60	1,284	1,555	121%	644	1,170	182%
Kitchen Faucet Aerator	27	42	8	19%	343	64	19%
Std Efficient Flow Showerhead	74	1,284	1,555	121%	644	780	121%
LED Specialty Candelabra 25w Equivalent	121	1,681	490	29%	3,105	905	29%
LED Specialty Downlight 55w Equivalent	8	256	71	28%	467	129	28%
LED Specialty Downlight 65w Equivalent	172	4,421	1,897	43%	12,333	5,293	43%
LED Specialty Downlight 75w Equivalent	15	438	180	41%	1,191	490	41%
LED Specialty Downlight 90w Equivalent	36	1,275	486	38%	3,217	1,226	38%
LED Specialty Globe 25w Equivalent	38	528	135	26%	896	230	26%
LED Specialty Globe 40w Equivalent	458	6,999	2,920	42%	19,327	8,065	42%
LED Standard 100w Equivalent	40	1,584	746	47%	4,528	2,134	47%
LED Standard 60w Equivalent	521	12,304	5,153	42%	33,459	14,013	42%
LED Standard 75w Equivalent	99	2,888	1,254	43%	8,050	3,495	43%
Total	1,784	35,202	16,493	47%	89,183	38,235	43%
PY1 Total							
Total	2,361	67,694.60	48,781.24	72%	145,192.82	90,068.05	62%

One of the other big changes in the 2022 Addendum is the lowering of the measure life for LEDs to account for the EISA baseline standards change. The ML went from 15 years to 4 years, Table 6-5 presents the lifetime savings differences for the QHEC LEDs.

Table 6-5: Comparison Between the Lifetime Ex-Ante and Ex-Post kWh PY1 Actuals and 2022 Addendum Recalculations

Measure	Quantity	2020 TRM ML	2022 Add ML	Ex-Ante Lifetime Savings (kWh)	2022 Add Ex-Ante Lifetime Savings (kWh)	Ex-Ante Lifetime Ratio (kWh)	Ex-Post Lifetime Savings (kWh)	2022 Add Ex-Post Lifetime Savings (kWh)	Ex-Post Lifetime Ratio (kWh)
LED Specialty Candelabra 25w Equivalent	121	15	4	25,215	1,959	7.8%	46,575	3,618	7.8%
LED Specialty Downlight 55w Equivalent	8	15	4	3,834	282	7.4%	7,005	515	7.4%
LED Specialty Downlight 65w Equivalent	172	15	4	66,308	7,588	11.4%	184,995	21,172	11.4%
LED Specialty Downlight 75w Equivalent	15	15	4	6,564	720	11.0%	17,865	1,961	11.0%
LED Specialty Downlight 90w Equivalent	36	15	4	19,130	1,944	10.2%	48,255	4,905	10.2%
LED Specialty Globe 25w Equivalent	38	15	4	7,919	542	6.8%	13,440	919	6.8%
LED Specialty Globe 40w Equivalent	458	15	4	104,985	11,682	11.1%	289,905	32,258	11.1%
LED Standard 100w Equivalent	40	15	4	23,756	2,986	12.6%	67,920	8,538	12.6%
LED Standard 60w Equivalent	521	15	4	184,567	20,612	11.2%	501,885	56,050	11.2%
LED Standard 75w Equivalent	99	15	4	43,323	5,015	11.6%	120,750	13,978	11.6%
PY1 Total	1,508	15	4	485,600	53,331	11.0%	1,298,595	143,914	11.1%

7 Appendix A: EE Products Program Evaluation Report

7.1 Introduction

The Energy Efficient Products (EEP) program provides residential customers with financial incentives to purchase selected energy efficient products. Customers can purchase discounted products from the company's online marketplace and can apply for rebates for qualified retail products. Measures include heating, ventilation, and air conditioning (HVAC) products installed by participating qualified contractors, ENERGY STAR® appliances, smart thermostats, and water conservation measures.

HVAC measures include central air conditioners, air source heat pumps, mini-splits, gas furnaces, and gas combination boilers.

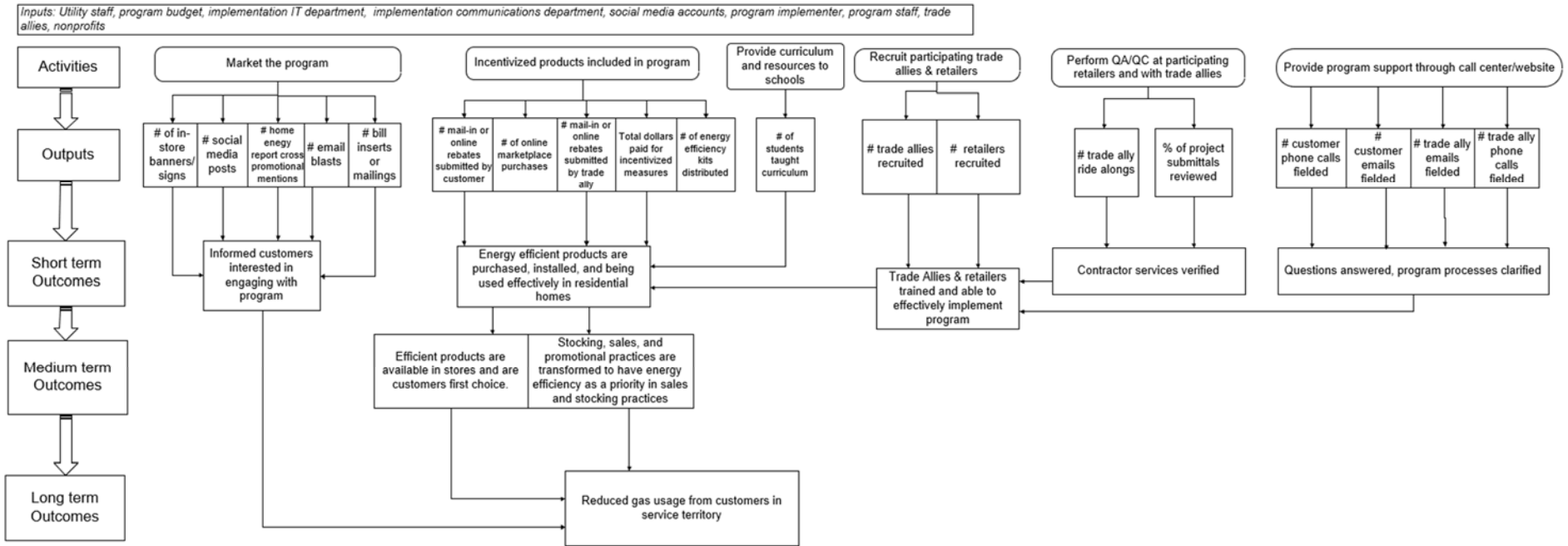
Appliance measures include ENERGY STAR clothes washers and dryers, smart thermostats, boiler reset controls, gas boilers, gas storage tank water heaters, indirect-fired storage tank water heaters, tankless water heaters, and qualifying gas heaters with qualifying gas water heaters.

Water conservation measures include low-flow showerheads, kitchen faucet aerators, and bathroom faucet aerators.

In 2021/2022 (PY1) 5,421 customers purchased 7,987 measures from the online marketplace, and 1,163 customers received rebates for 1,546 qualified products. PY1 resulted in 402,674.05 therms savings, 1,119,410 kWh savings, and 10.28 kW demand savings.¹⁹

The program design is illustrated as a logic map in Figure 7-1, developed from conversations with program and implementation staff, a review of program documentation, and ADM's experience with similar programs. The logic map is meant to capture dynamic program design to assist program staff, trade allies, and evaluators to understand the program's underlying operations.

¹⁹ There were several differences between the participant definitions between the M&V program tracking data reports and ETG management data reports. This resulted in some small differences between the ETG reported ex-ante values and the M&V reported values.



7.2 Methodology

This section describes the methodology the evaluators used to calculate electric and gas savings that resulted from the program.

During its evaluation, the evaluators:

- Quantified the number of program participants and installed measures.
- Conducted three customer surveys to collect additional data needed to calculate program savings.
- Calculated the energy (kWh) and gas savings (therms) attributable to the program.

The impact evaluation methodology used for each measure is described in detail in the following sections.

7.2.1 Estimating Gross Savings

This section details the impact analysis methodologies used for each measure category to determine verified gross energy impacts and measure life (for lifetime savings). Deemed savings values and algorithms from the 2020 and 2021 New Jersey Energy Efficiency Technical Reference Manual (NJ TRM) and the Maryland/Massachusetts TRM Version 10 (MD/MA TRM) were used to determine verified energy impacts and lifetime savings. Table 7-1 summarizes the TRM's used in this analysis.

Table 7-1: TRM Summary

Measure	TRM
HVAC Quality Installations	2020 NJ TRM (pg. 15-20)
Gas Furnaces	2020 NJ TRM (pg. 23)
Gas Combination Boilers	2020 NJ TRM (pg. 26)
ENERGY STAR Clothes Dryers	2020 NJ TRM (pg. 54).
ENERGY STAR Clothes Washers	2020 NJ TRM (pg. 53) 2021 NJ TRM (pg. 60)
ENERGY STAR Smart Thermostats	MD / MA TRM v10 (pg. 103, Method 3)
Boiler Reset Controls	2020 NJ TRM (pg. 28)
Gas Boilers	2020 NJ TRM (pg. 24)
Gas Storage Tank Water Heater	2020 NJ TRM (pg. 29)
Indirect-Fired Storage Tank Water Heaters	2020 NJ TRM (pg. 37)
Tankless Water Heater (UEF >= 0.87)	2020 NJ TRM (pg. 31)
Qualifying Gas Heater with Qualifying Gas Water Heater	2020 NJ TRM (pg. 23), 2020 NJ TRM (pg. 29), 2020 NJ TRM (pg. 31)
Low Flow Aerators, Showerheads, and Water Conservation Kits	2020 NJ TRM (pg. 182)

The sections below detail the impact analysis methodologies for each measure included in the program.

Water Conservation Measures

Faucet Aerators

The evaluators calculated fuel and energy savings for faucet aerators using Equation 1 (2020 NJ TRM, pg. 182) and following the Coordinated Measure List modification that hours (H) should be defined minutes (M).

$$\begin{aligned}
 & \text{Fuel Savings (therms/yr) or Electric Savings } \left(\frac{kWh}{yr}\right) \\
 & = (N * M * D * (F_b - F_q) * (8.33 * DT / EFF) / C) * 10
 \end{aligned}$$

Equation 1

Where:

- N* = Number of fixtures
- M* = Minutes per day of device usage
 - = 30 minutes
- D* = Days per year of device usage
 - = 260 days
- F_b* = Baseline device flow rate (gal/m)
 - = 2.2 gpm
- F_q* = Low flow device flow rate (gal/m)²⁰
 - <=1.5 gpm (kitchen, bathroom)
- 8.33* = Constant, heat content of water (Btu/gal/°F)
- DT* = Difference in temperature (°F) between cold intake and output
 - = 25°F
- EFF* = Efficiency of water heating equipment
 - = 80 percent natural gas
 - = 97 percent electric
- C* = Conversion factor from Btu to therms or kWh
 - = 100,000 for gas water heating (therms)
 - = 3,413 for electric water heating (kWh)

²⁰ Actual gallon per minute (gpm) flowrate derived from model in tracking data

For this measure, the evaluator confirmed faucet aerator flow rates from the program website and used the program tracking data for determining the quantity installed in each home. Calculated savings also depend on water heating fuel type, which the evaluator determined from the marketplace participant survey.

Low Flow Efficient Showerheads

The evaluators calculated fuel and energy savings of low flow showerheads using Equation 2, 3, and 4 (2021 NJ TRM, pg. 53).

kWh Annual Savings

$$= \text{Water Savings} \left(\frac{\text{gals}}{\text{year}} \right) \times (T_{\text{shower}} - T_{\text{main}}) \times \left(\frac{8.33}{3412} \right) \times \left(\frac{1}{UEF_{\text{elec}}} \right) \times F_{\text{elec}}$$

Equation 2

Therms Annual Savings

$$= \text{Water Savings} \left(\frac{\text{gals}}{\text{year}} \right) \times (T_{\text{shower}} - T_{\text{main}}) \times 8.33 \times \left(\frac{1}{UEF_{\text{gas}}} \right) \times F_{\text{gas}} \times \left(\frac{1 \text{ therm}}{100,000 \text{ Btu}} \right)$$

Equation 3

Water Savings $\left(\frac{\text{gals}}{\text{year}} \right)$

$$= (GPM_{\text{baseline}} - GPM_{\text{ee}}) \times \text{Throttle}_{\text{factor}} \times \frac{\text{minutes}}{\text{shower}} \times \frac{\text{showers}}{\text{day}} \times 365 \frac{\text{days}}{\text{year}}$$

Equation 4

Where:

- T_{Shower} = 105°F
- T_{main} = 60.6°F
- UEF_{elec} = Uniform Energy Factor for electric water heaters
= 0.9197
- UEF_{gas} = Uniform Energy Factor for gas water heaters
= 0.56
- F_{elec} = Percent of water heaters which are electric

	=	8.8 percent ²¹
F_{gas}	=	Percent of water heaters which are gas
	=	91.2 percent ²²
8.33	=	Conversion factor for energy required (Btu) to heat one gallon of water by 1°F
$GPM_{baseline}$	=	2.5
GPM_{ee}	=	actual gallon per minute flowrate derived from model in tracking data
$Throttle_{factor}$	=	0.9
$\frac{minutes}{shower}$	=	8.2
$showers/day$	=	2.03
100,000	=	Conversion factor from Btu to therms
3,412	=	Conversion factor from Btu to kWh

For this measure, the evaluator confirmed showerhead flow rates from the program website and used the program tracking data for determining the quantity installed in each home. Calculated savings also depend on water heating fuel type, which the evaluator determined from the marketplace participant survey.

2022 Addendum Aerators and Showerheads

Gas (therms) and electric (kWh) savings calculations for low-flow aerators and showerheads from the 2022 NJ TRM addendum are shown in Equation 5 and Equation 6 below.

²¹ Percent of water heaters fueled by electricity for participants who received water conservation measures derived from ADM participant survey.

²² Percent of water heaters fueled by natural gas for participants who received water conservation measures derived from ADM participant survey.

$$\begin{aligned} \text{Energy Savings (kWh/yr)} \\ = \%Electric\ DHW * (GPM_base - GPM_ee) * kWh/\Delta GPM \end{aligned}$$

Equation 5

$$\begin{aligned} \text{Natural Gas Impact (therm)} \\ = \%Gas\ DHW * (GPM_base - GPM_ee) * therm/\Delta GPM \end{aligned}$$

Equation 6

Where:

- %Electric DHW* = proportion of water heating supplied by electricity
= 8.8 percent (from participant survey)
- GPM_base* = Flow rate of the baseline showerhead (gallons per minute)
= showerheads, 2.5
= aerators, 2.2
- GPM_ee* = Flow rate of the efficient showerhead (gallons per minute)
= showerheads, 2.0
= kitchen aerators, 1.8
= bathroom aerators, 1.5
- kWh/ΔGPM* = Electric energy savings of efficient showerhead per gallon per minute (GPM)
= showerheads, 390.1
= aerators, 63.7
- %Gas DHW* = proportion of water heating supplied by natural gas
= 91.2 percent (from participant survey)
- therm/ΔGPM* = natural gas energy savings of efficient showerhead per gallon per minute (GPM)
= showerheads, 16.8
= aerators, 5.0

Central Air Conditioners

The evaluators calculated electric savings (kWh) and demand reduction (kW) for central air conditions using Equation 7 and Equation 8 (2020 NJ TRM, pg. 15).

$$\text{Energy Savings } \left(\frac{kWh}{yr}\right) = Tons * 12 \frac{kBtu_h}{Ton} * \left(\frac{1}{SEER_b} - \frac{1}{SEER_q}\right) * EFLH_c * ESF$$

Equation 7

$$Peak\ Demand\ Savings\ (kW) = Tons * 12\ kBtuh/Ton * (1/EERb - 1/EERq) * CF * DSF$$

Equation 8

Where:

- Tons* = The rated cooling capacity of the unit being installed
- SEERb* = The Seasonal Energy Efficiency Ratio of the Baseline Unit.
 - = Split Systems (A/C) = 13
 - = Split Systems (HP) = 14
 - = Single Package (A/C) = 14
 - = Single Package (HP) = 14
- SEERq* = The Seasonal Energy Efficiency Ratio of the qualifying unit being installed.
- EERb* = The Energy Efficiency Ratio of the Baseline Unit.
 - = 11.3
- EERq* = The Energy Efficiency Ratio of the unit being installed.
 - = $(11.3/13) * SEERq$
- CF* = The coincidence factor which equates the installed unit's connected load to its demand at time of system peak
 - = 69 percent
- EFLHc* = The Equivalent Full Load Hours of operation for the average unit (cool or heat)
 - = cooling, 600 hours
- ESF* = Energy savings factor or the assumed savings due to proper sizing and proper installation
 - = 1.092
- DSF* = Demand savings factor or the assumed peak demand capacity saved due to proper sizing and proper installation
 - = 1.092

For this measure, the variables required from the program tracking data included:

- Make and model number
- *Tons* (if available, can be confirmed using model number)

- *SEERq* (if available, can be confirmed using model number)

The 2022 NJ TRM Addendum changes the central air conditioner coincidence factor for kW demand reduction from 69 percent to 50 percent and the EFLHc for kWh savings from 600 to 562 for multi-family homes constructed after 2007.

Boiler Reset Controls

The evaluators calculated annual fuel savings using Equation 9 (2020 NJ TRM, pg. 28).

$$Fuel\ Savings\ \left(\frac{therms}{yr}\right) = \left(\frac{(\% Savings) \times (EFLH_h * Cap_{in})}{1,000 \frac{kBtu}{MMBtu}}\right) * 10$$

Equation 9

Where:

- % Savings* = Estimated percentage reduction in heating load due to boiler reset controls
= 0.05
- EFLH_h* = The equivalent full load hours of operation for the average unit during the heating season
= 965 hours
- Cap_{in}* = Input capacity of qualifying unit in kBtu/hr

For this measure, variables required from the program tracking data included:

- Make and model number
- *Cap_{in}*

ENERGY STAR Clothes Dryers

The evaluators verified clothes dryer model numbers included in program tracking data were ENERGY STAR models that met TRM qualifications. The evaluators calculated annual energy savings using deemed values included in Table 7-2 (2020 NJ TRM, pg. 54).

Table 7-2: Deemed Savings Values for ENERGY STAR Dryers

Tier	therms/yr	kWh/yr	kW
Tier 1	5.80	9.00	0.001
Tier 2	7.69	42.94	0.003

For this measure, the product make and model number were required to verify and calculate savings.

ENERGY STAR Clothes Washers

The evaluators verified clothes washer model numbers included in program tracking data were ENERGY STAR models that met TRM qualifications (see Table 7-3).

Table 7-3: Federal minimum Integrated Modified Energy Factor for clothes washers built after January 1, 2018

Configuration	Capacity	Federal Min-IMEF (ft ³ /kWh/cycle)	Federal Max – IWF (gal/cycle/ft ³)
Top Load	< 1.6 ft ³	1.15	12
Top Load	≥ 1.6 ft ³	1.57	6.5
Front Load	< 1.6 ft ³	1.13	8.3
Front Load	≥ 1.6 ft ³	1.84	4.7

For clothes washers purchased before April 1, 2022, the evaluators calculated annual energy savings using deemed values included in Table 7-4 (NJ TRM FY2020, pg. 53).

Table 7-4: Deemed Savings for Clothes Washers

Tier	kWh/yr	kW	therms/yr
ENERGY STAR Clothes Washers – Tier 1	55	0.005	4.8
ENERGY STAR Clothes Washers – Tier 2	61	0.006	9.0

For clothes washers purchased after April 1, 2022, the evaluators calculated annual energy savings using Equation 10 (NJ TRM FY2021, pg. 60).

$$\Delta kWh_{washer} = Capacity \times (1/IMEF_b - 1/IMEF_{ee}) \times Cycles/yr \times SF_{washer}$$

Equation 10

Where:

- Capacity* = Rated volume(ft³) of ENERGY STAR machine
- IMEF_b* = Federal minimum Integrated Modified Energy Factor by configuration and capacity
- IMEF_{ee}* = Integrated Modified Energy Factor for ENERGY STAR machine

SF_{washer}	=	proportion of total savings attributed to machine
	=	5 percent
CF	=	0.029
$Cycles/year$	=	283 Single Family
	=	1,138 Multi Family

For this measure, variables required from the program tracking data included:

- Make and model number
- *Capacity* (if available, can be confirmed using model number)
- $IMEF_{ee}$ (if available, can be confirmed using model number)
- Washer configuration type (if available, can be confirmed using model number)
- Single or Multi Family home (estimated from survey)
- Water heating fuel type (estimated from survey)

Gas Boilers

The program included both gas boilers and gas combination boilers. Methods for determining savings for each are presented separately below.

The evaluators verified gas boiler model numbers included in program tracking data met TRM qualifications and calculated annual fuel savings using Equation 11 (2020 NJ TRM, pg. 24).

$$Fuel\ Savings\ \left(\frac{therms}{yr}\right) = Cap_{in} * EFLH_h * \frac{\left(\frac{AFUE_q}{AFUE_b} - 1\right)}{1,000 \frac{kBtu}{MMBtu}} * 10$$

Equation 11

Where:

Cap_{in}	=	Input capacity of qualifying unit in kBtu/hr
$EFLH_h$	=	Equivalent Full Load Hours of operation for the average unit during the heating season
	=	965
$AFUE_q$	=	Annual Fuel Utilization Efficiency of the qualifying boiler
$AFUE_b$	=	Annual Fuel Utilization Efficiency of the baseline boiler (see Table 7-5)

Table 7-5: Annual Baseline Fuel Utilization Efficiency

Measure	AFUE _b
Gas fired boiler	82%
Oil fired boiler	84%
Electric resistance heating	35%

For this measure, variables required from the program tracking data included:

- Make and model number
- Cap_{in} (if available, can be confirmed using model number)
- $AFUE_q$ (if available, can be confirmed using model number)
- $AFUE_b$

Gas Combination Boilers

The evaluators verified gas combination boiler model numbers included in program tracking data were met TRM qualifications. The evaluators calculated annual fuel savings (therms/yr) for gas combination boilers that meet efficiency standards required by IECC 2015 using Equation 12 through Equation 14 (2020 NJ TRM, pg. 26). Qualifying combination boilers must have hot water storage tanks. Annual fuel savings includes boiler fuel savings and water heater savings.

$$Fuel\ Savings\ (therms/yr) = Boiler\ Fuel\ Savings + Domestic\ Hot\ Water\ Fuel\ Savings$$

Equation 12

$$Boiler\ Fuel\ Savings\ \left(\frac{therms}{yr}\right) = \left(Cap_{in} * EFLH_h * \frac{\left(\left(\frac{AFUE_q}{AFUE_b}\right) - 1\right)}{\frac{1000kBtu}{MMBtu}} \right) * 10$$

Equation 13

$$Domestic\ Hot\ Water\ Fuel\ Savings\ \left(\frac{therms}{yr}\right) = \left(\left(1 - \left(\frac{UEF_b}{UEF_q} \right) \right) \times Baseline\ Water\ Heater\ Usage \right) * 10$$

Equation 14

Where:

- Cap_{in} = Input capacity of qualifying unit in kBtu/hour
- $EFLH_h$ = The Equivalent Full Load Hours of operation per year for the average unit during the heating season
= 965 hours
- $AFUE_q$ = Annual Fuel Utilization Efficiency of the qualifying boiler
- $AFUE_b$ = Annual Fuel Utilization Efficiency of the baseline boiler
= Gas fired boiler, 82 percent
= Oil fired boiler: 84 percent
- UEF_q = Uniform energy factor of the qualifying energy efficient water heater
= 0.87
- UEF_b = Uniform energy factor of the baseline water heater (storage water heater)
= 0.657
- Baseline Usage* = Annual usage of the baseline water heater
= 23.6 MMBtu/yr

For this measure, variables required from the program tracking data included:

- Make and model number
- Cap_{in} (if available, can be confirmed using model number)
- $AFUE_q$ (if available, can be confirmed using model number)

The 2022 NJ TRM Addendum changes the calculation for Domestic Hot Water Heater to Equation 15.

$$\begin{aligned}
 & \text{Domestic Hot Water Fuel Savings (therm/yr)} \\
 & = GPD * 365 * 8.33 * (T_{set} - T_{main}) * (1/UEF_b - 1/UEF_q) / 100,000
 \end{aligned}$$

Equation 15

Where:

- EUF_q = Uniform energy factor of qualifying energy efficient water heater
- EUF_b = Uniform energy factor of the baseline water heater.

- = 0.87
- GPD* = gallons per day of hot water use
- = 55.70²³
- T_{set}* = 125° F
- T_{main}* = 60° F

Gas Furnaces

The evaluators calculated annual fuel savings (therms/yr) for high efficiency gas furnaces using Equation 16 (2020 NJ TRM, pg. 23).

$$Fuel\ Savings\ (therms/yr) = (Cap_{in} * EFLH_h * \frac{\left(\left(\frac{AFUE_q}{AFUE_b}\right) - 1\right)}{\frac{1000kBtu}{MMBtu}}) * 10$$

Equation 16

Where:

- Cap_{in}* = Input capacity of qualifying unit in kBtu/hour
- EFLH_h* = The Equivalent Full Load Hours of operation per year for the average unit during the heating season
- = 965 hours
- AFUE_q* = Annual Fuel Utilization Efficiency of the qualifying furnace
- AFUE_b* = Annual Fuel Utilization Efficiency of the baseline furnace meeting current federal equipment standards (see Table 7-6).

²³ Based on average number of people in the household. Data collected from the EEP participant survey.

Table 7-6: Baseline Annual Fuel Utilization Efficiency

Installation Type	AFUE_b
Weatherized Gas	0.81
Weatherized Oil	0.78
Mobile Home Gas	0.80
Mobile Home Oil	0.75
Non-weatherized Gas	0.80
Non-Weatherized Oil	0.83
Electric Resistance Heating	0.35

For this measure, variables required from the program tracking data included:

- Make and model number
- Cap_{in} (if available, can be confirmed using model number)
- $AFUE_q$ (if available, can be confirmed using model number)
- Installation location of the new furnace within the home

ENERGY STAR Smart Thermostats

The evaluators calculated energy savings using deemed savings values in Table 7-7 (MD/MA TRM v10, p. 103, Method 3).

Table 7-7: Smart Thermostat Deemed Savings

Measure	therms	kWh/yr
Smart Thermostat – Gas Heat w/ Central AC	40.37	142.45

For this measure, kWh and therms savings are deemed and do not require variables from the program tracking data other than the quantity.

Gas Storage Tank Water Heaters

The evaluators verified that the model numbers of gas storage tank water heaters rebated through the program met the TRM specifications and calculated annual fuel savings using Equation 17 (2020 NJ TRM, pg. 29).

$$\text{Fuel Savings (MMBtu/yr)} = (1 - (UEF_b / UEF_q)) \times \text{Baseline Water Heater Usage}$$

Equation 17

Where:

- UEF_q = Uniform Energy Factor of the qualifying energy efficient water heater.
- UEF_b = Uniform Energy Factor of the baseline water heater
 - = < 55 gallons, $0.6483 - (0.0017 \times V)$
 - = > 55 gallons, $0.7897 - (0.0004 \times V)$
- V = Volume of the installed storage water heater tank (gallons)
- Baseline usage* = Annual usage of baseline water heater
 - = 23.6 MMBtu/yr

For this measure, variables required from the program tracking data included:

- Make and model number
- UEF_q (if available, can be confirmed using model number)
- V (if available, can be confirmed using model number)

The 2022 NJ TRM Addendum changes the calculation for Gas Storage Tank Water savings to Equation 18.

$$\begin{aligned} \text{Fuel Savings (therm/yr)} \\ = GPD * 365 * 8.33 * (T_{set} - T_{main}) * (1/UEF_b - 1/UEF_q) / 100,000 \end{aligned}$$

Equation 18

Where:

- EUF_q = Uniform energy factor of qualifying energy efficient water heater
- EUF_b = Uniform energy factor of the baseline water heater.
 - = 0.87
- GPD = gallons per day of hot water use
 - = 55.70^{24}

²⁴ Based on average number of people in the household. Data collected from the EEP participant survey.

$$T_{set} = 125^{\circ} \text{ F}$$

$$T_{main} = 60^{\circ} \text{ F}$$

Tankless Water Heaters

The evaluators verified that model numbers of rebated tankless water heaters met TRM specifications and calculated annual fuel savings using Equation 19 (2020 NJ TRM (pg. 31)).

$$Fuel\ Savings\left(\frac{MMBtu}{yr}\right) = \left(1 - \left(\frac{UEF_b}{UEF_q}\right)\right) \times Baseline\ usage$$

Equation 19

Where:

- UEF_q = Uniform energy factor of the qualifying energy efficient water heater
- UEF_b = Uniform energy factor of the baseline water heater
 - = Storage water heater, 0.657
 - = Instantaneous water heater, 0.81
- Baseline usage* = 23.6 MMBtu/yr

For this measure, variables required from the program tracking data included:

- Make and model number
- UEF_q (if available, can be confirmed using model number)
- Type of water heater that was replaced (gathered from survey)

The 2022 NJ TRM addendum changes the calculation for tankless water heater algorithm savings to Equation 20.

$$Fuel\ Savings\ (therm/yr) = GPD * 365 * 8.33 * (T_{set} - T_{main}) * (1/UEF_b - 1/UEF_q) / 100,000$$

Equation 20

Where:

- EUF_q = Uniform energy factor of qualifying energy efficient water heater
- EUF_b = Uniform energy factor of the baseline water heater.
 - = 0.87

GPD	=	gallons per day of hot water use
	=	55.70 ²⁵
T_{set}	=	125° F
T_{main}	=	60° F

7.2.2 Process Evaluation Approach

The process evaluation was designed to explore the EEP Program's design, barriers to participation, implementation, and outcomes. To investigate these areas, ADM reviewed program documents, spoke with program staff, conducted interviews with trade allies, and surveyed customers.

ADM explored general research questions about the EEP Program, as well as questions that are specific to either downstream or online marketplace distribution channels. Process evaluation activities sought to answer the following research questions and offer specific recommendations to support program improvements.

Program Design and Implementation

- How well did the program staff, implementation staff, and Trade Ally contractors work together? Are there data tracking and communication efficiencies that can be gained?
- How are the program operations designed for each channel and what are the perceived outcomes – are these being fulfilled as expected? Are there ways to improve the design or implementation process?
- Is there cross-participation between the distribution channels or between the EEP Program and other programs offered by the Company? Has participation in one EEP Program distribution channel influenced customers to participate in other program offerings?
- Are there underlying assumptions about the program design and operation that effect the how effective program is?
- Beyond the first program year: Were there any significant changes or new obstacles to program delivery for either downstream or online marketplace channels? Were there any outside or external barriers that influenced the program's success?
- Are the incentive levels appropriately set for each product and delivery channel? Should incentives be increased to promote participation? Could incentive levels be

²⁵ Based on average number of people in the household. Data collected from the EEP participant survey.

decreased without significantly impacting participation? How successful has the On-Bill Financing option been?

Downstream

- What are the end user experiences with applying for and receiving rebates through the program? What are the end user experiences with submitting rebate applications through contractors? What are the Trade Ally contractor experiences with the rebate application process?
- How are customers learning about the rebates available? Are the marketing efforts effective and useful or are customers finding out about the program in other ways?
- Were participants satisfied with the rebate amount, the application process (whether through the Company directly or through their contractor), and the product they installed? What are the causes of dissatisfaction?
- How did the On-Bill Financing option affect purchase decisions on big equipment?
- What are the end user experiences like with Trade Ally contractors?
- How are Trade Ally contractors marketing program involvement? Are there ways to support Trade Ally marketing?
- How are customers learning about the program – through trade allies directly or from other sources?
- Were participants satisfied with their interactions with the Trade Ally they worked with? What are the causes of dissatisfaction?
- What are barriers to customer participation from the trade allies' perspective?

Marketplace

- How are the online marketplace delivery operations designed and what are the perceived outcomes – are these being fulfilled as expected? Are there ways to improve the design or implementation process?
- What are the end user experiences like with ordering and receiving products through the online marketplace?
- How are customers learning about the online marketplace? Are the marketing efforts effective and useful or are customers finding out about the program in other ways?
- Were participants satisfied with the products available through the marketplace? What are the causes of dissatisfaction?

- Are there barriers to using the marketplace that are hindering customer participation? What might be hindering near-participants from completing purchases through the online marketplace?

Non-Participants

- Are there barriers that are hindering customer participation? What might be hindering near-participants from completing purchases through the online marketplace or through the downstream channel?

Implementation and Barriers to Participation

ADM used its interviews program and implementation staff to explore their roles marketing, administering, and implementing the program, as well as their experiences with it. We asked staff to describe their organization's work and investigate barriers to participation in the downstream channel of the program with questions such as:

- When customers are not at all interested in participating in the program, what are the reasons? Based on your customer interactions, what do you perceive could bolster the interest of these customers?
- What are the obstacles to getting partially interested customers involved with the program? Are there ways that those obstacles could be mitigated?
- Have there been challenges with marketing?
- Are there any specific measures for which the current incentive levels do not motivate customers to buy high efficiency equipment instead of standard efficiency equipment? If so, what are they and how much would the incentives need to be increased to get good uptake?
- Are there any specific measures for which a lower program incentive level would still motivate customers to buy high efficiency equipment instead of standard efficiency equipment? If so, what are they and how much could incentive levels be reduced?

Outcomes

To understand program outcomes, the EEP customer survey asked customers if they were satisfied with the program and utility service in general. These questions were used to answer research questions such as:

- Were the customers satisfied with their experience? What are the causes of dissatisfaction?
- Is the program adequately serving different types of customers (e.g., based on homeownership, income level, education level, geographic area, ethnicity)?

- Looking forward, what are key impediments and drivers to program success?

7.2.3 Sampling Approach

The evaluators completed a census review of all tracking data quarterly to verify that correct deemed savings values were recorded, to check that all required variables were collected, and to identify any other program tracking data issues.

The evaluators also surveyed three customer groups to collect data for the impact analysis and the process evaluation:

- Downstream measure participants
- Online Marketplace participants
- non-participants

The evaluators emailed customers invitations to complete the online surveys designed to collect useful and detailed information while minimizing respondent burden. The sample of customers who were invited to take a survey represented eighty percent of program savings and included a representative number of customers who installed any measure that generated five percent or more of program savings. Non-participants were surveyed to develop an understanding of why they did not take advantage of any of the program offerings.

Sample size met SWE guidelines to achieve a relative precision of ±10 percent at the 90 percent confidence interval at the program level and ±15 percent at the 85 percent confidence interval at the measure level²⁶. The sample size calculation for achieving 90 percent confidence with 10 percent precision is shown in Equation 21.

$$n_0 = \frac{N \times \frac{1}{4}}{(N - 1) \times \frac{D^2}{Z_{\alpha/2}^2}}$$

Equation 21

Where:

- n_0 = Minimum sample size
- N = Population size
- $Z_{\alpha/2}$ = Z value at 90 percent confidence interval, 1.645
- $\frac{1}{4}$ = The maximum value of $p(1-p)$ at $p=1/2$, a conservative estimate

²⁶ If program participation for a specific measure subgroup exceeds or is projected to exceed 1,000, then the sample size will be adjusted to achieve ±15% at the 90% confidence interval.

D = Relative Precision (0.10)

7.2.4 Sampling Results

Survey responses for upstream and downstream measures in the EEP Programs is shown in Table 7-8 and Table 7-9.

Table 7-8: EEP Downstream Sampling Results by Measure Category

Measure Category	Measure Quantity	Ex-Ante Savings (therms)	Percent of Annual Gas Savings	Required responses to meet 85/15	Responses Collected	Final Confidence Interval
Gas Furnace	231	32,785.08	42.00%	21	31	85/5.4
Gas Combination Heater	114	16,081.16	20.60%	19	16	85/16.8
Gas Furnace with Water Heater	31	11,937.93	15.30%	13	6	85/26.8
Gas Boiler	31	5,527.33	7.10%	14	0	--
Clothes Dryer	489	3,760.41	4.80%	22	24	85/14.4
Clothes Washer	493	3,309.63	4.20%	22	29	85/13
Water Heater	94	2,650.13	3.40%	19	19	85/14.8
Smart Thermostat	48	1,937.76	2.50%	16	4	85/35
Reset Controls	1	27.56	0.00%	1	0	--
Total	1,532	78,016.99	100%	147	129	85/6

Table 7-9: EEP Online Marketplace Sampling Results

Measure Category	Measure Quantity	Ex-Ante Savings (therms)	Percent of Annual Gas Savings	Required responses to meet 85/15	Responses Collected	Final Confidence Interval
Smart Thermostat	7,424	299,810.08	92.9%	23	54	85/9.8
Water Savings Kit	173	14,146.21	4.4%	20	69	85/6.7
Low-flow Showerheads	319	7,529.87	2.3%	22	34	85/11.7
Faucet Aerators	71	1,121.31	0.3%	21	46	85/6.3
Total	7,987	322,607.47	100.0%	86	203	85/5

7.3 Impact Evaluation Results

The Evaluators reviewed tracking data to ensure that each measure met program qualifications, that each was installed in the 2021 project year, and that there were no duplicates or otherwise erroneous entries.

The Evaluators calculated ex-post gross impact savings as indicated in Section 7.2.1 Program savings are summarized in Table 7-10 through Table 7-12, and discussed in detail by measure category in the sections that follow.

Table 7-10: EEP Gross Annual Gas Savings

Measure Category	Quantity	Ex-Ante Savings (therms)	Ex-Post Savings (therms)	RR therms
Downstream				
Gas Furnace	231	32,785.08	35,289.35	108%
Gas Combination Heater	114	16,081.16	27,428.01	171%
Gas Boiler	31	5,527.33	5,755.93	104%
Clothes Dryer	489	3,760.41	3,760.41	100%
Gas Furnace with Water Heater	31	11,937.93	6,199.29	52%
Clothes Washer	493	3,309.63	2,962.90	90%
Gas Storage Tank Water Heater	47	1,063.67	1,978.65	186%
Smart Thermostat	48	1,937.76	1,937.76	100%
Tankless Water Heater	47	1,586.46	1,536.11	97%
Reset Controls	1	27.56	72.38	263%
Online Marketplace				
Smart Thermostat	7,424	299,810.08	288,708.46	96%
Water Saving Kit	173	14,146.21	16,300.78	115%
Low-flow Showerheads	319	7,529.87	9,671.09	128%
Faucet Aerators	71	1,121.31	1,072.93	96%
Total	9,519	400,624.46	402,674.05	101%

Table 7-11: EEP Gross Annual Electric Savings

Measure Category	Quantity	Ex-Ante Savings (kWh)	Ex-Post Savings (kWh)	RR kWh
Downstream				
Central Air Conditioner	14	5,600	5,041	90%
Smart thermostat	48	5,983	5,983	100%
Clothes Washer	493	28,490	38,677	136%
Online Marketplace				
Water Saving Kit	173	19,532	31,758	163%
Smart Thermostat	7,424	1,058,016	1,018,740	96%
Low-flow Showerhead	319	4,680	16,702	357%
Faucet Aerator	71	2,680	2,509	94%
Total	8,542	1,124,982	1,119,410	100%

Table 7-12: EEP Gross Demand Reduction

Measure Category	Quantity	Ex-Ante Demand Reduction (kW)	Ex-Post Demand Reduction (kW)	RR kW
Downstream				
Central Air Conditioner	14	7.41	6.56	89%
Smart Thermostat	48	N/A	N/A	N/A
Clothes Washer	493	2.69	3.72	138%
Online Marketplace				
Water Saving Kit	173	N/A	N/A	N/A
Smart Thermostat	7,424	N/A	N/A	N/A
Low-flow Showerhead	319	N/A	N/A	N/A
Faucet Aerator	71	N/A	N/A	N/A
Total	8,542	10.10	10.28	102%

7.3.1 Water Conservation Measures

Faucet Aerators

Low-flow faucet aerators were available through the online marketplace in two different installation categories, bathroom faucet aerators and kitchen faucet aerators. The Evaluators used the marketplace participant survey to determine the proportion of

participants with electric (8.8 percent)²⁷ vs. gas (91.2 percent)²⁸ water heating. Table 7-13 and Table 7-14 include annual savings for faucet aerators.

Table 7-13: Faucet Aerator Gross Annual Gas Savings

Measure Name	Quantity	Ex-Ante Savings (therms)	Ex-Post Savings (therms)	RR therms
Kitchen Faucet Aerator	49	633.57	584.19	92%
Bathroom Faucet Aerator	22	487.74	488.74	100%
Total	71	1,121.31	1,072.93	96%

Table 7-14: Faucet Aerator Gross Annual Electric Savings

Measure Name	Quantity	Ex-Ante Savings (kWh)	Ex-Post Savings (kWh)	RR kWh
Kitchen Faucet Aerator	49	1,515	1,366	90%
Bathroom Faucet Aerator	22	1,166	1,143	98%
Total	71	2,680	2,509	94%

Discussion of Realization Rate

The evaluators calculated the savings generated from low flow faucet aerator measures using variables in the 2020 TRM for residential installation (pg.182). The Evaluators used the survey-derived fraction of electric vs. gas water heaters for the ex-post savings. A survey-derived in-service rate was applied to ex-post savings, 100 percent for bathroom faucet aerators and 92 percent for kitchen faucet aerators. Ex-post calculations used flow rate verified by model number shown below in Table 7-15.

Table 7-15: Faucet Aerator Gallon Per Minute Flow Rates

Measure Name	Ex-Ante GPM	Ex-Post GPM	Ex-Ante Per-Unit therms	Ex-Post Per-Unit therms	Ex-Ante Per-Unit kWh	Ex-Post Per-Unit kWh
Kitchen Faucet Aerator	<i>Unknown</i>	1.5	12.93	11.92	31	28
Bathroom Faucet Aerator	<i>Unknown</i>	1.0	22.17	22.22	53	52

²⁷ Percent of water heaters fueled by electricity for participants who received water conservation measures derived from ADM participant survey

²⁸ Percent of water heaters fueled by natural gas for participants who received water conservation measures derived from ADM participant survey

Showerheads

Low-flow showerheads were available through the online marketplace. The evaluators used the marketplace participant survey to determine the proportion of participants with electric (8.8 percent)²⁹ vs. gas (91.2 percent)³⁰ water heating. Table 7-16 and Table 7-17 include annual savings for low-flow showerheads.

Table 7-16: Low-flow Showerhead Gross Annual Gas Savings

Measure Name	Quantity	Ex-Ante Savings (therms)	Ex-Post Savings (therms)	RR therms
Low-flow Showerhead	319	7,529.87	9,671.09	128%
Total	319	7,529.87	9,671.09	128%

Table 7-17: Low-flow Showerhead Gross Annual Electric Savings

Measure Name	Quantity	Ex-Ante Savings (kWh)	Ex-Post Savings (kWh)	RR kWh
Low-flow Showerhead	319	4,680	16,702	357%
Total	319	4,680	16,702	357%

Discussion of Realization Rate

The evaluators calculated the savings generated from showerheads using variables in the 2021 TRM as specified in the Coordinated Measure List. The evaluators used the flow ratings listed on the marketplace website for each unit and could not verify the flow ratings used for the ex-ante calculations. The evaluators also used the survey-derived fraction of electric or gas water heaters as well as the survey-derived in-service rate of 91 percent for the ex-post savings. For showerhead electric savings, the evaluator could not verify the reported (ex-ante) values. Table 7-18 below summarizes the flow rates used in the ex-post calculations and back-calculated flow rates used in the ex-ante calculations.

²⁹ Percent of water heaters fueled by electricity for participants who received water conservation measures derived from ADM participant survey.

³⁰ Percent of water heaters fueled by natural gas for participants who received water conservation measures derived from ADM participant survey.

Table 7-18: Low-flow Showerhead Gallon Per Minute Flow Rates

Measure Name	Ex-Ante GPM	Ex-Post GPM	Ex-Ante Per-Unit therms	Ex-Post Per-Unit therms	Ex-Ante Per-Unit kWh	Ex-Post Per-Unit kWh
Low-flow Showerhead	1.4 or 1.6	1.25 or 1.5	23.60	30.32	15	52

Water Saving Kits

Water saving kits were available through the online marketplace. Each kit included two showerheads, one kitchen faucet aerator, and one bathroom faucet aerator. The evaluators calculated savings for each measure independently following the methodologies presented in section 7.2.1. Additionally, the evaluators used the marketplace participant survey to determine the proportion of participants with electric (8.8 percent)³¹ vs. gas (91.2 percent)³² water heating. Table 7-19 and Table 7-20 include annual savings for water savings kits.

Table 7-19: Water Saving Kits Gross Annual Gas Savings

Measure Name	Quantity	Ex-Ante Savings (therms)	Ex-Post Savings (therms)	RR therms
Water Savings Kit	173	14,146.21	16,300.78	115%
Total	173	14,146.21	16,300.78	115%

Table 7-20: Water Saving Kits Gross Annual Electric Savings

Measure Name	Quantity	Ex-Ante Savings (kWh)	Ex-Post Savings (kWh)	RR kWh
Water Savings Kit	173	19,532	31,758	163%
Total	173	19,532	31,758	163%

Discussion of Realization Rate

Water Saving kits ex-post savings were calculated by adding the kits individual components' savings together. Per-kit ex-ante savings were 81.77 therms and 112.9 kWh while per-kit ex-post savings were 94.22 therms and 184 kWh.

³¹ Percent of water heaters fueled by electricity for participants who received water conservation measures derived from ADM participant survey.

³² Percent of water heaters fueled by natural gas for participants who received water conservation measures derived from ADM participant survey.

For faucet aerators, the evaluators calculated the savings using variables in the 2020 TRM for residential installation (pg.182). The evaluators used the survey-derived fraction of electric vs. gas water heaters for the ex-post savings. Finally, a survey-derived in-service rate was applied to ex-post savings, 100 percent for bathroom faucet aerators and 92 percent for kitchen faucet aerators.

For showerheads, savings were calculated using variables in the 2021 TRM as specified in the Coordinated Measure List. The evaluators used the flow ratings listed on the marketplace website for each unit and could not verify the flow ratings used for the ex-ante showerhead savings calculations. The evaluators also used the survey-derived fraction of electric or gas water heaters as well as the survey-derived in-service rate of 91 percent for the ex-post savings. For showerhead electric savings, the evaluators could not verify the reported (ex-ante) values.

7.3.2 Central Air Conditioners

The evaluators verified the specifications of each central air conditioner included in the tracking data using the AHRI database. There were 13 unique AHRI numbers, and the evaluators were able to verify all of them. The annual kWh savings are shown in Table 7-21.

Table 7-21: Central Air Conditioner Gross Annual Electric Savings

Measure Name	Quantity	Verified Quantity	Ex-Ante Savings (kWh)	Ex-Ante Demand Reduction (kW)	Ex-Post Savings (kWh)	Ex-Post Demand Reduction (kW)	RR kWh	RR kW
Central Air Conditioner (Tier 1)	11	11	3,864	5.11	3,313	4.27	86%	83%
Central Air Conditioner (Tier 2)	3	3	1,737	2.30	1,728	2.29	99%	100%
Total	14	14	5,600	7.41	5,041	6.56	90%	89%

Discussion of Realization Rate

Realization rates for central air conditioners are lower than 100 percent due to differences between ex-ante deemed variables and the verified model specifications used for the ex-post calculations. Table 7-22 shows the average ex-ante and ex-post variables used in electric savings calculations.

Table 7-22: Average Ex-Ante and Ex-Post variables

Measure	Average Ex-Ante Tonnage	Average Ex-Ante SEER	Average Ex-Post Tonnage	Average Ex-Post SEER	Ex-Ante Per-Unit kWh	Ex-Post Per-Unit kWh	Ex-Ante Per-Unit kW	Ex-Post Per-Unit kW
Central Air Conditioner (Tier 1)	2.63	16.25	2.69	16.30	351	301	0.46	0.39
Central Air Conditioner (Tier 2)	2.82	20.67	2.81	20.67	579	576	0.77	0.76

7.3.3 Boiler Reset Controls

There was one boiler reset control in the tracking data. The annual gas savings are shown in Table 7-23.

Table 7-23: Boiler Reset Controls Gross Annual Gas Savings

Measure Name	Quantity	Verified Quantity	Ex-Ante Savings (therms)	Ex-Post Savings (therms)	RR therms
Boiler Reset Controls	1	1	27.56	72.38	263%
Total	1	1	27.56	72.38	263%

Discussion of Realization Rate

The capacity of the associated boiler is required to calculate savings following the 2020 NJ TRM guidelines. This variable was not in the program tracking data. The evaluator used the premise account number associated with the boiler reset control to determine the boiler purchased through the EEP program. This boiler AHRI reference number was used to verify the capacity of the boiler.

7.3.4 ENERGY STAR Appliances

The evaluators verified appliance specifications (e.g., capacity and IMEF rating) by model number using the ENERGY STAR products database (energystar.gov). PY1 appliance savings are reported in Table 7-24 and Table 7-25.

Table 7-24: ENERGY STAR Appliances Gross Annual Gas Savings

Measure Name	Quantity	Verified Quantity	Ex-Ante Savings (therms)	Ex-Post Savings (therms)	RR therms
Clothes Washer (Tier 1)	264	264	1,258	1,143	91%
Clothes Washer (Tier 2)	229	229	2,052	1,820	89%
Clothes Dryer	489	489	3,760.41	3,760.41	100%
Total	982	982	7,070.04	6,723.31	95%

Table 7-25: ENERGY STAR Appliances Gross Annual Electric Savings

Measure Name	Quantity	Verified Quantity	Ex-Ante Savings (kWh)	Ex-Ante Demand Reduction (kW)	Ex-Post Savings (kWh)	Ex-Post Demand Reduction (kW)	RR kWh	RR kW
Clothes Washer (Tier 1)	264	264	14,521	1.32	20,966	1.98	144%	150%
Clothes Washer (Tier 2)	229	229	13,970	1.37	17,711	1.74	127%	127%
Total	493	493	28,490	2.69	38,677	3.72	136%	138%

Discussion of Realization Rate

The realization rate for clothes dryers was 100 percent and ranged from 89 percent to 150 percent for clothes washers. The evaluators calculated ex-post savings using deemed values for washers purchased before April 1, 2022, and used model specifications to calculate savings for washers purchased after April 1, 2022, following TRM guidelines. The realization rate for savings calculated using deemed values was 100 percent, while higher realization rates resulted from calculations using verified product specifications (see Table 7-26).

Table 7-26: ENERGY STAR Clothes Washer Savings

Measure Name	Quantity	Ex-Ante Savings (therms)	Ex-Post Savings (therms)	Ex-Ante Savings (kWh)	Ex-Ante Demand Reduction (kW)	Ex-Post Savings (kWh)	Ex-Post Demand Reduction (kW)	RR therms	RR kWh	RR kW
Clothes Washer (Tier 1)	60	288.00	163.30	3,300	0.30	9,746	0.96	57%	295%	319%
Clothes Washer (Tier 2)	37	333.00	92.40	2,257	0.22	5,999	0.59	28%	266%	266%
Total	97	621.00	255.70	5,557	0.52	15,745	1.55	41%	283%	297%

The average capacities and IMEF ratings for ex-post savings calculations after April 1st are shown in Table 7-27. The capacities and IMEF ratings were not provided in the program tracking data.

Table 7-27: Average Ex-Ante and Ex-Post Variables

Measure Name	Average Ex-Ante Volume	Average Ex-Ante IMEF	Average Ex-Post Volume	Average Ex-Post IMEF
Clothes Washer (Tier 1)	<i>Unknown</i>	<i>Unknown</i>	5.04	2.38
Clothes Washer (Tier 2)	<i>Unknown</i>	<i>Unknown</i>	4.59	2.38

7.3.5 Gas Boilers

The evaluators verified the specifications for gas boiler models included in the tracking data (Tier level, capacities, and Uniform Energy Factor ratings) using the AHRI database. There were 68 unique gas boiler AHRI reference numbers in the program tracking data. The evaluators were unable to verify 9 of the gas combination boiler AHRI reference numbers. As a result, ex-post savings could not be calculated for 9 gas boilers. Gas Boiler fuel savings are shown in Table 7-28.

Table 7-28: Gas Boiler Gross Annual Gas Savings

Measure Name	Quantity	Verified Quantity	Ex-Ante Savings (therms)	Ex-Post Savings (therms)	RR therms
Tier 1 Gas Boiler (AFUE 90-94.99)	3	3	386.25	382.23	99%
Tier 2 Gas Boiler (AFUE 95)	28	28	5,141.08	5,373.70	105%
Gas Combi Heat Tier 1 (AFUE 95-96.9)	114	105	16,081.16	27,428.01	171%

Measure Name	Quantity	Verified Quantity	Ex-Ante Savings (therms)	Ex-Post Savings (therms)	RR therms
Total	145	136	21,608.49	33,183.94	154%

Discussion of Realization Rate

The realization rate for gas boilers was 99 percent for Tier 1, 105 percent for Tier 2, and 171 percent for gas combination boilers. Realization rates other than 100 percent are the result of ex-ante savings that were calculated using an average of the gas boiler parameters and ex-post savings that were calculated using verified model parameters. Table 7-29 shows the average capacities and AFUE used in the ex-post savings calculations and the average capacity and AFUE from the reported tracking data.

Table 7-29: Average Ex-Ante and Ex-Post Variables

Measure Name	Average Ex-Ante Capacity	Average Ex-Ante AFUE	Average Ex-Post Capacity	Average Ex-Post AFUE	Ex-Ante Per-Unit therms	Ex-Post Per-Unit therms
Tier 1 Gas Boiler (AFUE 90-94.99)	111.33	91.27	116.67	91.27	128.75	127.41
Tier 2 Gas Boiler (AFUE 95)	120.50	95.02	125.32	95.02	183.61	191.92
Gas Combi Heat Tier 1 (AFUE 95-96.9)	136.67	95.04	132.79	95.03	141.06	261.22

7.3.6 Gas Furnaces

The evaluators verified the types (weatherized/non-weatherized), capacities, and Annual Fuel Utilization Efficiency (AFUE) ratings of each gas furnace model in the program with the AHRI database to ensure accurate savings calculations. There were 125 unique AHRI reference numbers in the program tracking data. The evaluators were unable to verify 14 of the AHRI reference numbers, as a result, ex-post savings could not be calculated for 14 gas furnaces. Tier 1 and Tier 2 gas furnace annual fuel savings are shown in Table 7-30 below.

Table 7-30: Gas Furnace Gross Annual Gas Savings

Measure Name	Quantity	Verified Quantity	Ex-Ante Savings (therms)	Ex-Post Savings (therms)	RR therms
Gas Furnace - Tier 1 (AFUE 95-96.9)	208	195	29,126.24	31,323.56	108%
Gas Furnace - Tier 2 (AFUE 97)	23	22	3,658.84	3,965.79	108%
Total	231	217	32,785.08	35,289.35	108%

Discussion of Realization Rate

Ex-post savings could not be calculated for 14 gas furnace models that the evaluators could not verify. Nevertheless, realization rates exceeded 100 percent because ex-post savings calculations which used verified furnace specifications rather than ex-ante deemed values. The evaluators found some discrepancies between the reported capacities and the model capacities reported by AHRI. Table 7-31 shows the average capacities and AFUE used in the ex-post savings calculations and the average capacity and AFUE from the reported tracking data.

Table 7-31: Average Ex-Ante and Ex-Post Variables

Measure Name	Average Ex-Ante Capacity	Average Ex-Ante AFUE	Average Ex-Post Capacity	Average Ex-Post AFUE	Ex-Ante Per-Unit therms	Ex-Post Per-Unit therms
Gas Furnace - Tier 1 (AFUE 95-96.9)	82.81	96.04	84.29	95.90	140.03	160.63
Gas Furnace - Tier 2 (AFUE 97)	85.13	97.63	84.82	97.61	159.08	180.26

7.3.7 Gas Heater with Water Heater

The evaluators verified the type of heaters (boiler or furnace) and water heaters (storage tank, tankless, or indirect), capacities, and ratings of each measure using the AHRI database. The evaluators were able to verify specifications for 16 gas furnaces, 14 boilers, 15 storage tank water heaters, three tankless water heaters, and 12 indirect fired storage tank water heaters. However, one gas heater and one water heater could not be verified. Savings for “gas heater and water heater” line items were the sum of savings for both the gas heater and the water heater. The annual gas savings are shown in Table 7-32.

Table 7-32: Gas Heater with Water Heater Gross Annual Gas Savings

Measure Name	Quantity	Verified Furnaces	Verified Water Heaters	Ex-Ante Savings (therms)	Ex-Post Savings (therms)	RR therms
Tier 1 Qualifying Gas Heater w Gas Water Heat (<55 gal)	21	20	20	7,961.73	4,240.05	53%
Tier 2 Qualifying Gas Heater w Gas Water Heat (>=55 gal)	10	10	10	3,976.20	1,959.24	49%
Total	31	30	30	11,937.93	6,199.29	52%

Discussion of Realization Rate

The evaluators calculated ex-post savings using verified model specifications while the ex-ante savings were a deemed value. The evaluators were unable to reproduce the ex-ante savings reported. Table 7-33 through Table 7-37 show the average variables used in the ex-post savings calculations and average variables from the reported tracking data. Variables for indirect storage tank water heaters are not included in the following tables because the savings are deemed.

Table 7-33: Average Gas Savings Per-Unit

Measure Name	Ex-Ante Per-Unit therms	Ex-Post Per-Unit therms
Qualifying Gas Heater w Gas Water Heat (<55 gal)	379.13	212.00
Qualifying Gas Heater w Gas Water Heat (>=55 gal)	397.62	195.92

Table 7-34: Average Ex-Ante and Ex-Post Furnace Variables

Measure Name	Average Ex-Ante Capacity	Average Ex-Ante AFUE	Average Ex-Post Capacity	Average Ex-Post AFUE
Qualifying Gas Heater w Gas Water Heat (<55 gal)	<i>Unknown</i>	95.94	86.00	95.94
Qualifying Gas Heater w Gas Water Heat (>=55 gal)	<i>Unknown</i>	96.27	86.67	96.27

Table 7-35: Average Ex-Ante and Ex-Post Boiler Variables

Measure Name	Average Ex-Ante Capacity	Average Ex-Ante AFUE	Average Ex-Post Capacity	Average Ex-Post AFUE
Qualifying Gas Heater w Gas Water Heat (<55 gal)	Unknown	94.86	122.14	94.86
Qualifying Gas Heater w Gas Water Heat (>=55 gal)	Unknown	94.49	110.71	94.49

Table 7-36: Average Ex-Ante and Ex-Post Storage Tank Water Heater Variables

Measure Name	Average Ex-Ante Gallons	Average Ex-Ante UEF	Average Ex-Post Gallons	Average Ex-Post EUF
Qualifying Gas Heater w Gas Water Heat (<55 gal)	Unknown	Unknown	48.00	0.69

Table 7-37: Average Ex-Ante and Ex-Post Tankless Water Heater Variables

Measure Name	Average Ex-Ante UEF	Average Ex-Post EUF
Qualifying Gas Heater w Gas Water Heat (>=55 gal)	Unknown	0.95

7.3.8 Water Heaters

The evaluators verified the types (storage tank/tankless), storage tank capacities, and UEF ratings of each AHRI reference number in the tracking data. There were 37 unique gas storage tank water heater AHRI reference numbers and 24 unique tankless water heaters in the program tracking data. The evaluators were unable to verify two of the storage tank water heaters and one of the tankless water heater AHRI reference numbers. As a result, the evaluators could not calculate ex-post savings for those models. Water heater fuel savings are shown in Table 7-38.

Table 7-38: Water Heater Gross Annual Gas Savings

Measure Name	Quantity	Verified Quantity	Ex-Ante Savings (therms)	Ex-Post Savings (therms)	RR therms
Gas Storage Tank Water Heater (<55 gal)	47	45	1,063.67	1,978.65	186%
Tankless Water Heater (UEF>=0.87)	47	46	1,586.46	1,536.11	97%
Total	94	91	2,650.13	3,514.76	133%

Discussion of Realization Rate

Ex-ante savings calculations use average model specifications. A realization rate of 133 percent for the measure category resulted from calculating ex-post saving using verified model specifications. Table 7-39 shows the average capacities and AFUE used in the ex-post savings calculations and the average capacity and AFUE from the reported tracking data.

Table 7-39: Average Ex-Ante and Ex-Post Variables

Measure Name	Average Ex-Ante Gallons	Average Ex-Ante UEF	Average Ex-Post Gallons	Average Ex-Post EUF	Ex-Ante Per-Unit therms	Ex-Post Per-Unit therms
Gas Storage Tank Water Heater (<55 gal)	Unknown	Unknown	48.22	0.70	22.63	43.97
Tankless Water Heater (UEF>=0.87)	N/A	Unknown	N/A	0.94	33.75	33.39

7.3.9 Smart Thermostats

Smart thermostat incentives were available through the Online Marketplace and through the downstream program. The evaluators were able to verify all smart thermostats purchased through the downstream program met the specifications outlined in the MD/MA TRM v10. Table 7-40 and Table 7-41 report annual savings for smart thermostats.

Table 7-40: Smart Thermostat Gross Annual Gas Savings

Distribution Channel	Quantity	Verified Quantity	Ex-Ante Savings (therms)	Ex-Post Savings (therms)	RR therms
Downstream	48	48	1,937.76	1,937.76	100%
Online Marketplace	7,424	7,424	299,810.08	288,708.46	96%
Total	7,472	7,472	301,747.84	290,646.22	96%

Table 7-41: Smart Thermostat Gross Annual Electric Savings

Distribution Channel	Quantity	Verified Quantity	Ex-Ante Savings (kWh)	Ex-Post Savings (kWh)	RR kWh
Downstream	48	48	5,983	5,983	100%
Online Marketplace	7,424	7,424	1,058,016	1,018,740	96%
Total	7,472	7,472	1,063,999	1,024,723	96%

Discussion of Realization Rate

The downstream smart thermostat analysis resulted in a realization rate of 100 percent. The evaluators noted minor discrepancies in the tracking data that did not have a material effect on the realization rate. A survey-derived in-service rate of 96 percent was applied to the online marketplace savings.

7.3.10 Lifetime Savings

Lifetime savings were calculated for each measure by multiplying ex-post annual savings by the expected useful lifetime (EUL). Lifetime savings results are reported in Table 7-42 and Table 7-43. EULs were sourced from the 2020 NJ TRM and the MD/MA V10 TRM.

Table 7-42: EEP Lifetime Gas Savings

Measure Category	Quantity	Ex-Post Savings (therms)	EUL	Lifetime Savings (therms)
Downstream Distribution Channel				
Gas Furnace	231	35,289.35	20	705,787.01
Gas Combination Heater	114	27,428.01	20	548,560.17
Gas Boiler	31	5,755.93	20	115,118.62
Gas Furnace with Water Heater	31	6,199.29	15	92,989.33
Clothes Dryer	489	3,760.41	12	45,124.92
Clothes Washer	493	2,962.90	11	32,591.92
Tankless Water Heater	47	1,536.11	20	30,722.22
Gas Storage Tank Water Heater	47	1,978.65	11	21,765.14
Smart Thermostat	48	1,937.76	7.5	14,533.20
Reset Controls	1	72.38	10	723.75
Online Marketplace				
Smart Thermostat	7,424	288,708.46	7.5	2,165,313.47
Water Saving Kit	173	16,300.78	10	163,007.84
Low-Flow Showerheads	319	9,671.09	10	96,710.95
Faucet Aerators	71	1,072.93	10	10,729.29
Total	9,519	402,674.05	10	4,043,677.81

Table 7-43: EEP Lifetime Electric Savings

Measure Category	Quantity	Ex-Post Savings (kWh)	EUL	Lifetime Savings (kWh)
Downstream Distribution Channel				
Clothes Washer	493	38,677	11	425,450
Central Air Conditioner	14	5,041	15	75,608
Smart thermostat	48	5,983	7.5	44,872
Online Marketplace				
Smart Thermostat	7,424	1,018,740	7.5	7,640,548
Water Saving Kit	173	31,758	10	317,584
Low-Flow Showerheads	319	16,702	10	167,020
Faucet Aerators	71	2,509	10	25,091
Total	8,542	1,119,410	7.8	8,696,172

7.3.11 Data Review

The evaluators reviewed program tracking data for all measures included in Program Year 1 (2021) as part of its first year in a multi-year evaluation cycle. The evaluators provide the following findings as part of its review of program tracking data.

Missing or Incorrect Data

Missing quantity field. During the first months of the program, the program tracking data records did not include a quantity field. As a result, ex-ante savings were incorrectly calculated for records with a measure quantity other than one. The Company added the quantity data element mid-cycle.

Incorrect AHRI reference numbers. AHRI reference numbers are included in the program tracking data records for several measures. ADM uses the reference number to access measure specifications for the exact model product the customer has purchased. The 2021 tracking data included several incorrect or incomplete AHRI reference numbers, which prevented ADM from calculating ex-post savings for those records. Realization rates were negatively impacted by incorrect or incomplete AHRI reference numbers.

Opportunity to Improve Realization Rates

Realization rates reflect the ratio of forecasted savings to verified savings. Realization rates close to 100 percent reflect an accurate forecast of program performance. ADM provides the following recommendations to improve realization rates.

Calculate ex-ante savings using actual measure parameter values by record, rather than using parameter averages. During PY1, ex-ante savings for many measures were

calculated using average values for measure parameters (e.g., efficiency rating, capacity, flow rate, etc.). When actual parameter values vary, realization rates also vary. When measure specifications are available (for example, using the AHRI reference number), ex-ante savings can be calculated that result in a realization rate closer to 100 percent.

Ensure program tracking data follows the savings algorithms and any calculation modifications agreed on in the Coordinated Measure List. Realization rates for the water conservation measures were impacted by differences in savings methodology calculations. Updating the program data savings calculations to adhere to the agreed upon Coordinated Measure List methodologies will improve realization rates.

Disaggregate savings for the “Gas Heater with Water Heater”. Savings for this measure are the sum of the savings for the gas heater and the water heater. Two AHRI reference numbers were included in each record for this measure without an indication of which appliance (the heater or water heater) was referenced by each; therefore, the order of appearance in the tracking data was inconsistent. Disaggregation of the two components of this measure is likely to result in more accurate savings calculations.

7.4 Process Evaluation Results

The process-related data collection activities for the EEP Program evaluation included a facilitated discussion with utility management and program implementation staff and surveys of EEP Downstream and Online Marketplace customers.

7.4.1 Program Staff Facilitated Discussions

The Evaluator conducted four discussions with ETG, SJI, Uplight, and Honeywell staff to investigate the design and implementation of ETG’s residential energy efficiency programs, with focus on the Behavioral, QHEC, and Energy Efficient Product (EEP) programs. The summary information presented here was synthesized from five discussions held with utility, implementation, EM&V, and marketing staff.

The discussions were held from July to September 2022 and included four calls, ranging from 45-90 minutes. The five calls included:

- Honeywell program staff (August 2022): Honeywell’s program manager, district manager, and solution architect.
- Uplight staff (August 2022): Uplight’s client solutions director and solutions manager.
- Honeywell marketing staff (September 2022): Honeywell’s marketing manager and program manager.
- ETG staff (July 2022): ETG’s energy efficiency manager and energy efficiency analyst.

SJI's EM&V manager attended each call. The Evaluator also held a call with South Jersey Gas staff; that discussion helped build understanding of ETG's programs, as the two companies share a parent company and collaborate and benefit from synergies that arise from consistent program design and implementation strategies and efforts. SJI's director of energy efficiency attended the SJG staff call. The Evaluator received additional follow-up information from SJI's financial planning analyst, program staff, and marketing manager via email.

ETG has strong working relationships with the residential program implementation vendors, though there were some initial challenges. ETG's energy efficiency manager stated that there is good communication and strong working relationships with the program's implementation vendors. Because there had been some "false starts," "hiccups," and some issues with vendors acting on the guidance that ETG provided, the program manager had recently started requiring implementation program managers and ETG's energy efficiency analysts to have re-occurring one-on-one meetings with each program's implementation staff. Honeywell staff acknowledged that there had been communication challenges in PY1, but the solution architect and program manager observed there had been process improvements made to improve accountability and focus through more open-dialogue and frequent communication. Uplight's solutions manager characterized their working relationship with utility staff as having "hit its stride" and noted that there had been strong communication throughout the entire year.

The transition from NJCEP to utility-run energy efficiency programs required significant coordination and resources. Utility staff noted that though generally the programs had "not changed much" from the customer perspective, there were back-end challenges as well as issues related to contractor engagement and awareness. From an administrative perspective, SJI's director observed that not all utilities had their programs ready at the same time. SJI's director noted during the transition phase that there was a learning curve - contractors were accustomed to a single state-run program and now had to navigate utility programs, with different forms and implementation contractors. Training sessions were held by ETG for contractors to ease the transition. Correspondingly, Honeywell's program manager noted that the programs had been "in flux" and alluded to start-up efforts and coordination with other utilities as having required time and resources. Honeywell's marketing manager noted that the most significant challenge in PY1 had been the development, coordination and revision of application forms and website materials to align and ensure consistency across gas and electric utilities.

Data tracking and reporting requires coordination from utility and implementation staff. Utility and implementation staff indicated that internal and coordinated data tracking systems are sufficient, but they experienced some initial challenges collaborating and ensuring timely and accurate data management. The ETG energy efficiency manager noted that there had been some initial "time lag" issues related to Honeywell and Uplight

having internal tracking systems and needing to transfer data to the utility tracking and reporting system but was unaware of the exact extent of the issues. Honeywell's program manager noted that there had been data tracking and reporting obstacles related to their internal system and its alignment with the statewide coordinator's system. Uplight's solution manager described their program tracking procedures and observed that coordination of tracking and reporting processes was running "pretty smoothly most of the time".

SJI's financial planning analyst observed that consolidated reporting is working well as it allows them to create quarterly reports for the BPU, as well as internal dashboards. He noted working with AEG on putting together a process to flag measure-level gas savings if they fall outside of an acceptable range.

Staff indicated that there are sufficient QA/QC procedures and policies in place, though the ability to assess effectiveness of QA/QC procedures is limited because of the recent start date of the third-party inspector. Multiple parties are involved in project quality control activities. ETG staff "shadows" vendors and has done site visits for programs to familiarize themselves with the program and to look for areas of improvement. In July 2022, SJI hired Performance Systems Development (PSD) to conduct third party inspections and check for missed opportunities, health and safety issues and verify that documented work has been completed.

- **Utility staff shared an example QC Inspection Report and Customer Survey Report that the third-party inspector completed for an ETG HW-HVAC Program project.** The QC Inspection report included information regarding the status of the installed measure, safety issues, photos of the measure, as well as additional observations and potential missed opportunities. The Customer Survey Report included customer satisfaction regarding the program, rebate process, contractor, measure instructions, newly installed equipment, as well as a question regarding if they have noticed improved comfort and utility usage post-measure installation.
- **Honeywell conducts inspections and has internal QC targets.** The Honeywell program manager stated that five percent of all EEP Downstream, Income Qualified Weatherization, and Multifamily Direct Install projects and ten percent of Multifamily and Single Family HPwES projects are required to have internal quality assurance conducted. She also noted that new contractors have a quality assurance requirement for their first two Multifamily Direct Install and Income Qualified Weatherization jobs or first five jobs for the Single Family and Multifamily HPwES program. For the QHEC program, there is a quality assurance requirement for the first two QHEC visits for each new subcontractor. The Honeywell contacts noted that after quality assurance checks, Honeywell staff may provide supplemental training if needed.

Multiple parties are involved in marketing, using a variety of methods. ETG, Honeywell, and Uplight use a variety of strategies including emails, bill inserts, and search engine optimization to promote the residential programs. Honeywell leads marketing efforts for the residential portfolio of programs whereas Uplight cross-promotes programs through the Behavioral program and conducts targeted outreach for the Online Marketplace program. All marketing is coordinated through ETG's marketing team and approval is granted through ETG for all marketing efforts.

Marketing the programs requires coordination between implementation and SJI staff as well as with other utilities. Honeywell's solution architect observed that marketing and outreach for the residential programs in New Jersey differs from other states in that the state required all utilities to coordinate to deliver energy efficiency programs. He observed that there is a requirement to present customers with both gas and electric offerings that are available and for all utilities to provide consistent messaging. The solution architect suggested that though this requirement entails a higher level of coordination compared to in other states, there is less market confusion, and more value is provided to customers. Honeywell's marketing manager provided ADM with a summary roll-up of the monthly marketing reporting that is provided to SJI and ETG; this summary roll-up included website analytics, and information related to in-store QR code engagement and high-level details on engagement generated through Facebook and search and display advertising. More detailed information was provided through a screenshare during ADM's call with the marketing manager.

Awareness and other utility programs, coupled with a limited marketing budget are perceived as barriers to success. SJI's director of energy efficiency said that recruiting customers to participate in programs other than EEP Downstream has been a challenge, as they are still building awareness, and electric utilities have the same offerings and may have more aggressive marketing or deeper connections to their customers. The director reflected that their first year had broad-based marketing and suggested that for their second program year they have challenged Honeywell to focus marketing on programs. Honeywell's marketing manager noted the program's budget limits the amount of outreach that can be performed, further he indicated the need for reduced spending and marketing activities in PY2. He stated that Honeywell had recently provided utility staff with an in-depth budget analysis and observed that they were providing data-driven recommendations to focus on activities which spur the most engagement.

The EEP Program has launched downstream and online marketplace rebates as well as distribution of kits and curriculum to schools. The EEP program currently entails downstream rebates (customer and contractor applications), an online marketplace, and an energy efficiency kit distributed through community partners. Staff indicated they are in the process of expanding to also include delivery of kits to customers through the Universal Service Fund (USF) and plan to expand to food banks in the future.

They stated that no additional measures were being planned or considered at the time of the call.

Though there was a transition phase for the EEP program, it is running well, and neither program staff nor implementation staff identified any substantial barriers to success. ETG's energy efficiency manager noted initial hurdles in the transition period from NJCEP to utility-run programs. He said it took the state-run program a "very long time" to close out the rebates that were in process, which caused ETG to have to extend their EEP Downstream legacy program by six months. The staff indicated that communication with implementation companies was sufficient. The Honeywell program manager observed challenges in PY1 because there had been a "fluid process" with details regarding the program's offerings, rebate levels, and savings calculations and "none of that was solidified at the onset of the program."

The existence of past programs set a strong foundation for operational success for the EEP Downstream offerings. Staff perceive there to be a high level of customer and contractor awareness of the EEP Downstream offerings because they were offered prior to PY1. The ETG energy efficiency manager observed that from his perspective, the current rebate levels were "working well".

The OBRP and the deferral of payment option in PY1 attracted customers to the EEP Downstream program. The ETG energy efficiency manager noted that on-bill financing or on-bill repayment plan (OBRP) had "sweetened the deal for customers" and it had been especially attractive for moderate income customers. He further highlighted the program's first year payment deferral feature which enabled customers that had opted for OBRP to have the cost of the purchase appear on their bill until July 2022. At the time of the facilitated discussion with the Evaluator, ETG's energy efficiency manager said they were trying to improve the data, reporting, and information going between Honeywell and the loan facilitation processing company (EFS) to "smooth out" the OBRP for downstream measures.

The EEP Downstream offering required paper or PDF forms in PY1; a contractor portal had recently launched at the time of ADM's call. ETG staff suggested that the availability of a contractor portal would likely benefit the program and ease the application process for contractors as the vast majority of applications from ETG's legacy programs went through the portal, not through pdf/paper forms.

ETG's Online Marketplace did not meet its budget spending expectations in PY1; this was attributed to initially limited marketing, a limited range of products, and the launch date of the program website. Uplight staff observed that the program "did not hit as much rebate spend" as they had planned in PY1 and attributed it to limited marketing at the beginning of the program year, goals based on a wider range of program offerings, and the ETG program being a new offering, launching in late September,

missing two months of potential sales. Uplight staff noted that the Online Marketplace was not heavily marketing in the beginning of PY1. Therefore, there was concern from Uplight and utility staff regarding program spending at the beginning of PY1, but after the program experienced a slow start there was a pivot to more aggressive marketing in the Fall 2021.

Implementation staff expects the Online Marketplace to meet its spending goals for both its first and second years in PY2. Comparing the summer of PY2 to PY1, the Uplight solution manager noted that the sales of smart thermostats had “increased markedly”. There were two reasons for increased sales; the program was being marketed more aggressively in PY2, and Google had allowed the New Jersey utilities to provide a special sale price for smart thermostats sold through the Marketplace. He equated the Google special sale price combined with the rebate to a “silver bullet” and said it made certain models of smart thermostat “essentially free,” as they have been able to effectively leverage the combination of the sale and rebate.

Broader economic conditions and lingering impacts from the COVID-19 pandemic were noted as having varying impacts on the EEP program. Honeywell’s district manager observed that lingering and lasting impacts from the COVID-19 pandemic were affecting the EEP program. He said that the effects of the pandemic were not specific to New Jersey, but supply and labor supply issues had created challenges for the program and noted that trade allies were “challenged to maintain their businesses” and for companies to allocate staff and resources to participate and engage with the program. He emphasized that though the pandemic’s effects were felt broadly across the United States and other utility-run energy efficiency programs, New Jersey’s programs may have been adversely affected in a different or more significant way because of the timing of their launch. Uplight’s solution manager noted that macro-economic conditions had caused sales to slow down, and suggested “prices are going up, people are concerned with inflation, they’re afraid to spend.” Regarding supply chain issues, the Uplight solution manager stated that there were minimal impacts to the Online Marketplace with one type of thermostat temporarily unavailable.

7.4.2 Downstream Survey Results

The Evaluator conducted an email survey of Downstream participants in August 2022. A total of 1,191 customers participated in the Downstream program through June 2022 and 1,010 (85 percent) had email addresses in program tracking data.

A sample of 795 customers were sent an invitation to share their feedback and 602 customers received a reminder email. Customers were offered a \$10 incentive to take the survey. Three customers that were invited to take the survey were disqualified; these customers indicated that program tracking data was incorrect for one or more reasons. Three percent of email invitations bounced.

Ninety-three customers that participated in the Downstream program completed the survey (12 percent response rate) and provided feedback regarding the purchase process, their decision-making, measures purchased, and overall experience.

Additional information regarding sampling methodology can be found in Section 7.2.3. Section 9.3.5 provides information about measure verification. ADM compared responses from different types of customers based on their response patterns as well as program tracking data and reported demographic information. Statistically significant differences as well as notable similarities are mentioned.³³

All respondents were homeowners and most were living in single-family homes, with gas home and water heating. Ninety-one percent of respondents said they lived with no more than three other people. Table 7-44 summarizes Downstream Survey respondents' home characteristics.

³³ ADM compared results with two proportion z-tests. Reported differences are statistically significant at $p < 0.05$ using a two-tailed test. A single asterisk denotes differences that were found to be statistically significant.

Table 7-44: Downstream Respondent Home Characteristics

Question	Response	Percentage (n=93)
Do you own or rent your home?	Own	100%
Which of the following best describes your home type?	Single-family	87%
	Duplex	2%
	Apartment/condo	2%
	Single family townhouse or row house	9%
When was your home built?	Before 1960	32%
	1960 to 1979	25%
	1980 to 1999	25%
	2000 to 2009	14%
	2010 or later	2%
Including yourself, how many people live in your household?	1	8%
	2	39%
	3	18%
	4	23%
	5	9%
	Prefer not to say	4%
About how many square feet is your home?	Less than 1,000 square feet	1%
	1,000-1,999 square feet	35%
	2,000-2,999 square feet	41%
	3,000-3,999 square feet	14%
	4,000 or more square feet	5%
	Don't know	3%
What is the main fuel used to heat your home?	Electricity	3%
	Natural gas	96%
	Oil	2%
What is the main fuel used to heat your water?	Electricity	6%
	Natural gas	94%

ETG’s Downstream program is serving a range of customers, though most identified as white and over half said their income was more than 400 percent of the Federal Poverty Level (FPL). Respondents were somewhat evenly split between identifying as 35-55 years old and over 55 years old. About five percent of respondents noted that their income was below 250 percent of the FPL, while 13 percent said it was between 250 percent and 400 percent of the FPL³⁴. In comparison, using Census Bureau data, ADM estimates that about 27 percent of households served by ETG have incomes under 250 percent of FPL³⁵. Table 7-45 provides additional self-reported survey-taker demographic information.

Table 7-45: Downstream Respondent Demographics and Additional Background Information

Question	Response	Percent (n=93)
What is your age?	Under 35 years old	10%
	35-55 years old	43%
	Over 55 years old	39%
	Prefer not to answer	9%
How would you identify your race or ethnicity?	Asian	9%
	Black/African American	1%
	Caucasian/White	65%
	Hispanic or Latino	5%
	Kashmiri	1%
	Parsi	1%
	Multi Race	1%
	Prefer not to say	18%

Downstream participants tend to learn about the program from contractors or on their own through the program website. Though 63 percent of respondents worked with a contractor,³⁶ only one-third indicated they learned about the program from a contractor. Figure 7-1 displays customers’ source of program awareness. ADM compared

³⁴ Fifty-five percent said their income was more than 400% of the FPL. Twenty-seven percent of respondents either preferred not to state or did not know their household income.

³⁵ U.S. Census Bureau 2020 American Community Survey (ACS) Five Year Estimates Public Use Microdata Sample (PUMS)

³⁶ Based on reported contractor information in the program tracking data.

the manner in which customers learned about the program across age groups. There were too few responses to draw meaningful conclusions.

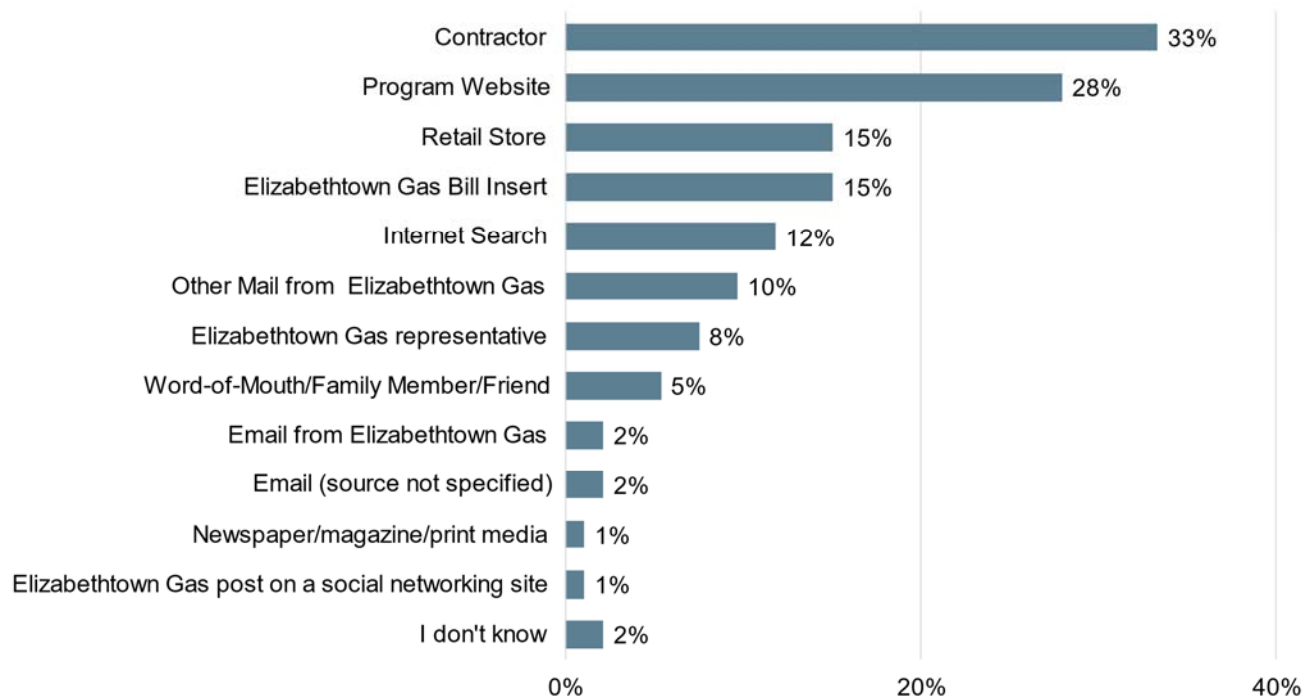


Figure 7-1: EEP Downstream Participants’ Sources of Program Awareness (n=93)

ETG Downstream participants tend to apply for the rebate themselves. Sixty-nine percent of respondents applied for the program on their own either through the ETG website (38 percent), by mailing a paper form (26 percent), or emailing ETG directly (five percent). Other respondents said their contractor applied on their behalf (38 percent) or they could not recall how they applied (four percent).

The Downstream rebate process is generally easily understood and uncomplicated to navigate. Eighty-one percent said it was easy to apply for the rebate (see Figure 7-2).³⁷ ADM investigated the rated ease of the application process for customers who worked with and without a service provider and found similar ratings. Customers that rated the process a 3 or less were given an opportunity to elaborate (n=14).

- Four customers observed that the rebate process was confusing or challenging.
- Three customers suggested the rebate application be made available to complete fully online.
- Three comments related to the rebate application form being confusing or difficult.

³⁷ Rated the ease of the application process a 4 or 5 on a scale from 1 (very difficult) to 5 (very easy).

- Two customers noted significant delays during the process.
- One customer noted that the rebate was in transition during their purchase, and this adversely affected the ease of the application process.

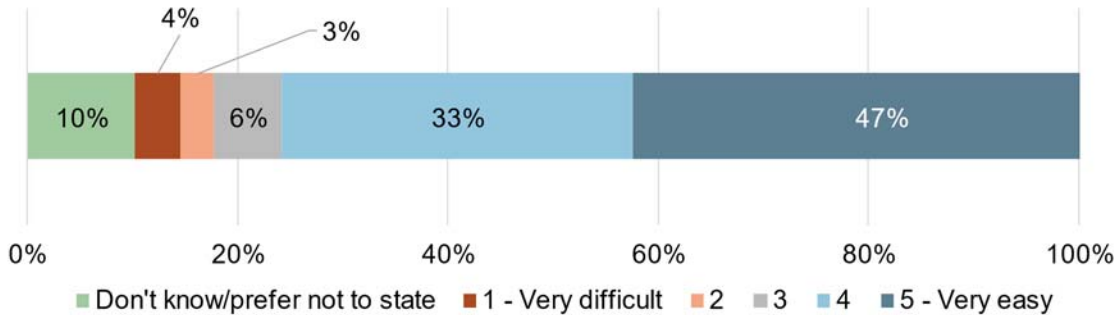


Figure 7-2: Ease of Downstream Rebate Application (n=93)

Contractors are professional, knowledgeable, and generally make the rebate process easy to understand. Figure 7-3 displays the customer agreement with four statements about their experience with the contractor that assisted them with their Downstream program participation.

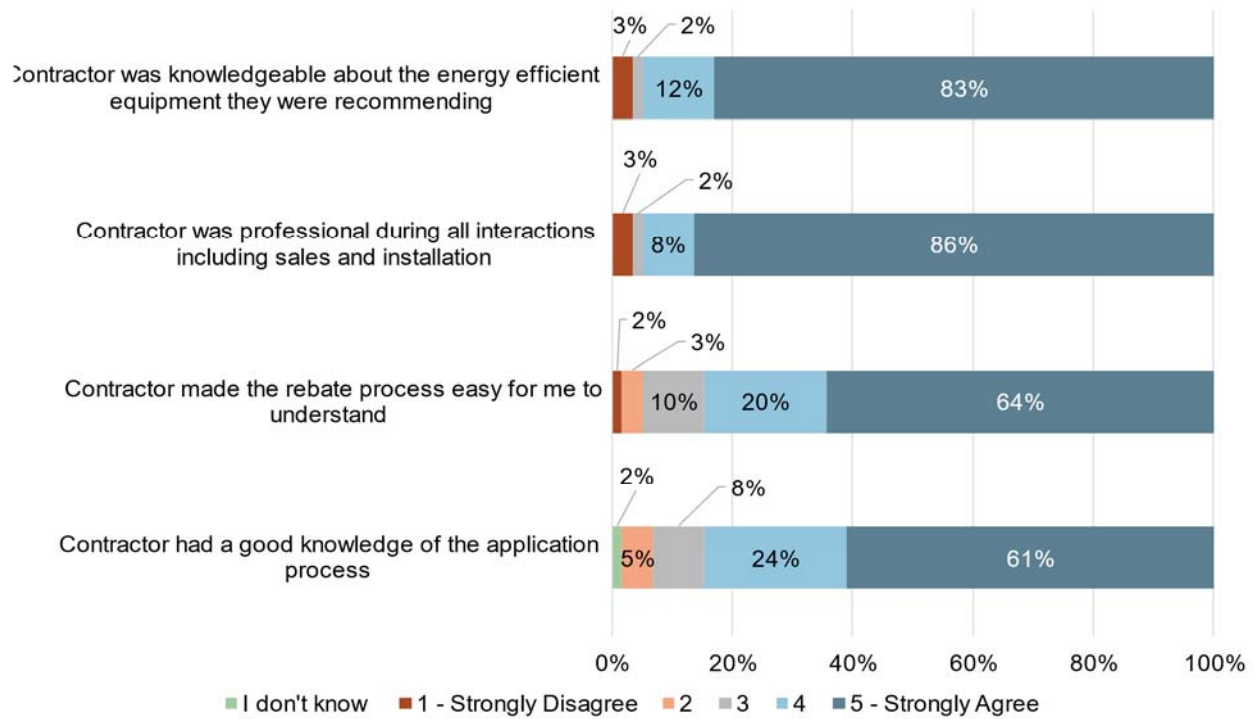


Figure 7-3: Customer Agreement with Statements about Downstream Contractor (n=59)

Washer and dryer customers cited various reasons for choosing the model of washer and dryer, but the rebate was cited by over half of respondents. Table 7-46 displays the reasons customers chose the model or type of clothes washer and dryer.

Table 7-46: Reasons customers chose model or type of clothes washer and dryer³⁸

Response	Clothes Washer Percentage (n=29)	Clothes Dryer Percentage (n=24)
It was a good price	59%	63%
There was a rebate for it	52%	63%
It costs less to operate	41%	42%
It uses less water	34%	N/A
It's good for the environment	24%	33%
The retailer recommended it	10%	17%
It had the features I wanted	62%	63%
It was the right size	28%	38%
It was a good brand	48%	54%
To match clothes dryer/washer model	3%	0%
Consumer Reports rating (write in response)	3%	0%
It was the right color	7%	21%

Though most ETG downstream respondents did not utilize the On-Bill Repayment Program (OBRP), it is enabling ETG customers to finance eligible equipment. Fifteen percent of the 47 respondents that purchased eligible products said they applied for the OBRP. Most of the customers that applied for the OBRP said they were approved for the program. All of these customers worked with a contractor to complete their downstream rebate project and most of these customers said they would not have been able to install the equipment or did not know if they would have been able to if they had not participated in the OBRP.

Downstream participants are generally aware of the OBRP, though awareness could be improved and potentially enable additional high efficiency equipment installations. Of those who did not apply for OBRP (n=44), 34 percent said they did not know a financing option was able through their utility. Further, nearly half of the customers who were not aware of the OBRP said they would have installed additional equipment if they knew about the financing option. Table 7-47 displays the reasons downstream participants said they did not apply for the OBRP.

³⁸ Does not sum to 100% because customers could select more than one response.

Table 7-47: Reasons Downstream customers did not apply for financing through the OBRP³⁹

Response	Percentage (n=44)
Not interested	61%
I did not know there was a financing option available	34%
Was financially able to pay without financing	14%
I did not understand how it worked	5%
Installer not included on list of vendors (write in response)	2%
I don't know	5%

Downstream rebate customers are satisfied with the rebated equipment. Ninety-seven percent of respondents indicated satisfaction with the rebated measure they purchased (n=67) and forty-nine percent of customers said they had noticed savings on their ETG bill since installing the rebated measures (n=84).

Downstream rebate customers were satisfied with the program overall and experience with ETG. Sixty-five percent said they had recommended the program to someone else and of those who had not recommended the program 70 percent said they would recommend it.⁴⁰ Further, when asked what they would change about the Downstream program, a third of respondents said they either would not change anything or did not know what they would change. Figure 7-4 displays participant satisfaction and Table 7-48 displays recommendations to improve the program.

Customers were given an opportunity to write feedback regarding their overall experience and any suggestions for improvement. Twenty-four percent of customers provided write-in comments to clarify their dissatisfaction or suggestions to improve the program:

- Twelve customers wrote in comments related to the length or onerousness of the application process. Eight of these write-ins explicitly mentioned the time required to complete the process.
- Three customers indicated they were interested in expanding and/or clarifying the range of eligible measures, specifically mentioning thermostats and air conditioning.

³⁹ Does not sum to 100% because customers could select more than one response.

⁴⁰ Rated their likelihood of recommending the program a 7 or higher on a scale from 0 (not at all likely) to 10 (extremely likely).

- Three communicated dissatisfactions with their application for the rebate or OBRP being denied or the rebate amount being less than expected, with one customer requesting an appeal process be added.
- One customer was dissatisfied with the requirement to have an inspection of the rebated measure.
- Two customers did not elaborate on their dissatisfaction or rating.

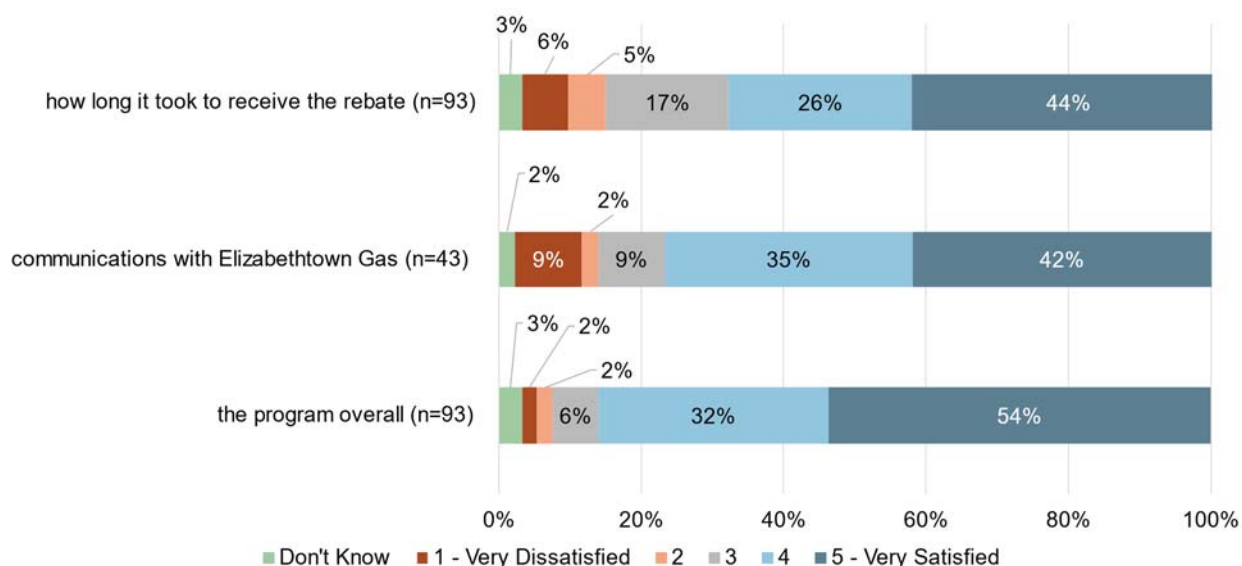


Figure 7-4: Downstream Rebate Participant Satisfaction

Table 7-48: Downstream Respondent Recommendations to Improve Program⁴¹

Response	Percentage (n=93)
Prompted Responses – Select All That Apply	
Increase rebate amount	42%
Speed up rebate payment time	31%
Improve the program application process	19%
Elizabethtown Gas could provide more info about how much I will save by installing the rebated equipment	16%
Elizabethtown Gas should improve program marketing	13%

The primary reason customers have not participated in other ETG programs was they were not aware of them, though a lack of time or perceived applicability were

⁴¹ Respondents could provide more than one recommendation.

also driving factors. Most respondents were not aware of ETG's energy efficiency offerings beyond its Downstream program. Sixty percent of customers said they were unaware or did not know of other Elizabethtown Gas incentive or rebate programs for energy efficient equipment or improvements.

Table 7-50 displays the reasons Downstream customers that were aware of other programs said they had not participated in other ETG offerings. The Evaluator investigated the sources of awareness for customers who were aware of other ETG offerings compared to those who were only aware of the Downstream program. We found that customers who were unaware of other ETG offerings learned about the Downstream program through a contractor at a higher rate compared to customers who were aware of other ETG programs (see

Table 7-50).

Table 7-49: Sources of Program Awareness for Downstream Participants (Aware vs. Unaware of Other ETG Programs)

Source	Downstream participants unaware of other ETG offerings (n=36)	Downstream participants aware of other ETG offerings (n=35)
Contractor*	50%	26%
Program Website*	14%	37%
Retail Store	11%	14%
Word-of-Mouth/Family Member/Friend	8%	3%
Internet Search*	6%	26%
Elizabethtown Gas Bill Insert*	8%	23%
Other Mail from Elizabethtown Gas	6%	9%
Elizabethtown Gas representative	8%	6%
Email (source not specified)	0%	6%
Email from Elizabethtown Gas	3%	0%
Elizabethtown Gas post on a social networking site	0%	3%

Table 7-50: Reasons Downstream Participants Have Not Participated in Other ETG Offerings

Response	Percent (n=22)
Available programs are not applicable to my home	32%
Do not have current need to participate in ETG energy efficiency offerings	14%
Not interested	9%
Did not have the time	9%
Cannot afford additional improvements	5%
I could not figure out how to apply or participate	5%
Poor experience with Downstream Program (write in response)	5%

7.4.3 Online Marketplace Survey Results

The Evaluator conducted an email survey of Online Marketplace customers in August 2022. A total of 5,421 customers made purchases through the marketplace through June 2022 and 5,398 (99 percent) had email addresses in program tracking data. A sample of 603 customers were sent invitations to share their feedback and 148 customers received a reminder email. Customers were offered a \$10 incentive to take the survey. One customer was disqualified from taking the survey (they indicated ETG records were incorrect). One percent of email invitations bounced.

Sixty-nine customers that purchased measures through ETG’s Online Marketplace responded to the survey (11 percent response rate) and provided feedback regarding the purchase process, their decision-making, measures purchased, and overall experience. Additional information regarding sampling methodology can be found in section 7.2.3. section 9.3.5 provides information about measure verification.

Most respondents were homeowners, living in small-to-moderate-sized single-family homes, with gas home and water heating. Eighty-seven percent of respondents said they lived with no more than three other people.

Table 7-51 summarizes Online Marketplace survey respondents’ home characteristics.

Table 7-51: Online Marketplace Respondent Home Characteristics

Question	Response	Percentage (n=69)
Do you own or rent your home?	Rent	12%
	Own	88%
Which of the following best describes your home type?	Single-family detached	71%
	Duplex	4%
	Apartment/condo in a 2-4 unit building	4%
	Apartment/condo in a 5+ unit building	6%
	Single family townhouse or row house	13%
	I don't know	1%
	When was your home built?	Before 1960
	1960 to 1979	17%
	1980 to 1999	32%
	2000 to 2009	17%
	2010 or later	10%
	Don't know	7%
Including yourself, how many people currently live in your household?	1	16%
	2	30%
	3	17%
	4	23%
	5	6%
	6 or more	4%
	Prefer not to say	3%
About how many square feet is your home?	Less than 1,000 square feet	0%
	1,000-1,999 square feet	33%
	2,000-2,999 square feet	42%
	3,000-3,999 square feet	17%
	4,000 or more square feet	6%
	Don't know	4%
What is the main fuel used to heat your home?	Electricity	4%
	Natural gas	91%
	Oil	1%
	Don't know	3%
What is the main fuel used to heat your water?	Electricity	10%
	Natural gas	86%
	Don't know	4%

The Online Marketplace serves ETG customers with varying demographic characteristics. Though more than half were over 55 years old, and most identified as white, a substantial portion identified as Asian, Black, or Hispanic or Latino/Latina and said they were between 35-55 years old. About six percent of respondents noted that their income was below 250 percent of the Federal Poverty Level (FPL), while 18 percent said it was between 250 percent and 400 percent of the FPL.⁴² In comparison, using Census Bureau data ADM estimates that about 27 percent of households served by ETG have incomes under 250 percent of FPL⁴³

Table 7-52 and Table 7-53 provides additional self-reported survey-taker demographic information.

Table 7-52: Online Marketplace Respondent Demographics

Question	Response	Percentage (n=69)
What is your age?	Under 35 years old	6%
	35-55 years old	34%
	Over 55 years old	54%
	Prefer not to answer	6%
How would you identify your race or ethnicity?	Asian	13%
	Black/African American	6%
	Caucasian/White	65%
	Hispanic or Latino/Latina	9%
	Prefer not to say	9%
What is the primary language spoken in your home?	English	90%
	Chinese	1%
	Polish	1%
	Hindi	1%
	Spanish	1%
	Prefer not to answer	4%

⁴² Fifty-five percent said their income was more than 400% of the FPL. Twenty-six percent of respondents either preferred not to state (23%) or did not know (3%) their household income.

⁴³ U.S. Census Bureau 2020 American Community Survey (ACS) Five Year Estimates Public Use Microdata Sample (PUMS)

Smart thermostat customers are gaining access to and using additional features, though there are opportunities to increase feature usage. The smart thermostat customers indicated their new thermostats had several features. Figure 7-5 displays smart thermostat features and customers’ reported feature use. Ninety-eight percent of smart thermostat customers said they had used at least one the features and 39 percent said they had used all four smart thermostat features that ADM inquired about in its survey.

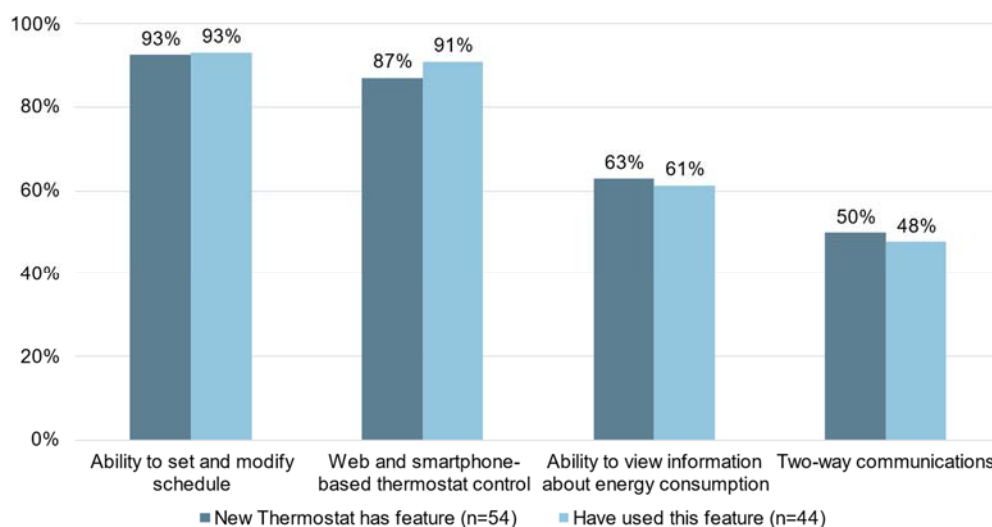


Figure 7-5: Online Marketplace Smart Thermostat Features & Feature Use

Most smart thermostat customers installed and learned about their new thermostat independently. Of the 54 customers who indicated their thermostat was installed, most had done the installation themselves (86 percent), though a portion had a HVAC technician or other professional (13 percent) or friend/family member complete the installation (20 percent). Most smart thermostat customers learned about its features through the user manual or online (see Table 7-53). Seven percent indicated they had learned about it from information from ETG.

Table 7-53: How did customers learn about smart thermostat features?⁴⁴

Response	Percentage (n=41)
Online (YouTube, manufacturer’s website, etc.)	50%
User manual	39%
From a friend or family member	13%
From an HVAC technician, electrician, or other professional	9%
Information provided by Elizabethtown Gas	7%
Not specified	2%
I don't know	2%

Over half of smart thermostat customers have not noticed savings since installing them. The Evaluator asked customers that purchased a smart thermostat if they had noticed savings on their gas bill since installing the equipment they purchased from the Online Marketplace. Sixty-five percent of smart thermostat customers said they either had not noticed savings on their gas bill (26 percent) or did not know if they had noticed savings (39 percent) since installing the items; however, this may correlate to purchase timing and customer awareness and does not directly reflect actual gas savings. The ability to view information about energy consumption does not appear to relate to noticing savings. Of the 27 customers who said their thermostat had the ability to view information about energy consumption, 52 percent said they had noticed savings and 48 percent said they had not noticed savings.

Most customers indicated they learned about the Online Marketplace through a bill insert or other mailing from ETG. Figure 7-6 displays customers’ source of program awareness.

⁴⁴Does not sum to 100% because respondents could select more than one option.

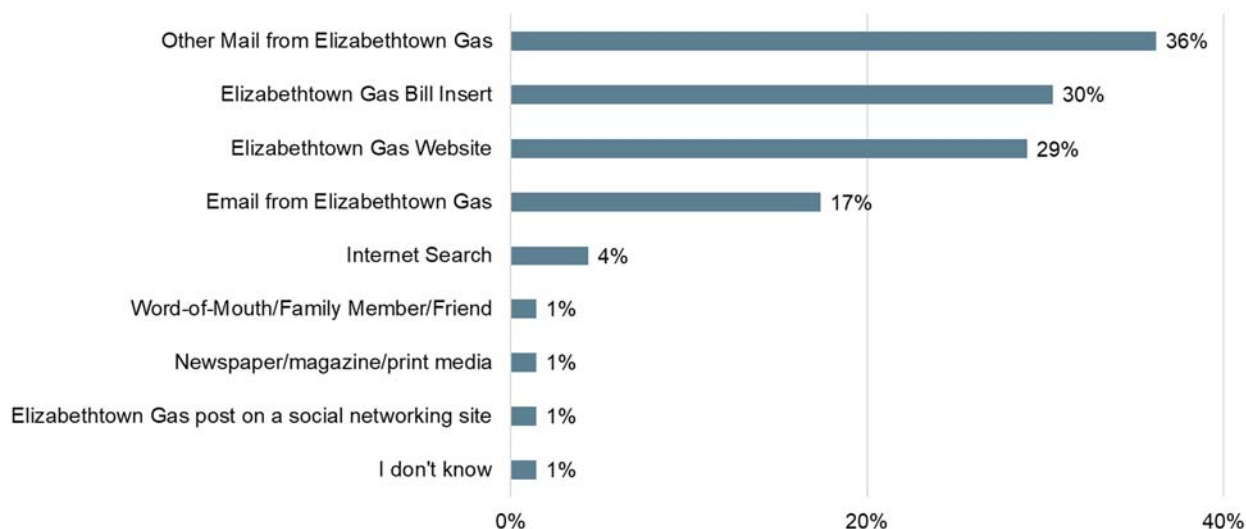


Figure 7-6: Online Marketplace Customers’ Sources of Program Awareness (n=69)

Customers were satisfied with the measures they purchased from the Online Marketplace and their experience overall. The majority of participants indicated satisfaction with the measures they received, variety of measures offered, time to receive the product they purchased, and the program overall. Sixty-seven percent said they had recommended the program to someone else and of those who had not recommended the program 70 percent said they would recommend it.⁴⁵ Further, when asked what they would change about the Online Marketplace, 52 percent of respondents said they either would not change anything or did not know what they would change. Figure 7-7 displays customer satisfaction and Table 7-54 displays recommendations.

⁴⁵ Rated their likelihood of recommending the program a 7 or higher on a scale from 0 (not at all likely) to 10 (extremely likely).

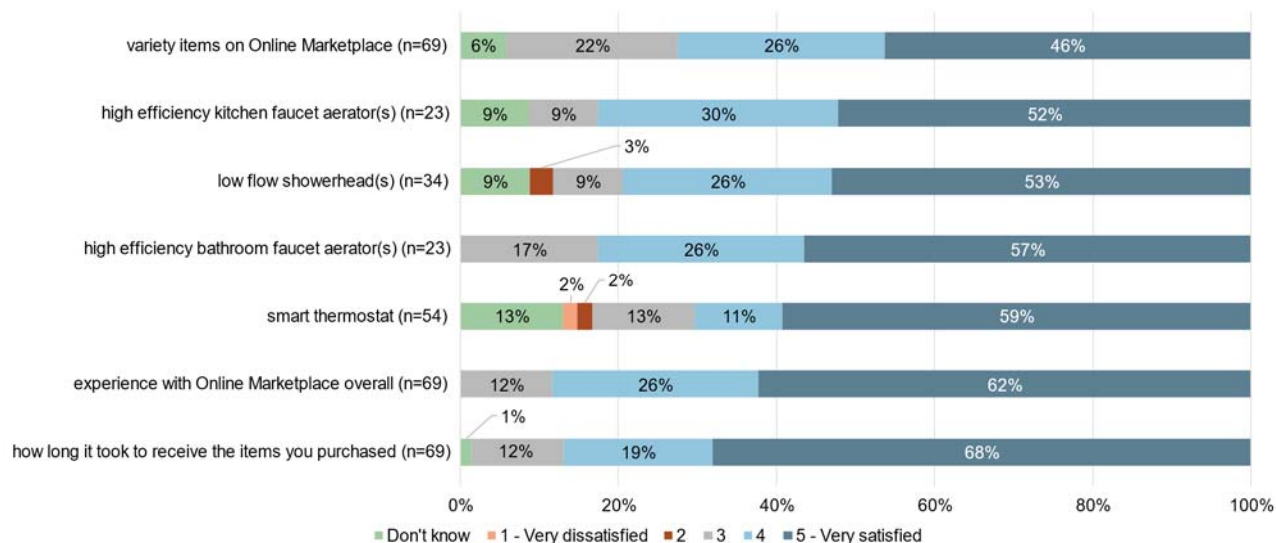


Figure 7-7: Online Marketplace Customer Satisfaction

Table 7-54: Online Marketplace Respondent Recommendations to Improve Program ⁴⁶

Response	Count	Percentage (n=69)
Prompted Responses – Selected All That Apply		
Increase variety of products available	19	26%
Elizabethtown Gas could provide more info about how much I will save by installing incented products	6	9%
Elizabethtown Gas should improve marketing	5	7%
Make website easier to navigate	4	6%
Speed up product shipment	3	4%
Unprompted Responses – Open-end or “Other” Recommendations		
Increase amount of marketing regarding available rebates and incentives	2	3%
Provide more information about compatibility of products (specifically thermostats and C wires)	1	1%
Provide discounted installation services.	1	1%
Remove two item limits for rebates	1	1%

⁴⁶ Respondents could provide more than one recommendation.

Most Online Marketplace customers had not participated in other ETG offerings.

Six percent of respondents reported they had participated in another ETG program since making their purchase through the Online Marketplace. All of these customers indicated their Online Marketplace experience was important to their decision to participate in the other program.⁴⁷

The primary reason customers have not participated in other ETG programs was they were not aware of them, though a lack of time or perceived applicability were also driving factors.

Most respondents were not aware of ETG's energy efficiency offerings beyond its Online Marketplace. Of those who had not participated in another offering (n=63), 54 percent said they were unaware of Elizabethtown Gas offering other incentives or rebates programs for energy efficient equipment or improvements. Figure 7-8 displays the reasons Online Marketplace customers said they had not participated in other ETG offerings. All of the customers who said the programs were not applicable to their homes said they had gas home heating and most said they had gas water heating. Though inferences should be drawn cautiously as there were a small number of responses to these questions, these results suggest an opportunity to further explore customers' perceptions regarding the applicability of ETG offerings to their homes in ADM's PY2 residential customer surveys.

⁴⁷ Rated the importance of the experience a 7 or higher on a scale from 0 (not at all important) to 10 (very important).

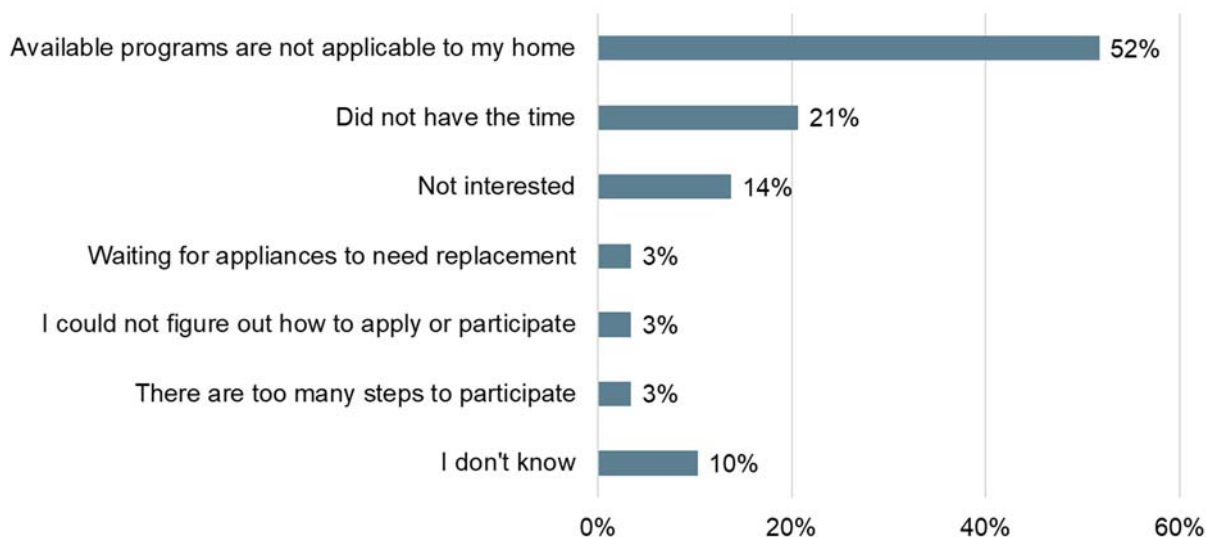


Figure 7-8: Reasons Online Marketplace Customers Did Not Participated in Other ETG Offerings (n=29)

7.4.4 Nonparticipant Survey Results

In August 2022, the Evaluator conducted a survey of ETG customers who had not participated in any program in the past 12 months. SJI staff provided ADM with a list of 3,000 customers for the nonparticipant survey. The Evaluator invited 2,184 customers to participate in an online survey. Each unique customer with a valid email address was sent an invitation. Prior to sending invitations, the Evaluator verified the list did not contain any customers who had participated in ETG’s energy efficiency programs or had been invited to take the Evaluator’s HERs survey (either as participants or non-participants). A \$5 gift certificate was offered as an incentive for the survey. Eighty customers completed the survey (four percent response rate). About five percent of email invitations bounced. Statistically significant differences as well as notable similarities are noted.⁴⁸

About two-thirds of respondents were homeowners, and the majority reported living in small-to-moderate-sized single-family homes, with gas home and water heating. Eighty-five percent of respondents said they lived with no more than three other people. Table 7-55 summarizes respondents’ home characteristics.

⁴⁸ ADM compared results with two proportion z-tests. Reported differences are statistically significant at p < 0.05 using a two-tailed test. A single asterisk denotes differences that were found to be statistically significant.

Table 7-55: Non-Participant Respondent Home Characteristics

Question	Response	Percentage (n=80)
Do you own or rent your home?	Rent	33%
	Own	68%
Which of the following best describes your home type?	Single-family detached	51%
	Duplex	8%
	Triple decker	1%
	Apartment/condo in a 2-4 unit building	14%
	Apartment/condo in a 5+ unit building	10%
	Single family townhouse or row house	16%
When was your home built?	Before 1960	36%
	1960 to 1979	5%
	1980 to 1999	21%
	2000 to 2009	11%
	2010 or later	10%
	Don't know	16%
Including yourself, how many people currently live in your household?	1	25%
	2	30%
	3	14%
	4	16%
	5	8%
	6 or more	5%
	Prefer not to say	3%
About how many square feet is your home?	Less than 1,000 square feet	10%
	1,000-1,999 square feet	34%
	2,000-2,999 square feet	23%
	3,000-3,999 square feet	10%
	4,000 or more square feet	24%
	Don't know	10%
What is the main fuel used to heat your home?	Electricity	10%
	Natural gas	84%
	Oil	3%
	Don't know	4%
What is the main fuel used to heat your water?	Electricity	9%
	Natural gas	80%
	Don't know	11%

The Evaluator also asked respondents to provide demographic information. About half identified as white and 90 percent said that English was the primary language spoken in their home. Twenty-five percent of respondents noted that their income was below 250 percent of the Federal Poverty Level (FPL) and ten percent said it was between 250 percent and 400 percent of the FPL.⁴⁹ In comparison, using Census Bureau data the Evaluator estimates that about 27 percent of households served by ETG have incomes under 250 percent of FPL.⁵⁰ Table 7-56 provides additional self-reported survey-taker demographic information.

Table 7-56: Non-Participant Respondent Demographics

Question	Response	Percentage (n=80)
What is your age?	Under 35 years old	15%
	35-55 years old	34%
	Over 55 years old	46%
	Prefer not to answer	5%
How would you identify your race or ethnicity?	Asian	14%
	Black/African American	5%
	Caucasian/White	53%
	Hispanic or Latino	15%
	Middle Eastern or North African	1%
	Native Hawaiian and Other Pacific Islander	1%
	Haitian	1%
	Prefer not to say	13%
What is the primary language spoken in your home?	English	90%
	Spanish	6%
	Gujarathi	1%
	Portuguese	1%
	Malayalam	1%

⁴⁹Twenty-nine percent said their income was more than 400% of the FPL. Thirty-six percent of respondents either preferred not to state (29%) or did not know (8%) their household income (does not sum to 36% due to rounding).

⁵⁰U.S. Census Bureau 2020 American Community Survey (ACS) Five Year Estimates Public Use Microdata Sample (PUMS)

Sixty-eight percent of respondents were unaware that Elizabethtown Gas offered rebates for energy efficient equipment and home improvements. The Evaluator compared the manner in which customers learned about the program across age groups and found that older customers tended to be aware of ETG’s offerings at a higher rate, compared to younger customers. Fifty-one percent of respondents over 55 years old were aware of ETG’s offerings, compared to 26 percent of respondents between 35-55 years old. None of the respondents identified as under 35 years old.

Customers noted ETG emails and bill inserts as well as internet searches as the primary sources of information for energy efficiency. Figure 7-9 displays how customers get information about making home improvements, reducing gas/energy usage, and maintaining home heating and air systems. The Evaluator compared reported sources of information for respondents who indicated they had heard about the ETG rebates before the survey to those who had not heard about them at the time of the survey. The only significant difference was found to be between the portion of respondents who said they learn about home improvements, reducing gas/energy usage, and maintaining their HVAC system through speaking with contractors over the phone.

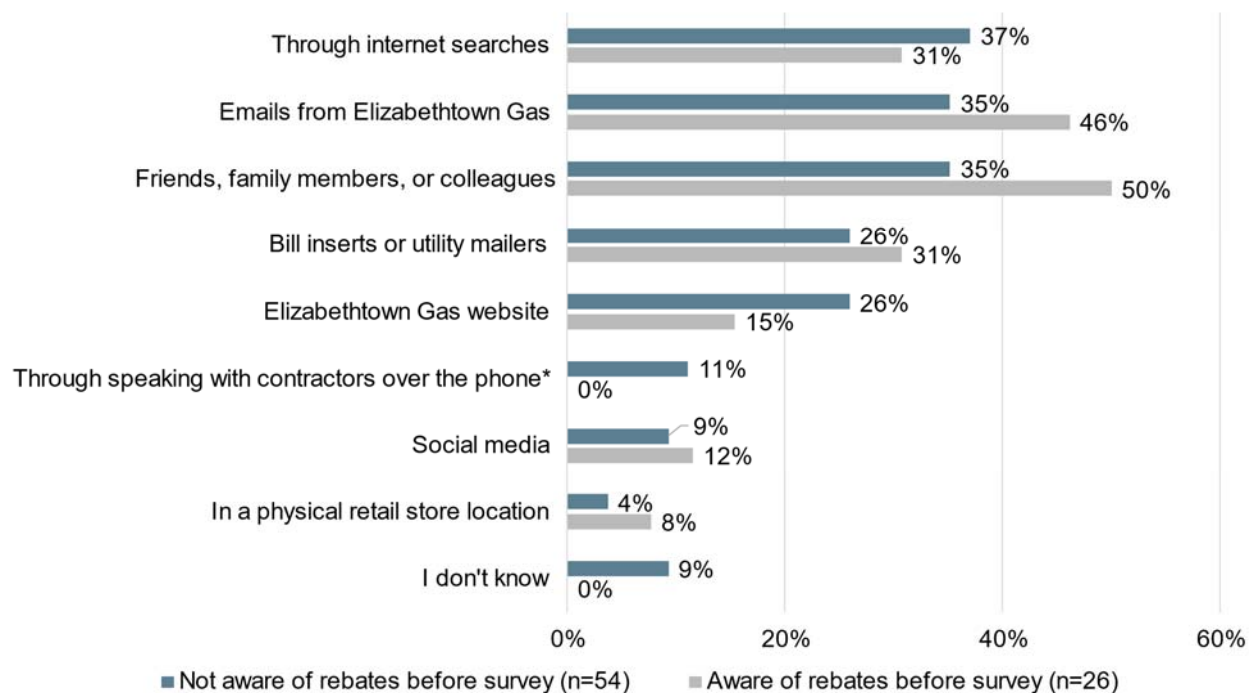


Figure 7-9: Sources of information for home improvements, reducing gas/energy usage, and maintaining HVAC system⁵¹

⁵¹ n=80. Total is greater than 100 percent because customers could select more than one source.

Awareness was highest for ETG’s appliance rebate and QHEC programs. Table 7-57 displays the ETG offerings that respondents noted hearing about before the survey. The table percentages do not total 100 percent as respondents could indicate awareness of more than one program. No respondents indicated being aware of ETG’s on bill repayment program or instant home energy analysis survey.

Table 7-57: What Types of Programs are Non-Participants Aware Of?

Answer	Percentage (n = 26)
Appliance rebates	58%
A FREE in-home energy assessment with the Quick Home Energy Checkup (QHEC)	50%
Discounted energy-saving products through the online ETG Marketplace	31%
FREE home weatherization services for income-qualified customers	27%
HVAC and Water Heating Rebates	19%
Instant Home Energy Analysis survey on ETG website to create home energy profile	19%
Whole-house energy-saving solutions through the Home Performance with ENERGY STAR Program	12%
An on-site energy assessment and incentives for multi-family buildings	8%
I don't know	12%

Emails and bill inserts/mailers are driving customer awareness. Half of respondents indicated they learned about ETG’s offerings from emails from ETG or from ETG bill inserts or mailers.

Table 7-58 shows non-participants’ sources of program awareness. The respondents who indicated learning about ETG’s programs from a friend, family member or colleague all indicated the information they heard had been positive.⁵²

⁵² n=4. Rated the information a 4 or 5 on a scale from 1 (extremely negative) to 5 (extremely positive).

Table 7-58: Non-Participants’ Sources of Program Awareness

Source	Percentage (n = 26)
Bill insert or utility mailer	50%
Email from Elizabethtown Gas	50%
Friend, family member, or colleague	15%
A print advertisement	15%
Elizabethtown Gas website	12%
Through an internet search	8%
Through a retailer	8%
Through an internet advertisement	4%
A radio advertisement	4%

Nearly half of the respondents that were aware of ETG’s offerings learned about them over six weeks ago. Though some customers indicated they were learning about ETG’s offerings in the past two weeks (12 percent) or between three to six weeks ago (19 percent), 46 percent said they had heard about the offerings more than six weeks ago. Twenty-three percent could not recall when they had heard about the rebates or services offered by ETG.

Non-participants are generally not interested in ETG’s offerings. The Evaluator asked customers if they were interested in various ETG offerings, and though results varied, no offering garnered more than about one-third of customers indicating interest in participation (see Table 7-58). Between 14 percent and 18 percent of respondents indicated uncertainty regarding their interest in receiving or participating in each of ETG’s offerings, suggesting additional information could motivate participation. Customers were given an opportunity to provide suggestions for additional offers; 15 percent of customers wrote in recommendations. However, 10 percent of these write-in recommendations were unrelated to gas usage or requested programs or services that were already offered. Non-participants’ write-in recommendations related to gas usage or efficiency programs, excluding measures already offered included:

- Educational videos and training to inform customers.
- Rebates or incentives for windows replacements.
- Focusing on marketing to apartment complex managers.

Table 7-59: Non-participants’ Interest in ETG Offerings (n=80)

Offering	Yes	No	I don’t know
an instant discount for high efficiency showerheads	34%	49%	18%
a self-guided online home energy analysis	34%	53%	14%
a rebate for an ENERGY STAR water heater	33%	51%	16%
free installation of LED lightbulbs, faucet aerators and advanced power strips	33%	50%	18%
an instant discount for a smart thermostat	31%	53%	16%
an instant discount for high efficiency faucet aerators	29%	55%	16%
a rebate for an ENERGY STAR clothes washer	28%	59%	14%
a rebate for an ENERGY STAR clothes dryer	28%	59%	14%
a rebate for an ENERGY STAR gas furnace	28%	55%	18%

Non-participants that were aware of ETG’s programs said they had not participated because of the time commitment, a lack of financial ability, and a lack of interest. Other non-participants that were aware of the ETG programs said they did not know why they had not participated. See Table 7-60 for non-participants’ reasons for not participating in any ETG offering.

Table 7-60: Non-participants’ Reasons for Not Participating in Any ETG Offering

Reasons	Percent (n=19)
Prompted Responses – Selected All That Apply	
Time it would take to participate	26%
Not interested in what Elizabethtown Gas is offering	16%
I don’t know	26%
Unprompted Responses – Open-end or “Other” Recommendations	
Not financially able	16%
House is already efficient/has ENERGY STAR rated appliances	11%
It seems inconvenient	5%
House is undergoing renovations	5%

Non-participants that lack authority to make improvements generally have not spoken to their landlord about energy efficiency. Twenty-nine percent of customers said they had no or limited authority to make repairs. Of these respondents, about one-fifth said they had spoken to their landlord about energy efficiency.

Most respondents indicated they had not participated in any electric utility or NJCEP energy efficiency program offerings. Seventy-nine percent of respondents said they had not taken advantage of any energy efficiency programs offered through their electric utility in the last twelve months; 73 percent said they had not ever participated in any NJCEP offerings. Only one respondent indicated participating in an NJCEP in the past 12 months.

Table 7-61: Electric Utility Energy Efficiency Program Participation

Recommendation	Percent (n=17)
Appliance rebates	29%
FREE home weatherization services for income-qualified customers	12%
Discounted energy-saving products through their online Marketplace	12%
HVAC and Water Heating Rebates	6%
Whole-house energy-saving solutions through the Home Performance with ENERGY STAR Program	6%
A FREE in-home energy assessment with the Quick Home Energy Checkup (QHEC)	6%

Survey results indicate customers are satisfied with ETG and customers generally view ETG as a trusted source for information regarding saving energy in their homes. Fifty-eight percent of customers said ETG was a trustworthy source of information about saving energy in their home. Seventy-nine percent said they were interested in receiving energy saving tips and information on ETG’s available rebates for energy efficiency.

Customers that trust ETG and are satisfied are generally more interested in energy saving tips and rebate programs offered by ETG. Sixty-five percent of customers that said ETG was trustworthy said they were moderately or very interested in getting information on energy saving tips and rebate programs offered by ETG; similarly, 66 percent that were satisfied with ETG indicated they were moderately or very interested in getting information from ETG.

There is an opportunity to encourage more ETG customers to install smart thermostats. Eighty-five percent of customers indicated that they did not have smart thermostats, though nearly half said they had a programmable thermostat (see Table 7-52).

ADM compared the types of customers (age, homeownership, home type, home size) and their reported thermostat types but found no meaningful, statistically significant differences that would permit drawing conclusions from these comparisons.

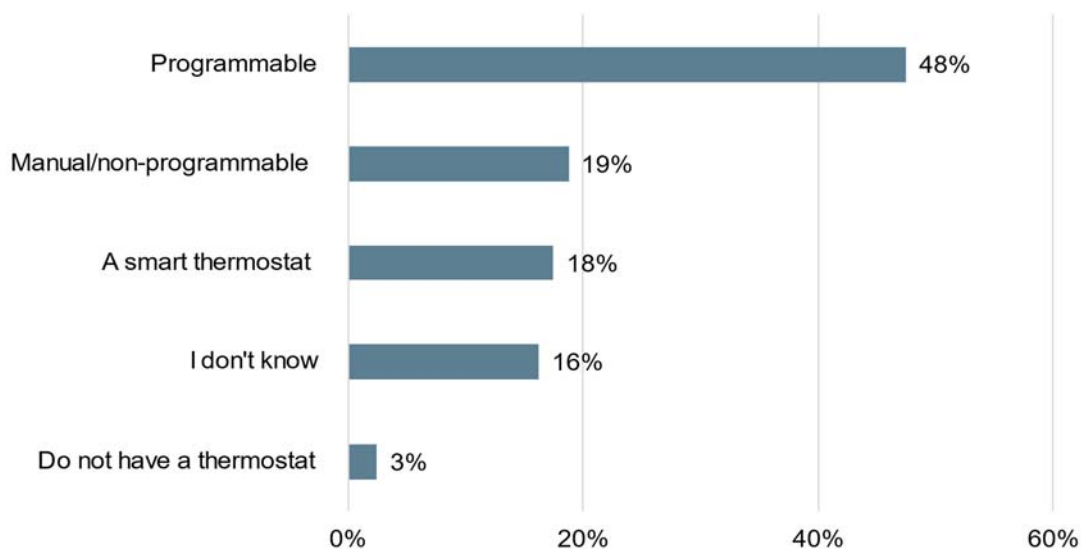


Figure 7-10: Non-participant thermostat type (n=80)

Survey respondents’ attitudes indicate an opportunity to improve awareness and knowledge about energy efficiency. Though 79 percent of respondents agreed with the statement that “Energy efficiency saves money”, 39 percent said they knew of steps they could take to reduce their energy use. Figure 7-11 displays non-participants’ energy efficiency attitudes and beliefs.

Non-participating customers generally do not plan to reduce their household energy use, though they acknowledge there are actions they could take, and they have time to take them. Less than half of respondents agreed with the statement that signaled intent to reduce household energy use in the next 12 months. Only 16 percent of respondents agreed that they were too busy to worry about making energy related improvements to their home and 24 percent said they had already done everything they could to improve the efficiency of their home.

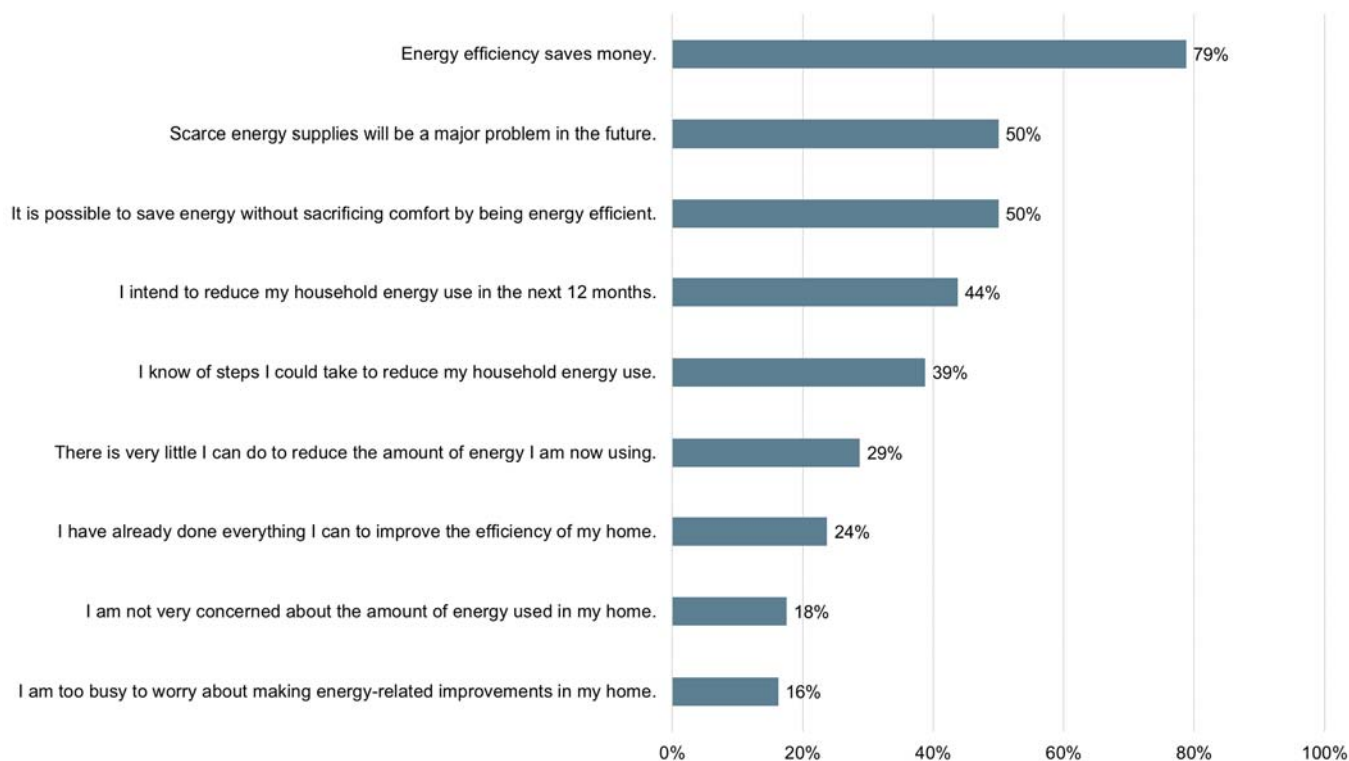


Figure 7-11: Energy Efficiency Beliefs and Attitudes (n=80)⁵³

7.5 Conclusions and Recommendations

Conclusion: EEP Downstream participants tend to have higher incomes, suggesting opportunities to promote the program’s OBRP to engage with a more diverse range of ETG’s customer base. Over half of survey respondents said their income was more than 400 percent of the Federal Poverty Level (FPL).

Recommendation: Continue to use bill inserts and marketing emails to promote ETG’s programs but focus on middle- and lower-income households by highlighting lower energy bills from energy efficient equipment. Customers noted ETG emails and bill inserts as well as internet searches as the primary sources of information for energy efficiency.

Conclusion: General awareness of the Downstream program may be raised by emails, mail, and other forms of outreach, but participants tend to report learning about the program from contractors or on their own through the program website. One-third of customers said they learned about the program from a contractor and 28

⁵³ Figure displays agreement as defined with a rating of 7 or higher on scale from 0 (strongly disagree) to 10 (strongly agree).

percent from the website, suggesting awareness is either contractor-driven or customer-motivated.

Recommendation: Consider working with contractors to bolster outreach and enrollment efforts for the EEP Downstream program. Downstream participants tend to learn about the program from contractors or on their own through the program website. Though 63 percent of respondents worked with a contractor, only one-third indicated they learned about the program from a contractor. Moreover, it was uncommon for customers who learn about the program through a contractor to report completing the program's application on their own. This may suggest an opportunity for ETG to increase outreach and enrollment efforts with contractors by holding an in-person training, webinar, or through distributing additional outreach materials for the contractors to use during their service call and marketing.

Conclusion: Direct outreach from ETG is driving customer awareness of the Online Marketplace. Seventy-one percent of customers indicated they learned about the Online Marketplace from either a bill insert, email from ETG, or other mailing.

Recommendation: Continue to promote the Online Marketplace and Downstream programs through bill inserts and mailing marketing. Bill inserts and mailings are drivers of Online Marketplace participation and may provide a way for ETG to continue to build awareness and engagement with its EEP programs.

Conclusion: Over half of smart thermostat customers have not noticed savings since installing them. Sixty-five percent of smart thermostat customers said they either had not noticed savings on their gas bill or did not know if they had noticed savings since installing the items; however, this may correlate to installation and heating/cooling season timing and customer awareness and does not directly reflect actual gas savings.

Recommendation: Add messaging or documentation on how to utilize a smart thermostat's energy savings features and reporting of energy savings capabilities to the Online Marketplace purchases.

Conclusion: Sixty-eight percent of respondents were unaware that Elizabethtown Gas offered rebates; awareness was highest for ETG's appliance rebate and QHEC programs. No respondents indicated being aware of ETG's on bill repayment program or instant home energy analysis survey.

Recommendation: Consider focused marketing and outreach that highlights not only the available rebates, but the potential gas/energy savings from making upgrades. Survey findings indicated an opportunity to improve awareness and knowledge about energy efficiency as well as the possibility of increasing customer interest in participation. Highlighting potential energy savings for specific equipment

upgrades in mail insert and email outreach could foster increased interest and participation.

Conclusion: Survey respondents' attitudes indicate an opportunity to improve awareness and knowledge about energy efficiency and that customers were interested in various ETG offerings. Though 79 percent of respondents agreed with the statement that "Energy efficiency saves money", 39 percent said they knew of steps they could take to reduce their energy use. About one-third of respondents stated they were interested in programs that offered incented high efficiency showerheads, LED lightbulbs, faucet aerators, advanced power strips, smart thermostats, and ENERGY STAR water heaters.

Recommendation: Consider marketing programs using specific measures that are popular with ETG customers and messaging that describes how those measures will save on natural gas usage in the home.

7.6 Barriers to Participation

Downstream and Marketplace customers' lack of awareness and time are barriers to participation in other ETG programs. Most respondents were not aware of ETG's energy efficiency offerings beyond the program they had participated in. Of the customers who were aware of other offerings, a lack of time and a perceived lack of applicability were other reasons they noted for not having participated.

Downstream participants are generally aware of the OBRP, though awareness could be improved and potentially enable additional high efficiency equipment installations. Of those who did not apply for OBRP, 34 percent said they did not know a financing option was able through their utility (n=44). Further, 43 percent of the customers who were not aware of the OBRP (n=14) said they would have installed additional equipment if they knew about the financing option.

Customer awareness is a barrier to participation and the level of awareness differs by age group. Sixty-eight percent of respondents were unaware that Elizabethtown Gas offered rebates for energy efficient equipment and home improvements. The Evaluator compared the manner in which customers learned about the program across age groups and found that older customers tended to be aware of ETG's offerings at a higher rate, compared to younger customers. Fifty-one percent of respondents over 55 years old were aware of ETG's offerings, compared to 26 percent of respondents between 35-55 years old. None of the respondents identified as under 35 years old.

Non-participants that were aware of ETG's programs said they had not participated because of the time commitment, a lack of financial ability, and a lack of interest. Other non-participants that were aware of the ETG programs said they did not know why they had not participated. Survey respondents' attitudes regarding energy efficiency and

lack of interest in participation may indicate an opportunity to improve awareness and knowledge about energy efficiency and its benefits.

The transition from NJCEP to utility-run energy efficiency programs required significant coordination and resources. Utility staff noted that though generally the programs had “not changed much” from the customer perspective, there were back-end challenges as well as issues related to contractor engagement and awareness. From an administrative perspective, SJI’s director described the transition as a “painstaking process” and observed that not all utilities had their programs ready at the same time. Honeywell’s program manager noted that the programs had been “in flux” and alluded to start-up efforts and coordination with other utilities as having required time and resources. Honeywell’s marketing manager noted that the most significant challenge in PY1 had been the development, coordination and revision of application forms and website materials to align and ensure consistency across gas and electric utilities.

Awareness and other utility programs, coupled with a limited marketing budget are perceived as barriers to success. SJI’s director of energy efficiency said that recruiting customers to participate in programs other than those driven by HVAC contractors was initially a challenge, as they are still building awareness for programs, and electric utilities have the same offerings and may have more aggressive marketing or deeper connections to their customers. Honeywell’s marketing manager noted the program’s budget limits the amount of outreach that can be performed, further he indicated the need for reduced spending and marketing activities in PY2.

7.7 Evaluability Recommendations

Missing quantity field. During the first months of the program, the program tracking data records did not include a quantity field. As a result, ex-ante savings were incorrectly calculated for records with a measure quantity other than one. The Company added the quantity data element mid-cycle.

Incorrect AHRI reference numbers. AHRI reference numbers are included in the program tracking data records for several measures. ADM uses the reference number to access measure specifications for the exact model product the customer has purchased. The 2021 tracking data included several incorrect or incomplete AHRI reference numbers, which prevented ADM from calculating ex-post savings for those records. Realization rates were negatively impacted by incorrect or incomplete AHRI reference numbers.

Calculate ex-ante savings using actual measure parameter values by record, rather than using deemed parameter averages. When actual parameter values vary, realization rates also vary. When measure specifications are available (for example, using the AHRI reference number), ex-ante savings can be calculated that result in realization rates closer to 100 percent.

Ensure program tracking data follows the savings algorithms and any calculation modifications agreed on in the Coordinated Measure List. Updating the program data savings calculations to adhere to modifications in the Coordinated Measure List methodologies will improve realization rates.

Disaggregate savings for the “Gas Heater with Water Heater”. Disaggregation of the two components of this measure is likely to result in more accurate savings calculations.

Add the date of purchase to Online Marketplace tracking data. This additional information could help develop a more nuanced understanding of participants’ perception of savings since installing their program measures and also in-service rate calculations.

7.8 Research Questions for PY2

ADM noted additional data collection in PY2 would be required to continue to develop understanding of program design and barriers to program success. Specifically, ADM noted opportunities to answer the following research questions more fully:

- Are there any specific measures for which the current incentive levels do not motivate customers to buy high efficiency equipment instead of standard efficiency equipment? If so, what are they and how much would the incentives need to be increased to get good uptake?
- Are there any specific measures for which a lower program incentive level would still motivate customers to buy high efficiency equipment instead of standard efficiency equipment? If so, what are they and how much could incentive levels be reduced?

Partially answered: ADM investigated these questions by considering the uptake the measures and if engagement with any measure was dominating program activity. To further research these questions ADM asked survey respondents free ridership questions approved by the SWE, which will be analyzed by Cadmus.

Another method to analyze these questions is to use cost-benefit analysis to consider the incentive cost per kWh saved and if any measures have comparatively low or high acquisition costs.

- Is the program adequately serving different types of customers (e.g., based on homeownership, income level, education level, geographic area, ethnicity)?

Partially answered: ADM investigated the customers that the programs are serving but will continue to research this area and consider additional or revised demographic or background questions for each survey to learn more about program reach.

7.9 Surveys

Client: SJIU

Program: EE Products Program – Appliance, HVAC, and Water Heating Rebates

Group: Downstream Participants

Mode: Email

RESEARCH OBJECTIVES

Evaluation Question	Survey Question
Is there cross participation between the delivery channels or between the EEP program and other programs offered by the company? Has participation in one of the EEP program channels influenced customers to participate in other program offerings?	Q98-Q102
Is each delivery channel of the program adequately serving different types of customers (e.g., based on homeownership, income level, education level, geographic area, ethnicity)?	Q103-Q114
Are the incentive levels appropriately set for each product / delivery channel? Should incentives be increased to promote participation? Could incentives levels be decreased without significantly impacting participation?	Free ridership battery
What are the end user experiences like with applying for and receiving rebates through the program?	Q87-Q93
How are customers learning about the rebates available? Are the marketing efforts effective and useful or are customers finding out about the program in other ways?	Q86
Were participants satisfied with rebate, the application process, and the product they installed? What are any causes of dissatisfaction?	Q92-Q93
Are the incentive levels appropriately set for each product / delivery channel? Should incentives be increased to promote participation? Could incentives levels be decreased without significantly impacting participation?	Free ridership battery
How did the low-cost loan option affect purchase decisions on big equipment?	Q81-Q85
Were participants satisfied with their interactions with the contractor they worked with and the product that was installed? What are any causes of dissatisfaction?	Q79-Q80

PREDEFINED VARIABLES

Variable	Definition
UTILITY	Utility name
SERVICE_PROVIDER	Name of contractor
ALL_MEASURES	List of all measures for which customer received a rebate
NTG_MEASURES	List of the randomly selected measures for the NTG battery.
MEASURE_NAME1 MEASURE_NAME2	Description of measure selected for free ridership assessment, excluding smart thermostats.(e.g., clothes washer, clothes dryer, water heater)
MEASURE1_QTY MEASURE2_QTY	Number of each measure purchased selected for free ridership assessment
ADDRESS	Street Address
CW	1 if clothes washer, else 0
CD	1 if clothes dryer, else 0
WAT	1 if water heater, else 0
BOIL	1 if boiler, else 0
FURN	1 if furnace, else 0

COMBI	1 if combi heater, else 0
TSTAT_QUANT	Quantity of thermostats
BOILER_CONTROL	1 if boiler reset controls installed, else 0

EMAIL SURVEY MESSAGE

Subject: Help Improve [UTILITY]'s Energy Efficiency Programs

Reply To: adm-surveys@admenergy.com

From Name: [UTILITY]

Do you have a few minutes for a quick survey about the rebate you received from [UTILITY]? Your feedback will help us improve our energy efficiency offerings and provide you with excellent customer service.

Click here to take the survey: [SURVEY LINK]

The survey will take only a few minutes to complete. It's administered by our authorized contractor, ADM Associates, and your feedback will be kept anonymous and confidential.

If you have questions or require technical assistance, please respond to this email or contact us at adm-surveys@admenergy.com. If you wish to no longer receive emails about this survey, please click on the "Unsubscribe" link below. Thank you in advance for your time!

Kind Regards,

ADM Associates / Contractor to [UTILITY]

SCREENING

1. [UTILITY] records indicate that you received a rebate for the purchase of the [ALL_MEASURES] installed at [ADDRESS] in [YEAR]. Is this correct?
 1. Yes
 2. No

[DISPLAY Q2 AND Q3 IF Q1 = 2]

2. Which of the following is incorrect? [MULTISELECT]
 1. [ALL_MEASURES] (Please specify correct equipment) [OPEN-ENDED]
 2. [ADDRESS] (Please specify correct address) [OPEN-ENDED]
 3. [YEAR] (Please specify correct year) [OPEN-ENDED]
 4. Other (Please specify) [OPEN-ENDED]
3. If someone else in your household is more familiar with the rebate you may have received, please write their email in the textbox below.
Email address: _____

[TERMINATION PAGE]

4. How did you apply for the rebate for the [ALL_MEASURES]? Please select all that apply.
 1. Online through [UTILITY] website
 2. Through the mail with a printed [UTILITY] rebate form
 3. [SERVICE_PROVIDER] applied [DISPLAY IF SERVICE PROVIDER<>BLANK]
 4. Other (Please specify) [OPEN-ENDED]
 5. I don't recall

BOILER CONTROL

[DISPLAY SECTION IF BOILER_CONTROL=1]

5. Are the new boiler reset controls currently installed?
 1. Yes
 2. No
 98. I don't know

[DISPLAY Q6 IF Q5=1]

6. Are the new boiler reset controls working properly?
 1. Yes
 2. No
 98. I don't know

[DISPLAY Q7 IF Q6=2 OR Q5=2]

7. Why are they not installed or working properly?
[OPEN-ENDED]

BOILER

[DISPLAY SECTION IF BOIL=1]

8. Is the new ENERGY STAR® Boiler currently installed?
- 3. Yes
 - 4. No
 - 99. I don't know

[DISPLAY Q9 IF Q8=1]

9. Is the new ENERGY STAR® Boiler working properly?
- 3. Yes
 - 4. No
 - 99. I don't know

[DISPLAY Q10 IF Q8= 2 OR Q9=2]

10. Why is it not installed or working properly?
[OPEN-ENDED]

COMBINATION BOILER

[DISPLAY SECTION IF COMBI=1]

11. Is the new ENERGY STAR® Gas Combination Boiler currently installed?
- 1. Yes
 - 2. No
 - 98. I don't know

[DISPLAY Q12 IF Q11=1]

12. Is the new ENERGY STAR® Gas Combination Boiler working properly?
- 1. Yes
 - 2. No
 - 98. I don't know

[DISPLAY Q13 IF Q11=2 OR Q12=2]

13. Why is it not installed or working properly?
[OPEN-ENDED]

ENERGY STAR® CLOTHES WASHER

[DISPLAY SECTION IF CW=1]

14. Why did you select this model or type of Clothes Washer? [SELECT ALL THAT APPLY]
- 1. It was a good price

2. There was a rebate for it
3. It costs less to operate
4. It uses less water
4. It's good for the environment
5. It was all that was available
6. The retailer recommended it
7. It had the features I wanted
8. It was the right size
9. It was the right color
10. It was a good brand
96. Other (Please specify) [**OPEN-ENDED**]
98. I don't know

15. Is the new ENERGY STAR® Clothes Washer currently installed?

1. Yes
2. No
98. I don't know

[DISPLAY Q16 IF 15=1]

16. Is the new ENERGY STAR® clothes washer working properly?

3. Yes
4. No
99. I don't know

[DISPLAY Q17 IF Q15= 2 OR Q16=2]

17. Why is it not installed or working properly?

[OPEN-ENDED]

ENERGY STAR® CLOTHES DRYER

[DISPLAY SECTION IF CD=1]

18. Why did you select this model or type of Clothes Dryer? [SELECT ALL THAT APPLY]

1. It was a good price
2. There was a rebate for it
3. It costs less to operate
4. It's good for the environment
5. It was all that was available
6. The retailer recommended it
7. It had the features I wanted
8. It was the right size
9. It was the right color
10. Wanted the brand

96. Other (Please specify) [**OPEN-ENDED**]

98. I don't know

19. Is the new ENERGY STAR® Clothes Dryer currently installed?

1. Yes

2. No

98. I don't know

[DISPLAY Q20 IF Q19=1]

20. Is the new ENERGY STAR® Clothes Dryer working properly?

1. Yes

2. No

98. I don't know

[DISPLAY Q21 IF Q15= 2 OR Q16=2]

21. Why is it not installed or working properly?

[OPEN-ENDED]

[DISPLAY Q22 IF Q19= 2]

22. Why is it not installed or working?

[OPEN-ENDED]

ENERGY STAR® WATER HEATER

[DISPLAY IF WAT=1]

23. What type of ENERGY STAR® Water Heater did you purchase?

1. Storage Tank Water Heater

2. Tankless Water Heater

96. Other (Please specify) [**OPEN-ENDED**]

98. I don't know

24. What type of water heater did you replace with the new ENERGY STAR® Water Heater?

1. Storage Tank Water Heater

2. Tankless Water Heater

3. Tankless boiler

4. Boiler with external storage tank

96. Other (Please specify) [**OPEN-ENDED**]

98. I don't know

25. Is the new ENERGY STAR® Water Heater currently installed?

1. Yes
2. No
98. I don't know

[DISPLAY Q26 IF Q25=1]

26. Is the new ENERGY STAR® Water Heater working properly?

1. Yes
2. No
98. I don't know

[DISPLAY Q27 IF Q25=2 OR Q26=2]

27. Why is it not installed or working properly?

[OPEN-ENDED]

ENERGY STAR® FURNACE

[DISPLAY IF FURN=1]

28. Where in your home is the ENERGY STAR® Furnace located?

1. Insulated garage
2. Un-insulated garage
3. Finished basement
4. Un-finished basement
5. In closet/furnace room within the main living space
96. Other (Please specify) **[OPEN-ENDED]**
98. I don't know

29. Is the new ENERGY STAR® Furnace currently installed?

1. Yes
2. No
98. I don't know

[DISPLAY Q30 IF Q29=1]

30. Is the new ENERGY STAR® Furnace working properly?

1. Yes
2. No
98. I don't know

[DISPLAY Q31 IF Q29=2 OR Q30=2]

31. Why is it not installed or working properly?

[OPEN-ENDED]

SMART THERMOSTAT

[DISPLAY IF THERM=1]

32. What is the make and model of the smart thermostat?

[OPEN-ENDED]

33. Is the new smart thermostat currently installed?

1. Yes
2. No
98. I don't know

[DISPLAY Q34 IF Q33= 2]

34. Why haven't you installed the smart thermostat yet?

1. Waiting for a professional to install it
2. Haven't had time
96. Other (Please specify) **[OPEN-ENDED]**

[DISPLAY Q35 IF Q33=1]

35. Is the new smart thermostat working properly?

1. Yes
2. No
98. I don't know

[DISPLAY Q36 IF Q35=2]

36. How is it not working properly?

[OPEN-ENDED]

37. Does your smart thermostat provide the following services: **[INSERT GRID WITH, 1 = YES, 2 = NO, 98 = I DON'T KNOW]**

1. Web and smartphone-based thermostat control
2. Two-way communications (e.g., ability for your utility to adjust your thermostat during high-energy use periods)
3. Ability to set and modify a schedule
4. Ability to view information about your energy consumption_

38. Which of those features have you used? **[INSERT GRID WITH, 1 = YES, 2 = NO, 98 = I DON'T KNOW]**

1. Web and smartphone-based thermostat control [DISPLAY IF Q37.1=1]
2. Two-way communications (e.g., ability for your utility to adjust your thermostat during high-energy use periods) [DISPLAY IF Q37.2=1]
3. Ability to set and modify a schedule [DISPLAY IF Q37.3=1]
4. Ability to view information about your energy consumption_ [DISPLAY IF Q37.4=1]

39. What type of thermostat did your smart thermostat replace?

1. Manual/non-programmable (allows users to directly set thermostat setpoints)
2. Programmable (allows users to program future setpoints, such as automatically adjusting temperature at night and in the morning)

3. A smart thermostat with the same features
4. A smart thermostat with additional features
5. Did not previously have a thermostat
98. I don't know

[DISPLAY Q40 IF Q39=4]

40. What features does your new smart thermostat have that the previous one did not? **[MULTISELECT]**

1. Web and smartphone-based thermostat control
2. Two-way communications (e.g., ability for your utility to adjust your thermostat during high-energy use periods)
3. Ability to set and modify a schedule
4. Ability to view information about your energy consumption
96. Other features (write in) **[OPEN ENDED]**

41. Who installed the new smart thermostat you purchased?

1. I installed it myself
2. A friend/family member installed it for me
3. An HVAC technician, electrician, or other professional installed it
98. I don't know

42. How did you learn about the features of your smart thermostat and how to operate it? **[MULTISELECT]**

1. Thermostat's user manual
2. Information provided by **[UTILITY]**
3. From an HVAC technician, electrician, or other professional
4. From a friend or family member
5. Online (YouTube, manufacturer's website, etc.)
96. Other (Please specify) **[OPEN-ENDED]**
98. I don't know

43. Is the new smart thermostat currently installed?

1. Yes
2. No
98. I don't know

[DISPLAY Q44 IF Q43=1]

44. Is the new smart thermostat currently working properly?

1. Yes
2. No
98. I don't know

[DISPLAY Q44 IF Q43=2 OR Q44=2]

45. Why is it not installed or working properly?
[OPEN-ENDED]

FREE RIDERSHIP

EFFICIENT MEASURE1/2

[DISPLAY SECTION IF MEASURE_NAME1/2<>BLANK]

[DISPLAY TEXT IF MEASURE_NAME2<>BLANK AND TSTAT_QUANT>0]

For the next set of questions, please only think about the [MEASURE_NAME1] you received the [UTILITY] rebate for. We realize you may have received rebates for other products as well, but these questions will only ask about the [MEASURE_NAME1].

46. Before you heard about the [UTILITY] rebate, had you already planned to purchase the [MEASURE_NAME1]?

1. Yes
2. No
98. I don't know

47. Would you most likely have purchased the same [MEASURE_NAME1] without the rebate from [UTILITY]?

1. Yes
2. No
98. I don't know

[DISPLAY Q48 IF Q47= 2 OR 98]

48. Would you most likely have purchased a different [MEASURE_NAME1] without the [UTILITY] rebate or would you have decided not to purchase it?

1. I would have purchased a different [MEASURE_NAME1]
2. I would have decided not to purchase it
98. I don't know

[DISPLAY Q49 AND Q50 IF Q48=1 OR Q47 = 1]

49. Without the rebate from [UTILITY], what efficiency level of equipment would you most likely have purchased?

1. Same efficiency as purchased or higher
2. Lower efficiency
3. Lowest efficiency or lowest cost option available
98. I don't know

50. Thinking about timing, without the [UTILITY] rebate, when would you most likely have purchased the [MEASURE_NAME1]?

1. At the same time
2. Later, but within the same year
3. One to two years out
4. More than two years out or never
98. I don't know

[DISPLAY Q51 IF TSTAT_QUANT>1 AND Q47=1 OR Q48=1]

51. Without the instant rebate from [UTILITY], how many [MEASURE_NAME1](s) would you most likely have purchased?
[NUMERIC TEXT BOX]

52. Please rate how important the following factors were on your decision to purchase and install the [MEASURE_NAME1]. If an element is not applicable to you, please select "N/A" Use a scale from 1 to 5, with 1 meaning the factor was "not at all important" and 5 meaning the factor was "extremely important" in your decision to purchase the ENERGY STAR® [MEASURE_NAME1]. **[INSERT SCALE AS DEFINED WITH 1=NOT AT ALL IMPORTANT, 2=SLIGHTLY IMPORTANT, 3=MODEERATELY IMPORTANT, 5=EXTREMELY IMPORTANT, 98=I DON'T KNOW, AND 99=NOT APPLICABLE; RANDOMIZE ROWS 1-5]**

1. The [UTILITY] rebates for the [MEASURE_NAME1](s)
2. Recommendation from [UTILITY] program staff or program implementer
3. Information about energy efficiency that [UTILITY] provided
4. Information from contractor or vendor
5. Previous participation in a [UTILITY] energy efficiency program

53. In your own words, can you please describe how important the rebate and information or education from [UTILITY] was on your decision to purchase and install the [MEASURE_NAME1]?
[OPEN-ENDED]

[DISPLAY IF MEASURE_NAME2<> BLANK]

54. [UTILITY] records show that this property also received an incentive from [UTILITY] for a [MEASURE_NAME2]. Was the decision-making process for that purchase the same as for the [MEASURE_NAME1] purchase?

1. Yes
2. No [REPEAT Q46 – Q53]
98. I don't know

THERMOSTAT

[DISPLAY SECTION IF THERM=1]

55. Before you heard about the [UTILITY] rebate, had you already planned to purchase the smart thermostat?

1. Yes
2. No
98. I don't know

56. Would you most likely have purchased the same thermostat without the rebate from [UTILITY]?

1. Yes
2. No
98. I don't know

[DISPLAY Q57 IF Q56= 2 OR 98]

57. Would you most likely have purchased a different thermostat(s) without the [UTILITY] rebate or would you have decided not to purchase it?

1. I would have purchased a different thermostat(s)
2. I would have decided not to purchase it
98. I don't know

[DISPLAY Q58 IF Q57= 1 OR Q56 = 1]

58. Without the rebate from [UTILITY], what kind of thermostat would you most likely have purchased?

1. A smart or learning thermostat
2. A WiFi thermostat (non-learning)
3. A programmable or manual thermostat
4. Would not have purchased a new thermostat
98. I don't know

59. Thinking about timing, without the [UTILITY] rebate, when would you most likely have purchased the thermostat(s)?

1. At the same time
2. Later, but within the same year
3. One to two years out
4. More than two years out or Never
98. I don't know

[DISPLAY Q60 IF TSTAT_QUANT >1 AND Q56=1 OR Q57=1]

60. Without the instant rebate from [UTILITY], how many smart thermostats would you most likely have purchased?

[OPEN ENDED]

61. Please rate how important the following factors were on your decision to purchase and install the thermostat(s). If an element is not applicable to you, please select "N/A" Use a scale from 1 to 5, with 1 meaning the factor

was “not at all important” and 5 meaning the factor was “extremely important” in your decision to purchase the thermostat(s). **[INSERT SCALE AS DEFINED WITH 1=NOT AT ALL IMPORTANT, 2=SLIGHTLY IMPORTANT, 3=MODEERATELY IMPORTANT, 5=EXTREMELY IMPORTANT, 98=I DON’T KNOW, AND 99=NOT APPLICABLE; RANDOMIZE ROWS 1-5]**

1. The [UTILITY] rebates for the thermostat(s)
2. Recommendation from [UTILITY] program staff or program implementer
3. Information about energy efficiency that [UTILITY] provided
4. Information from a contractor or vendor
5. Previous participation in a [UTILITY] energy efficiency program

62. In your own words, can you please describe how important the rebate and information or education from [UTILITY] was on your decision to purchase and install the smart thermostat(s)?

[OPEN-ENDED]

SPILOVER

63. Since purchasing the [ALL_MEASURES], have you made any energy-efficiency improvements or installed any other energy-efficiency products in your home that you did NOT receive for free or a rebate from [UTILITY] or another organization for?

1. Yes
2. No
98. I don't know

[DISPLAY Q64 IF Q63=1]

64. Please select the energy-efficient products or improvements that you purchased (and installed, if applicable) since you received the rebate from [UTILITY] for the [ALL_MEASURES](s).

1. Gas Boiler
2. Gas Furnace
3. Gas Tank-less water heater
4. Gas Storage water heater
5. Electric Tank-less water heater
6. Insulation
7. Duct sealing
8. ENERGY STAR Clothes Washer
9. ENERGY STAR Dishwasher
10. ENERGY STAR Windows
11. Wi-Fi enabled thermostat or Smart thermostat

12. Programmable thermostat
13. LED Lighting
14. ENERGY STAR Refrigerator
15. Heat pump water heater
16. ENERGY STAR Room AC
17. Central AC
18. Heat Pump
19. ENERGY STAR Dehumidifier
20. ENERGY STAR Air Purifier
96. Other (Please specify) **[OPEN-ENDED]**

[DISPLAY Q65 IF Q63=1]

65. On a scale from 1 to 5, with 1 meaning “not at all important” and 5 meaning “very important”, please rate how important your experience with the [UTILITY] program was in your decision to install this/these energy-efficient products(s). **[INSERT 1-5 SCALE, WHERE 1 = NOT AT ALL IMPORTANT, 2=SLIGHTLY IMPORTANT, 3=MODERATELY IMPORTANT, 4=VERY IMPORTANT, AND 5 = VERY EASY, WITH 98 = I DON’T KNOW AND 99 = PREFER NOT TO STATE]**

[DISPLAY Q66 IF Q64=6]

66. What type of insulation did you install?
1. Attic
 2. Wall
 98. Other (Please specify) **[OPEN-ENDED]**

[DISPLAY Q67 IF Q64=6]

67. How many square feet of insulation did you install?
1. **[TEXT BOX]** square feet
 98. I don’t know

[DISPLAY Q68 IF Q64=7]

68. How many linear feet of duct sealing did you install?
1. **[TEXT BOX]** linear feet
 98. I don’t know

[DISPLAY Q69 IF Q64=18]

69. What type of heat pump(s) did you install? Select all that apply.
1. Central air source
 2. Ground source/geothermal
 3. Ductless/mini-split

[DISPLAY Q70 IF Q64=16]

70. How many ENERGY STAR room air conditioners did you buy?
[OPEN ENDED]

[DISPLAY Q71 IF Q64=11]

71. How many smart thermostats did you buy?
[OPEN ENDED]

[DISPLAY Q72 IF Q64=12]

72. How many programmable thermostats did you buy?
[OPEN ENDED]

[DISPLAY Q73 IF Q64=13]

73. How many LED light bulbs did you buy?
[OPEN ENDED]

[DISPLAY Q74 IF Q64=19]

74. How many ENERGY STAR dehumidifiers did you buy?
[OPEN ENDED]

[DISPLAY Q75 IF Q64=20]

75. How many ENERGY STAR air purifiers did you buy?
[OPEN ENDED]

[DISPLAY Q76 IF Q64= 1, 2, 3, 4, 11, 12, 15, 17, 18]

76. Why didn't you apply for and receive a rebate for [Q64 RESPONSE]?
1. I did not know rebate was available
2. Product did not quality
96. Other (Please specify) **[OPEN-ENDED]**

[DISPLAY Q77 AND Q78 FOR EACH Q64 RESPONSE]

77. How did you know the [Q64 RESPONSE] was energy efficient?
[OPEN ENDED]

78. In what year did you buy the [Q64 RESPONSE]?
1. Before 2020
2. 2020
3. 2021
4. 2022
5. I can't recall

CONTRACTOR & FINANCING EXPERIENCE
[SHOW IF SERVICE_PROVIDER<>BLANK]

79. We would like to ask a series of questions to gauge your experience with [SERVICE_PROVIDER]. Please rate your level of agreement on a scale from 1 (strongly disagree) to 5 (strongly agree).

1. Strongly Disagree
- 2.
- 3.
- 4.
5. Strongly Agree
98. I don't know

1. [SERVICE_PROVIDER] had a good knowledge of the application process
2. [SERVICE_PROVIDER] made the [UTILITY] rebate process easy for me to understand
3. [SERVICE_PROVIDER] was professional during all interactions including sales and installation
4. [SERVICE_PROVIDER] was knowledgeable about the energy efficient equipment they were recommending

[DISPLAY Q80 IF ANY Q79 A-C < 3]

80. Could you please elaborate on those ratings of the contractor you worked with?

[OPEN-ENDED]

81. Did you apply for financing through the On-Bill Repayment Program?

1. Yes
2. No

[DISPLAY Q82 IF Q81 = 2]

82. Why didn't you apply for financing through the On-Bill Repayment Program? [SELECT ALL THAT APPLY]

1. Not interested
2. I did not know there was a financing option available
3. I could not figure out how to apply
4. I did not understand how it worked
96. Other (Please specify) **[OPEN-ENDED]**
98. I don't know **[MAKE EXCLUSIVE]**

[DISPLAY Q83 IF Q82 = 2]

83. Would you have installed any other additional energy efficient equipment if you had known there were options to finance the purchase(s) through the On-Bill Repayment Program?

1. Yes
2. No
98. I don't know

[DISPLAY Q84 IF Q81 = 1]

84. Were you approved to receive financing through the On-Bill Repayment Program?

1. Yes
2. No

[DISPLAY Q85 IF Q84 = 1]

85. Would you have been able to install the [ALL_MEASURES] if you did not participate in the On-Bill Repayment Program?

1. Yes
2. No
96. Other (Please specify) [**OPEN-ENDED**]
98. I don't know [**MAKE EXCLUSIVE**]

SATISFACTION

86. How did you learn about the rebates available from [UTILITY]? [SELECT ALL THAT APPLY]

1. [UTILITY] Bill Insert
2. Other Mail from [UTILITY]
3. [UTILITY] representative
4. [UTILITY] Website
5. [UTILITY] post on a social networking site (e.g., Facebook or Twitter)
6. Community Event
7. Retail Store
8. Contractor
9. Newspaper/magazine/print media
10. Radio
11. Word-of-Mouth/Family Member/Friend
12. Internet Search
13. Email from [UTILITY]
96. Other (Please specify) [**OPEN-ENDED**]
98. I don't know [**MAKE EXCLUSIVE**]

87. Did you contact [UTILITY] with questions about your rebate or rebate application?

1. Never
2. Once
3. 2 or 3 times
4. 4 times or more
98. I don't know

[SHOW Q88 IF Q87 = 2, 3, OR 4]

88. How did you contact them? [SELECT ALL THAT APPLY]

1. Phone
2. E-mail/online
3. Letter
4. In person
98. I don't know

89. Using a scale from 1 (very difficult) to 5 (very easy), how difficult was it to apply for the rebates for the [MEASURES_ALL]? [INSERT 1-5 SCALE, WHERE 1 = VERY DIFFICULT AND 5 = VERY EASY, WITH 98 = I DON'T KNOW AND 99 = PREFER NOT TO STATE]

[DISPLAY Q90 IF Q89= 1-3]

90. What made it difficult?
[OPEN-ENDED]

91. From the time you submitted the application, about how many weeks did it take to receive your rebate?

1. 1 – 2 weeks
2. 2 – 3 weeks
3. 3 – 4 weeks
4. 4 – 5 weeks
5. 5 – 6 weeks
6. More than 6 weeks
98. I don't know

92. On a scale of 1 to 5 where 1 means very dissatisfied and 5 means very satisfied, please rate how satisfied or dissatisfied you were with each of the following.

Display Logic	Row Text	1 - Very Dissatisfied	2	3	4	5 - Very Satisfied	I don't know
[DISPLAY IF CW = 1]a	your new ENERGY STAR® Clothes Washer						
[DISPLAY IF CD = 1]b	your new ENERGY STAR® Clothes Dryer						
[DISPLAY IF WAT = 1]c	your new ENERGY STAR® Hot Water Heater						
[DISPLAY IF BOIL = 1]d	your new ENERGY STAR® Boiler						
[DISPLAY IF COMBI = 1]f	your new ENERGY STAR® Combi heater						
[DISPLAY IF TSTAT_QUANT >0]g	your new Smart Thermostat	1	2	3	4	5	98
[DISPLAY IF FURN = 1]h	your new Furnace						
[DISPLAY IF BOILER_RESET=1]g	your new reset controls for boiler						
[DISPLAY IF Q84=1]h	On-bill Repayment Program						
[DISPLAY IF Q87=1]i	your communications with [UTILITY]						
[DISPLAY IF CONTRACTION<>BLANK]	your experience with [SERVICE_PROVIDER]						
ALL	how long it took to receive the rebate						
ALL	this [MEASURE_ALL] rebate experience overall						

[SHOW Q93 IF Q89 = 1 OR 2]

93. Why were you dissatisfied?

[OPEN-ENDED]

94. Have you noticed any savings on your [UTILITY] bill since installing your new [ALL_MEASURES]?

1. Yes
2. No
98. I don't know

95. Have you recommended this [UTILITY] rebate opportunity to others?

1. Yes
2. No
98. I don't know

[DISPLAY Q96 IF Q95=2, 98, 9]

96. What is the likelihood you would recommend the rebates [UTILITY] offers to a friend or colleague? Please use a scale from 0 (not at all likely) to 10 (extremely likely). [INSERT SCALE AS DEFINED, WITH 98 = I DON'T KNOW]

97. What would you change about your experience receiving a rebate for the [ALL_MEASURE] from [UTILITY], if anything? [MULTI-SELECT]
1. Would not change anything
 2. Improve the application process
 3. Speed up rebate payment time
 4. [UTILITY] should improve marketing
 5. [UTILITY] could provide more info about how much I will save by installing [ALL_MEASURE]
 6. Increase variety of products with rebates available
96. Other (Please specify) **[OPEN-ENDED]**
98. I don't know
98. Since purchasing the [ALL_MEASURE], have you purchased any other discounted equipment or participated in any programs offered by [UTILITY]?
1. Yes
 2. No

[DISPLAY Q99 IF Q98=1]

99. What types of equipment rebates or services did you receive from [UTILITY]?
1. Appliance rebates
 2. HVAC and Water Heating Rebates
 3. 0% APR financing for HVAC equipment through the On-Bill Repayment Program (OBRP)
 4. Whole-house energy-saving solutions through the Home Performance with ENERGY STAR Program
 5. A FREE in-home energy assessment with the Quick Home Energy Checkup (QHEC)
 6. An on-site energy assessment and incentives for multi-family buildings
 7. FREE home weatherization services for income-qualified customers
 8. Discounted energy-saving products through the online [UTILITY] Marketplace
 9. Instant Home Energy Analysis
98. Other (Please specify) **[OPEN-ENDED]**

[DISPLAY Q100 IF Q98=2 OR 98]

100. Are you aware of other [UTILITY] incentive or rebate programs for energy efficient equipment or improvements?
1. Yes
 2. No

[DISPLAY Q101 IF Q98=1]

101. On a scale from 0 to 10 where 0 represents “not at all important” and 10 represents “very important”, how important was your [UTILITY] rebate in your decision to participate in the other program? [INSERT SCALE AS DEFINED WITH I DON'T KNOW=98, REFUSED=99]

[DISPLAY Q102 IF Q98=2 AND Q100=1]

102. Why haven't you participated in any other [UTILITY] programs? (Please select all that apply) **[MULTISELECT]**
1. Did not have the time
 2. Not interested
 3. Available programs are not applicable to my home
 4. There are too many steps to participate
 5. I could not figure out how to apply or participate
97. Other (Please specify) **[OPEN-ENDED]**
98. I don't know **[MAKE EXCLUSIVE]**

HOUSEHOLD CHARACTERISTICS / DEMOGRAPHICS

103. Do you rent or own your home?
1. Rent
 2. Own
96. Other (Please specify) **[OPEN-ENDED]**
104. Which of the following best describes your home?
1. Single-family detached
 2. Duplex
 3. Triple decker (e.g., three story house with each floor being a separate unit)
 4. Apartment/condo in a 2-4 unit building
 5. Apartment/condo in a 5+ unit building
 6. Single family townhouse or row house (adjacent walls to another house)
 7. Mobile home or trailer
96. Other (Please specify) **[OPEN-ENDED]**
98. I don't know
105. When was your home built?

1. Before 1960
2. 1960-1979
3. 1980-1999
4. 2000-2009
5. 2010 or later
98. I don't know

106. About how many square feet is your home? If you are unsure, an estimate is OK.

1. Less than 1,000 square feet
2. 1,000-1,999 square feet
3. 2,000-2,999 square feet
4. 3,000-3,999 square feet
5. 4,000-4,999 square feet
6. 5,000 or greater square feet
98. I don't know

107. What is the main fuel used for heating your home?

1. Electricity
2. Natural Gas
3. Propane
4. Oil
96. Other (Please specify) **[OPEN-ENDED]**
98. I don't know

108. What fuel does your main water heater use?

1. Electricity
2. Natural Gas
3. Propane
4. Oil
97. Other (Please specify) **[OPEN-ENDED]**
98. I don't know

109. What is your age?

1. Under 35 years old
2. 35-55 years old
3. Over 55 years old
99. Prefer not to answer

110. What is the primary language spoken in your home?

1. English
2. Spanish
3. Chinese
4. Hindi

- 5. Gujarathi
- 6. Portuguese
- 7. Russian
- 8. Tagalog
- 9. Arabic
- 10. Korean
- 11. Polish
- 96. Other (Please specify)
- 99. Prefer not to answer

111. Which of the following best describes the race or ethnic background you identify with? (Please select all that apply)

- 1. Black or African American
- 2. Hispanic or Latino/Latina
- 3. American Indian and Alaska Native
- 4. Asian
- 5. Middle Eastern or North African
- 6. Native Hawaiian and Other Pacific Islander
- 7. White
- 8. Not Listed (Please specify): [OPEN-ENDED]
- 96. Not Listed (Please specify): [OPEN-ENDED]
- 99. Prefer not to answer

112. Including yourself, how many people are living in your household?
[DROP DOWN BOX – 1-14 or more, 99. Prefer not to answer]

113. Is your annual household income over or under [CUTOFF]?

- IF Q112 = 1 CUTOFF = \$33,976
- IF Q112 = 2 CUTOFF = \$45,776
- IF Q112 = 3 CUTOFF = \$57,576
- IF Q112 = 4 CUTOFF = \$69,376
- IF Q112 = 5 CUTOFF = \$81,176
- IF Q112 = 6 CUTOFF = \$92,976
- IF Q112 = 7 CUTOFF = \$104,776
- IF Q112 = 8 CUTOFF = \$116,576
- IF Q112 = 9 CUTOFF = \$128,377
- IF Q112 = 10 CUTOFF = \$140,178
- IF Q112 = 11 CUTOFF = \$151,979
- IF Q112 = 12 CUTOFF = \$163,780
- IF Q112 = 13 CUTOFF = \$175,581
- IF Q112 = 14 CUTOFF = \$187,382
- 1. Over
- 2. Under
- 98. I don't know
- 99. Prefer not to answer

[DISPLAY Q114 IF Q113= 1]

114. Is your annual household income over or under [CUTOFF]?

- IF Q112 = 1 CUTOFF = \$54,360
- IF Q112 = 2 CUTOFF = \$73,240
- IF Q112 = 3 CUTOFF = \$92,120
- IF Q112 = 4 CUTOFF = \$111,000
- IF Q112 = 5 CUTOFF = \$129,880
- IF Q112 = 6 CUTOFF = \$148,760
- IF Q112 = 7 CUTOFF = \$167,640
- IF Q112 = 8 CUTOFF = \$186,520
- IF Q112 = 9 CUTOFF = \$205,400
- IF Q112 = 10 CUTOFF = \$224,280
- IF Q112 = 11 CUTOFF = \$243,160
- IF Q112 = 12 CUTOFF = \$262,040
- IF Q112 = 13 CUTOFF = \$280,920
- IF Q112 = 14 CUTOFF = \$299,800

- 1. Over
- 2. Under
- 98. I don't know
- 99. Prefer not to answer

THANK YOU

Thank you for participating in this survey. Have a great day!

TERMINATION PAGE

Thank you for your time – however, this survey is meant only for customers who recall receiving a rebate from [UTILITY].

Client: SJIU
 Program: Online Marketplace
 Mode: Email

RESEARCH OBJECTIVES

Evaluation Question	Survey Question
Is there cross participation between the delivery channels or between the EEP program and other programs offered by the company? Has participation in one of the EEP program channels influenced customers to participate in other program offerings?	Q72-Q76
Is each delivery channel of the program adequately serving different types of customers (e.g., based on homeownership, income level, education level, geographic area, ethnicity)?	Q78-Q89
Are the incentive levels appropriately set for each product / delivery channel? Should incentives be increased to promote participation? Could incentives levels be decreased without significantly impacting participation?	Free ridership battery
How are customers learning about the rebates available? Are the marketing efforts effective and useful or are customers finding out about the program in other ways?	Q65
What are the end user experiences like with ordering and receiving products through the online marketplace?	Q66-Q67, Q71
How are customers learning about the online marketplace? Are the marketing efforts effective and useful or are customers finding out about the program in other ways?	Q65
Were participants satisfied with the products available through the marketplace? What are any causes of dissatisfaction?	Q66-Q67

PREDEFINED VARIABLES

Variable	Definition
UTILITY	Utility name
YEAR	Year of participation
ALL_MEASURES	List of all measures for which customer received a rebate
NTG_MEASURES	List of the randomly selected measures for the NTG battery.
MEASURE_NAME1 MEASURE_NAME2	Description of measure selected for free ridership assessment, excluding smart thermostats.(e.g., bathroom aerator, kitchen aerator, showerhead)
MEASURE1_QTY MEASURE2_QTY	Number of each measure purchased selected for free ridership assessment
SHOWER_QUANT	Number of showerheads purchased
BATH_QUANT	Number of bathroom aerators purchased
KITCHEN_QUANT	Number of kitchen aerators purchased
TSTAT_QUANT	Quantity of thermostats

EMAIL SURVEY MESSAGE

Subject: Help Improve [UTILITY]'s Energy Efficiency Programs

Reply To: adm-surveys@admenergy.com

From Name: [UTILITY]

Program records indicate you purchased [ALL_MEASURES] from the [UTILITY] Efficient Product Marketplace in [YEAR]. [UTILITY] is interested in gathering feedback from customers like you to help improve the program in the future.

Click here to provide feedback: [SURVEY LINK]

We would greatly appreciate your taking a few minutes to provide your feedback. If you have questions or require technical assistance, please respond to this email or contact us at adm-surveys@admenergy.com.

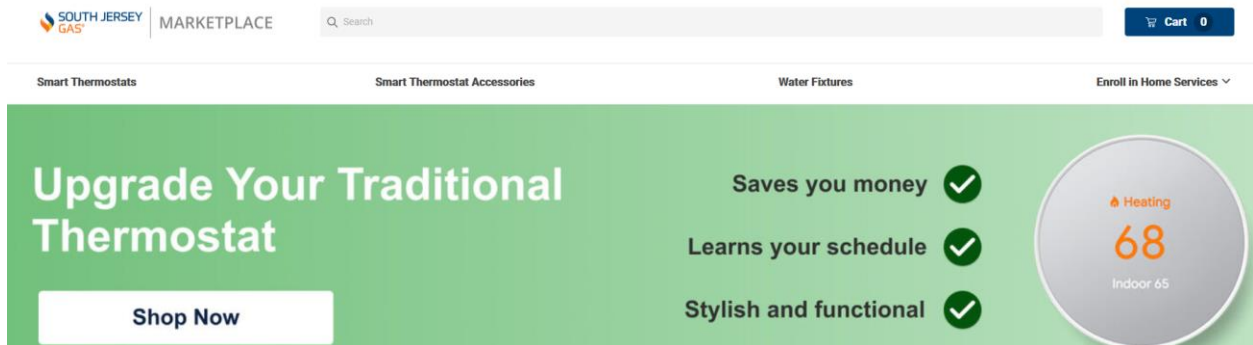
If you wish to no longer receive emails about this survey, please click on the "Unsubscribe" link below. Thank you in advance for your time!

Kind Regards,
ADM Associates / Contractor to [UTILITY]

SCREENING

1. Just to confirm, our records say that you bought a [MEASURES_ALL] from the [UTILITY] Online Marketplace (shown below) in [YEAR]. Does that sound about right?
 1. Yes
 2. No [Terminate and tally as No]
98. I am not sure [Terminate and tally as Not sure]

As a reminder, this is what the online Efficient Product Marketplace looks like:



BATH VERIFICATION

[DISPLAY Q2 IF BATH_QUANT > 0]

2. Are/is the [BATH_QUANT] high efficiency bathroom faucet aerator(s) that you purchased from the Online Marketplace currently installed?
 1. Yes
 2. [DISPLAY IF BATH_QUANT > 1] Some are
 3. No, none are

[DISPLAY Q4 IF Q2= 2]

4. How many of the [BATH_QUANT] high efficiency bathroom faucet aerator(s) that you purchased are currently installed?

[OPEN-ENDED]

[DISPLAY Q5 IF Q2= 2]

5. How many more of the high efficiency bathroom faucet aerator(s) do you think you will install in the next six months?

[OPEN-ENDED]

[DISPLAY Q6 IF Q2= 3]

6. How many of the high efficiency bathroom faucet aerator(s) do you think you will install in the next six months?

[OPEN-ENDED]

[DISPLAY Q7 IF Q2= 2 OR 3]

7. Why have you not installed all of the high efficiency bathroom faucet aerator(s)? (Select all that apply)
1. I have not had the time to install them
 2. I am not interested in installing them
 3. I need help installing them
 4. I don't like them
 5. Doesn't fit my faucet
 6. All my bathroom faucets have high efficiency aerator(s)
 96. Other (Please specify) **[OPEN-ENDED]**
 98. I don't know

KITCHEN VERIFICATION

[DISPLAY Q8 IF KITCHEN_QUANT > 0]

8. Are/is the [KITCHEN_QUANT] high efficiency kitchen faucet aerator(s) that you purchased from the Online Marketplace currently installed?
1. Yes
 2. **[DISPLAY IF BATH_QUANT > 1]** Some are
 3. No, none are

[DISPLAY Q9 IF Q8= 2]

9. How many of the [KITCHEN_QUANT] high efficiency kitchen faucet aerator(s) that you purchased are currently installed?

[OPEN-ENDED]

[DISPLAY Q10 IF Q8=2]

10. How many more of the high efficiency kitchen faucet aerator(s) do you think you will install in the next six months?

[OPEN-ENDED]

[DISPLAY Q11 IF Q8= 3]

11. How many of the high efficiency kitchen faucet aerator(s) do you think you will install in the next six months?

[OPEN-ENDED]

[DISPLAY Q12 IF Q8=2 OR 3]

12. Why have you not installed all of the high efficiency kitchen faucet aerator(s)? (Select all that apply)

1. I have not had the time to install them
2. I am not interested in installing them
3. I need help installing them
4. I don't like them
5. Doesn't fit my faucet
6. All my kitchen faucets have high efficiency aerators
96. Other (Please specify) **[OPEN-ENDED]**
98. I don't know

SHOWER VERIFICATION

[DISPLAY Q13 IF SHOWER_QUANT > 0]

13. Are/is the [SHOWER_QUANT] low flow showerheads(s) that you purchased from the Online Marketplace currently installed?

1. Yes
2. **[DISPLAY IF SHOWER_QUANT > 1]** Some are
3. No, none are

[DISPLAY Q14 IF Q13= 2]

14. How many of the [SHOWER_QUANT] low flow showerheads(s) that you purchased are currently installed?

[OPEN-ENDED]

[DISPLAY Q15 IF Q13=2]

15. How many more of the low flow showerheads(s) do you think you will install in the next six months?

[OPEN-ENDED]

[DISPLAY Q15 IF Q13= 3]

16. How many of the low flow showerheads(s) do you think you will install in the next six months?

[OPEN-ENDED]

[DISPLAY Q17 IF Q13=2 OR 3]

17. Why have you not installed all of the low flow showerheads(s)? (Select all that apply)

1. I have not had the time to install them
2. I am not interested in installing them

3. I need help installing them
4. I don't like them
5. Doesn't fit my faucet
6. All my showers have low flow showerhead(s) installed
96. Other (Please specify) **[OPEN-ENDED]**
98. I don't know

THERMOSTAT

[DISPLAY SECTION IF TSTAT_QUANT>0]

According to our records you purchased [TSTAT_QUANT] smart thermostat(s). When answering these questions please think of the thermostat that controls the temperature of the room that is occupied the most.

18. What is the make and model of the smart thermostat?
[OPEN-ENDED]

19. Is the new smart thermostat currently installed?
1. Yes
 2. No
 98. I don't know

[DISPLAY Q20 IF Q19= 2]

20. Why haven't you installed the smart thermostat yet?

1. Waiting for a professional to install it
2. Haven't had time
96. Other (Please specify) **[OPEN-ENDED]**

[DISPLAY Q21 IF Q19=1]

21. Is the new smart thermostat working properly?

1. Yes
2. No
98. I don't know

[DISPLAY Q22 IF Q21=2]

22. How is it not working properly?
[OPEN-ENDED]

23. Does your smart thermostat provide the following services: **[INSERT GRID WITH, 1 = YES, 2 = NO, 98 = I DON'T KNOW]**

1. Web and smartphone-based thermostat control
2. Two-way communications (e.g., ability for your utility to adjust your thermostat during high-energy use periods)
3. Ability to set and modify a schedule
4. Ability to view information about your energy consumption_

[DISPLAY Q24 IF Q23.1-Q23.4=1]

24. Which of those features have you used? **[INSERT GRID WITH, 1 = YES I HAVE USED THIS FEATURE, 2 = NO I HAVE NOT USED THIS FEATURE, 98 = I DON'T KNOW]**

1. Web and smartphone-based thermostat control [DISPLAY IF Q23.1=1]
2. Two-way communications (e.g., ability for your utility to adjust your thermostat during high-energy use periods) [DISPLAY IF Q23.2=1]
3. Ability to set and modify a schedule [DISPLAY IF Q23.3=1]
4. Ability to view information about your energy consumption_ [DISPLAY IF Q23.4=1]

25. What type of thermostat did your smart thermostat replace?

1. Manual/non-programmable (allows users to directly set thermostat setpoints)
2. Programmable (allows users to program future setpoints, such as automatically adjusting temperature at night and in the morning)
3. A smart thermostat with the same features
4. A smart thermostat with additional features
5. Did not previously have a thermostat
98. I don't know

[DISPLAY Q26 IF Q25=4]

26. What features does your new smart thermostat have that the previous one did not? **[MULTISELECT]**

1. Web and smartphone-based thermostat control
2. Two-way communications (e.g., ability for your utility to adjust your thermostat during high-energy use periods)
3. Ability to set and modify a schedule
4. Ability to view information about your energy consumption_
96. Other features (write in)

27. Who installed the new smart thermostat you purchased?

1. I installed it myself
2. A friend/family member installed it for me
3. An HVAC technician, electrician, or other professional installed it
96. Other (please specify): **[OPEN-ENDED]**
98. I don't know

28. How did you learn about the features of your smart thermostat and how to operate it? **[MULTISELECT]**

1. Thermostat's user manual
2. Information provided by [UTILITY]
3. From an HVAC technician, electrician, or other professional
4. From a friend or family member

- 5. Online (YouTube, manufacturer's website, etc.)
- 97. Other (Please specify) **[OPEN-ENDED]**
- 98. I don't know

FREE RIDERSHIP

EFFICIENT MEASURE1/2

[DISPLAY SECTION IF MEASURE_NAME1/2<>BLANK]

[DISPLAY TEXT IF MEASURE_NAME2<>BLANK AND TSTAT_QUANT>0]

For the next set of questions, please only think about the [NTG_MEASURES] you purchased from [UTILITY]'s Online Marketplace. We realize you may have purchased other products from the Online Marketplace as well, but these questions will only ask about the [MEASURE_NAME1].

- 29. Before you heard about the [UTILITY] rebate, had you already planned to purchase the efficient [MEASURE1]?
 - 1. Yes
 - 2. No
 - 98. I don't know

- 30. Would you most likely have purchased the same efficient [MEASURE1](s) without the instant rebate from [UTILITY]?
 - 1. Yes
 - 2. No
 - 98. I don't know

[DISPLAY Q31 IF Q30= 2 OR 98]

- 31. Would you most likely have purchased a different [MEASURE1] without the [UTILITY] instant rebate or would you have decided not to purchase it?
 - 1. I would have purchased a different [MEASURE1]
 - 2. I would have decided not to purchase it
 - 98. I don't know

[DISPLAY Q32 AND Q33 IF Q31 = 1 OR Q30=1]

- 32. Without the instant rebate from [UTILITY], what type of equipment would you most likely have purchased?
 - 1. Same efficiency as purchased or higher
 - 2. Lower efficiency
 - 3. Lowest efficiency or lowest cost option available
 - 98. I don't know

33. Thinking about timing, without the [UTILITY] instant rebate, when would you most likely have purchased the [MEASURE1]?
1. At the same time
 2. Later, but within the same year
 3. One to two years out
 4. More than two years out or never
98. I don't know

[DISPLAY Q34 IF MEASURE1_QTY>1 AND Q31=1 OR Q30 =1 AND ALL_MEASURES DOES NOT CONTAIN WATER CONSERVATION KIT]

34. Without the instant rebate from [UTILITY], how many [MEASURE1](s) would you most likely have purchased?
[NUMERIC TEXT BOX]

[DISPLAY Q35-Q37 IF ALL_MEASURES CONTAINS WATER CONSERVATION KIT]

35. Without the instant rebate from [UTILITY], how many low flow showerheads would you most likely have purchased?
[NUMERIC TEXT BOX]
36. Without the instant rebate from [UTILITY], how many kitchen faucet aerators would you most likely have purchased?
[NUMERIC TEXT BOX]
37. Without the instant rebate from [UTILITY], how many bathroom faucet aerators would you most likely have purchased?
[NUMERIC TEXT BOX]
38. Please rate how important the following factors were on your decision to purchase and install the [MEASURE_NAME1]. If an element is not applicable to you, please select "N/A" Use a scale from 1 to 5, with 1 meaning the factor was "not at all important" and 5 meaning the factor was "extremely important" in your decision to purchase the [MEASURE_NAME1]. **[INSERT SCALE AS DEFINED WITH 1=NOT AT ALL IMPORTANT, 2=SLIGHTLY IMPORTANT, 3=MODEERATELY IMPORTANT, 5=EXTREMELY IMPORTANT, 98=I DON'T KNOW, AND 99=NOT APPLICABLE; RANDOMIZE ROWS 1-5]**
1. The [UTILITY] rebates for the efficient [MEASURE_NAME1](s)
 2. Recommendation from [UTILITY] program staff or program implementer
 3. Information about energy efficiency that [UTILITY] provided
 4. Information from a contractor or vendor
 5. Previous participation in a [UTILITY] energy efficiency program

39. In your own words, can you please describe how important the rebate and information or education from [UTILITY] was on your decision to purchase and install the [MEASURE_NAME1]?

[OPEN-ENDED]

[DISPLAY IF MEASURE_NAME2<> BLANK]

40. [UTILITY] records show that this property also received an instant rebate from [UTILITY]'s Online Marketplace for a [MEASURE_NAME2]. Was the decision-making process for that purchase the same as for the [MEASURE_NAME1] purchase?

1. Yes
2. No [REPEAT Q29 – Q39]

THERMOSTAT

[DISPLAY SECTION IF TSTAT_QUANT>0]

41. Before you heard about the [UTILITY] instant rebate, had you already planned to purchase the thermostat?

1. Yes
2. No
98. I don't know

42. Would you most likely have purchased the same thermostat without the instant rebate from [UTILITY]?

1. Yes
2. No
98. I don't know

[DISPLAY Q43 IF Q42= 2 OR 98]

43. Would you most likely have purchased a different thermostat(s) without the [UTILITY] instant rebate or would you have decided not to purchase it?

1. I would have purchased a different thermostat(s)
2. I would have decided not to purchase it
98. I don't know

[DISPLAY Q44 IF Q42= 1 OR Q43= 1]

44. Without the instant rebate from [UTILITY], what kind of thermostat would you most likely have purchased?

1. A smart or learning thermostat
2. A WiFi thermostat (non-learning)
3. A programmable or manual thermostat
4. Would not have purchased a new thermostat
98. I don't know

45. Thinking about timing, without the [UTILITY] instant rebate, when would you most likely have purchased the thermostat(s)?

1. At the same time
2. Later, but within the same year
3. One to two years out
4. More than two years out or never
98. I don't know

[DISPLAY Q46 IF TSTAT_QUANT>1 AND Q42=1 OR Q43=1]

46. Without the instant rebate from [UTILITY], how many thermostats would you most likely have purchased?

[OPEN-ENDED]

47. Please rate how important the following factors were on your decision to purchase and install the thermostat(s). If an element is not applicable to

you, please select “N/A” Use a scale from 1 to 5, with 1 meaning the factor was “not at all important” and 5 meaning the factor was “extremely important” in your decision to purchase the thermostat(s). **[INSERT SCALE AS DEFINED WITH 1=NOT AT ALL IMPORTANT, 2=SLIGHTLY IMPORTANT, 3=MODERATELY IMPORTANT, 5=EXTREMELY IMPORTANT, 98=I DON’T KNOW, AND 99=NOT APPLICABLE; RANDOMIZE ROWS 1-5]**

1. The [UTILITY] instant rebates for the thermostat(s)
2. Recommendation from [UTILITY] program staff or program implementer
3. Information about energy efficiency that [UTILITY] provided
4. Information from a contractor or vendor
5. Previous participation in a [UTILITY] energy efficiency program

48. In your own words, can you please describe how important the instant rebate and information or education from [UTILITY] was on your decision to purchase and install the thermostat(s)?
[OPEN-ENDED]

SPILLOVER

49. Since purchasing the [ALL_MEASURES], have you made any energy-efficiency improvements or installed any other energy-efficiency products in your home that you did NOT receive for free or a rebate from [UTILITY] or another organization for?
1. Yes
 2. No
 98. I don't know

[DISPLAY Q50 IF Q49=1]

50. Please select the energy-efficient products or improvements that you bought since you purchased the [ALL_MEASURES](s). Select all that apply. **[MULTI-SELECT]**
1. Gas Boiler
 2. Gas Furnace
 3. Gas Tank-less water heater
 4. Gas Storage water heater
 5. Electric Tank-less water heater
 6. Insulation
 7. Duct sealing
 8. ENERGY STAR Clothes Washer
 9. ENERGY STAR Dishwasher
 10. ENERGY STAR Windows
 11. Wi-Fi enabled thermostat or Smart thermostat
 12. Programmable thermostat

- 13. LED Lighting
- 14. ENERGY STAR Refrigerator
- 15. Heat pump water heater
- 16. ENERGY STAR Room AC
- 17. Central AC
- 18. Heat Pump
- 19. ENERGY STAR Dehumidifier
- 20. ENERGY STAR Air Purifier
- 96. Other (Please specify) **[OPEN-ENDED]**

[DISPLAY Q51 IF Q49=1]

51. On a scale from 1 to 5, with 1 meaning “not at all important” and 5 meaning “very important”, please rate how important your experience with the [UTILITY] program was in your decision to install this/these energy-efficient products(s). **[INSERT 1-5 SCALE, WHERE 1 = NOT AT ALL IMPORTANT, 2=SLIGHTLY IMPORTANT, 3=MODERATELY IMPORTANT, 4=VERY IMPORTANT, AND 5 = VERY EASY, WITH 98 = I DON'T KNOW]**

[DISPLAY Q52 IF Q50=6]

52. What type of insulation did you install?
- 1. Attic
 - 2. Wall
 - 3. Other (Please specify) **[OPEN-ENDED]**

[DISPLAY Q53 IF Q50=6]

53. How many square feet of insulation did you install?
- 1. **[TEXT BOX]** square feet
 - 98. I don't know

[DISPLAY Q54 IF Q50=7]

54. How many linear feet of duct sealing did you install?
- 1. **[TEXT BOX]** linear feet
 - 98. I don't know

[DISPLAY Q55 IF Q50=18]

55. What type of heat pump did you install? Select all that apply.
- 1. Central air source
 - 2. Ground source/geothermal
 - 3. Ductless/mini-split

[DISPLAY Q56 IF Q50=16]

56. How many ENERGY STAR room air conditioners did you buy?
[OPEN ENDED]

[DISPLAY Q57 IF Q58=11]

57. How many smart thermostats did you buy?

[OPEN ENDED]

[DISPLAY Q58 IF Q58=12]

58. How many programmable thermostats did you buy?

[OPEN ENDED]

[DISPLAY Q59 IF Q50=13]

59. How many LED light bulbs did you buy?

[OPEN ENDED]

[DISPLAY Q60 IF Q50=19]

60. How many ENERGY STAR dehumidifiers did you buy?

[OPEN ENDED]

[DISPLAY Q61 IF Q50=20]

61. How many ENERGY STAR air purifiers did you buy?

[OPEN ENDED]

[DISPLAY Q62 IF Q50= 1, 2, 3, 4, 11, 15, 17, 18]

62. Why didn't you apply for and receive a rebate for [Q50 RESPONSE]?

1. I did not know rebate was available
2. Product did not qualify
96. Other (Please specify) **[OPEN-ENDED]**

[DISPLAY Q63 AND Q64 FOR EACH Q50 RESPONSE]

63. How did you know the [Q50 RESPONSE] was energy efficient?

[OPEN ENDED]

64. In what year did you buy the [Q50 RESPONSE]?

1. Before 2020
2. 2020
3. 2021
4. 2022
5. I can't recall

PROGRAM SATISFACTION

65. How did you learn about the rebates available through [UTILITY]'s Online Market Place? **[SELECT ALL THAT APPLY]**

1. [UTILITY] Bill Insert
2. Other Mail from [UTILITY]
3. [UTILITY] representative
4. [UTILITY] Website
5. [UTILITY] post on a social networking site (e.g., Facebook or Twitter)

- 6. Community Event
- 7. Retail Store
- 8. Contractor
- 9. Newspaper/magazine/print media
- 10. Radio
- 11. Word-of-Mouth/Family Member/Friend
- 12. Internet Search
- 96. Other (Please specify) [**OPEN-ENDED**]
- 98. I don't know

66. On a scale of 1 to 5 where 1 means very dissatisfied and 5 means very satisfied, please rate how satisfied or dissatisfied you were with each of the following.

Display Logic	Row Text	1 - Very Dissatisfied	2	3	4	5 - Very Satisfied	I don't know
[DISPLAY IF BATH_QUANT>0]	your new high efficiency bathroom faucet aerator(s)	1	2	3	4	5	98
[DISPLAY IF KITCHEN_QUANT>0]	your new high efficiency kitchen faucet aerator(s)						
[DISPLAY IF SHOWER_QUANT > 0]	your new low flow showerhead(s)						
[DISPLAY IF TSTAT_QUANT>0]	your new smart thermostat						
ALL	how long it took to receive the items you purchased						
ALL	the variety of energy saving items on [UTILITY]'s Online Marketplace						
ALL	your experience with [UTILITY]'s Online Marketplace overall						

[SHOW Q67 IF Q66 = 1 OR 2]

67. Why were you dissatisfied?

[OPEN-ENDED]

[DISPLAY Q68 IF TSTAT_QUANT>0]

68. Have you noticed any savings on your [UTILITY] bill since installing your new [ALL_MEASURES]?

- 1. Yes
- 2. No
- 98. I don't know

69. Have you recommended the Online Marketplace to others?

- 1. Yes

- 2. No
- 98. I don't know

[DISPLAY Q70 IF Q69=2, 98, OR 99]

70. What is the likelihood you would recommend the Online Marketplace to a friend or colleague? Please use a scale from 0 (not at all likely) to 10 (extremely likely). [INSERT SCALE AS DEFINED, WITH 98=I DON'T KNOW]

71. What would you change about the [UTILITY] Online Marketplace if anything? [MULTI-SELECT]

- 1. Would not change anything
- 2. Make website easier to navigate
- 3. Speed up product shipment
- 4. [UTILITY] should improve marketing
- 5. [UTILITY] could provide more info about how much I will save by installing [ALL_MEASURE]
- 6. Increase variety of products available
- 96. Other (Please specify) **[OPEN-ENDED]**
- 98. I don't know

72. Since purchasing the [ALL_MEASURES], have you purchased any other discounted equipment or participated in any programs offered by [UTILITY]?

- 1. Yes
- 2. No
- 98. I don't know

[DISPLAY Q73 IF Q72=2 OR 98]

73. Are you aware of other [UTILITY] incentive or rebate programs for energy efficient equipment or improvements?

- 1. Yes
- 2. No

[DISPLAY Q74 IF Q72=1]

74. On a scale from 0 to 10 where 0 represents "not at all important" and 10 represents "very important", how important was your experience with the [UTILITY] Online Marketplace in your decision to participate in the other program? [INSERT SCALE AS DEFINED WITH I DON'T KNOW=98, REFUSED=99]

[DISPLAY Q75 IF Q72=2 AND Q73=1]

75. On a scale from 0 to 10 where 0 represents "not at all important" and 10 represents "very important", how important was your experience with

[UTILITY] Online Marketplace in your decision to not participate in any other [UTILITY] programs? [INSERT SCALE AS DEFINED WITH I DON'T KNOW=98, REFUSED=99]

[DISPLAY Q76 IF Q72=2 AND Q73=1]

76. Why haven't you participated in any other [UTILITY] programs? (Please select all that apply) **[MULTISELECT]**

1. Did not have the time
2. Not interested
3. Available programs are not applicable to my home
4. There are too many steps to participate
5. I could not figure out how to apply or participate
96. Other (Please describe) **[OPEN-ENDED]**
98. I don't know **[MAKE EXCLUSIVE]**

77. Do you have any additional comments for [UTILITY] regarding your experience or suggestions to improve the Online Marketplace?

[OPEN-ENDED]

HOUSEHOLD CHARACTERISTICS / DEMOGRAPHICS

78. Do you rent or own your home?

1. Rent
2. Own
96. Other (Please specify) **[OPEN-ENDED]**

79. Which of the following best describes your home?

1. Single-family detached
3. Duplex
4. Triple decker (e.g., three story house with each floor being a separate unit)
5. Apartment/condo in a 2-4 unit building
6. Apartment/condo in a 5+ unit building
7. Townhouse or row house (adjacent walls to another house)
8. Mobile home or trailer
97. Other (Please specify) **[OPEN-ENDED]**
98. I don't know

80. When was your home built?

1. Before 1960
2. 1960-1979
3. 1980-1999
4. 2000-2009
5. 2010 or later
98. I don't know

81. About how many square feet is your home? If you are unsure, an estimate is OK.

1. Less than 1,000 square feet
2. 1,000-1,999 square feet
3. 2,000-2,999 square feet
4. 3,000-3,999 square feet
5. 4,000-4,999 square feet
6. 5,000 or greater square feet
98. I don't know

82. What is the main fuel used for heating your home?

1. Electricity
2. Natural Gas
3. Propane
4. Other (Please specify) **[OPEN-ENDED]**
98. I do not recall

83. What fuel does your main water heater use?

1. Electricity
2. Natural Gas
3. Propane
96. Other (Please specify) **[OPEN-ENDED]**
98. I do not recall

84. What is your age?

1. Under 35 years old
2. 35 – 55 years old
3. Over 55 years old
99. Prefer not to answer

85. What is the primary language spoken in your home?

1. English
2. Spanish
3. Chinese
4. Hindi
5. Gujarathi
6. Portuguese
7. Russian
8. Tagalog
9. Arabic
10. Korean
11. Polish
96. Other (Please specify) **[OPEN-ENDED]**
99. Prefer not to answer

86. Which of the following best describes the race or ethnic background you identify with? (Please select all that apply)

1. Black or African American
2. Hispanic or Latino/Latina
3. American Indian and Alaska Native
4. Asian
5. Middle Eastern or North African
6. Native Hawaiian and Other Pacific Islander
7. White
96. Not Listed (Please specify): **[OPEN-ENDED]**
99. Prefer not to answer

87. Including yourself, how many people are living in your household?
[DROP DOWN BOX – 1-14 or more, 99. Prefer not to answer]

88. Is your annual household income over or under [CUTOFF]?

- IF Q87 = 1 CUTOFF = \$33,976
- IF Q87 = 2 CUTOFF = \$45,776
- IF Q87 = 3 CUTOFF = \$57,576
- IF Q87 = 4 CUTOFF = \$69,376
- IF Q87 = 5 CUTOFF = \$81,176
- IF Q87 = 6 CUTOFF = \$92,976
- IF Q87 = 7 CUTOFF = \$104,776
- IF Q87 = 8 CUTOFF = \$116,576
- IF Q87 = 9 CUTOFF = \$128,376
- IF Q87 = 10 CUTOFF = \$140,176
- IF Q87 = 11 CUTOFF = \$151,976
- IF Q87 = 12 CUTOFF = \$163,776
- IF Q87 = 13 CUTOFF = \$175,576
- IF Q87 = 14 CUTOFF = \$187,376

1. Over
2. Under
3. I don't know
99. Prefer not to answer

[DISPLAY Q89 IF Q88= 1]

89. Is your annual household income over or under [CUTOFF]?

- IF Q87 = 1 CUTOFF = \$54,360
- IF Q87 = 2 CUTOFF = \$73,240
- IF Q87 = 3 CUTOFF = \$92,120
- IF Q87 = 4 CUTOFF = \$111,000
- IF Q87 = 5 CUTOFF = \$129,880
- IF Q87 = 6 CUTOFF = \$148,760
- IF Q87 = 7 CUTOFF = \$167,640
- IF Q87 = 8 CUTOFF = \$186,520
- IF Q87 = 9 CUTOFF = \$205,400

IF Q87 = 10 CUTOFF = \$224,280

IF Q87 = 11 CUTOFF = \$243,160

IF Q87 = 12 CUTOFF = \$262,040

IF Q87 = 13 CUTOFF = \$280,920

IF Q87 = 14 CUTOFF = \$299,800

1. Over
2. Under
3. I don't know
99. Prefer not to answer

THANK YOU

Thank you for participating in this survey. Have a great day!

Client: [UTILITY]
 Program: EE Products
 Group: Nonparticipant
 Mode: Email

RESEARCH OBJECTIVES

Evaluation Question	Survey Question
Is the program adequately serving different types of customers (e.g., based on homeownership, income level, education level, geographic area, ethnicity)?	Q27-Q39
How are customers learning about the rebates available? Are the marketing efforts effective and useful or are customers finding out about the program in other ways?	Q0
Are there barriers to using the marketplace that are hindering customer participation? What might be hindering near-participants from completing purchases through the online marketplace?	Q20-Q24
Are there barriers that are hindering customer participation?	Q2-Q0, Q33

PREDEFINED VARIABLES

Prepopulated variables are shown in all caps enclosed in brackets, e.g., [PREDEFINED VARIABLE]

Variable	Definition
RESPONDENT NAME	Customer contact first and last name
EMAIL	Customer contact email
PHONE	Customer contact phone number
DATE	Date customer rebate was processed
MEASURE	Discounted measure
PASSWORD	Static 4 – character password
SURVEY LINK	URL of the Survey
MARKETPLACE	1=Near participant in marketplace, 0=Not near participant (If data available)

EMAIL SURVEY MESSAGE

Subject: Help Improve [UTILITY]'s Energy Efficiency Programs
 Reply To: adm-surveys@admenergy.com
 From Name: [UTILITY]

Hello- we'd like to hear from you about your experience with [UTILITY]. We would greatly appreciate your taking a few minutes to answer a short survey.

Click here to take the survey: [SURVEY LINK]

Your responses will be kept anonymous and completely confidential. The feedback you provide will be used to help improve the program in the future. If you have questions or

require technical assistance, please respond to this email or contact us at adm-surveys@admenergy.com.

If you wish to no longer receive emails about this survey, please click on the “Unsubscribe” link below. Thank you in advance for your time!

Kind Regards,
ADM Associates / Contractor to [UTILITY]

SCREENING

1. Have you received a rebate or financial incentive from [UTILITY] for purchasing or installing energy efficient equipment or making energy efficiency improvements in the past 12 months?
 1. Yes **[THANK AND TERMINATE]**
 2. No
 98. I don't know

CROSS PARTICIPATION

2. How do you typically get information about making home improvements, reducing gas/energy usage, and maintaining your home heating and air systems? **[MULTISELECT] [RANDOMIZE 1-9]**
 1. Through internet searches (e.g., Google search)
 2. In a physical retail store location
 3. Through speaking with contractors over the phone
 4. [UTILITY] website
 5. Friends, family members, or colleagues
 6. Bill inserts or utility mailers
 7. Emails from [UTILITY]
 8. Social media (e.g., Facebook, Twitter, Flickr)
 9. Emails from [UTILITY]
 96. Other (Please explain) **[OPEN-ENDED]**
 98. I don't know

[DISPLAY Q3 IF Q1 = 2 OR 98]

3. Before this survey, were you aware of any rebates for energy efficient equipment and home improvements or other services offered by [UTILITY]?
 1. Yes
 2. No
 98. I don't know

[DISPLAY Q4 IF Q3=1]

4. What types of equipment rebates or services do you recall hearing about? **[MULTISELECT] [RANDOMIZE 1-9]**
 1. Appliance rebates
 2. HVAC and Water Heating Rebates
 3. 0% APR financing for HVAC equipment through the On-Bill Repayment Program (OBRP)
 4. Whole-house energy-saving solutions through the Home Performance with ENERGY STAR Program
 5. A FREE in-home energy assessment with the Quick Home Energy Checkup (QHEC)

6. An on-site energy assessment and incentives for multi-family buildings
7. FREE home weatherization services for income-qualified customers
8. Discounted energy-saving products through the online [UTILITY] Marketplace
9. Instant Home Energy Analysis survey on [UTILITY] website to create home energy profile
96. Other (Please specify) **[OPEN-ENDED]**
98. I don't know

[DISPLAY Q5 AND Q7 IF Q2= 1]

5. How did you learn of those rebates or services? **[MULTISELECT]**
[RANDOMIZE 1-14]
 1. Contractor
 2. Home energy consultant
 3. [UTILITY] representative
 4. [UTILITY] website
 5. Friend, family member, or colleague
 6. Bill insert or utility mailer
 7. Email from [UTILITY]
 8. Social media post (e.g., Facebook, Twitter, Flickr)
 9. Through an internet search (e.g., Google search)
 10. Through an internet advertisement
 11. A radio advertisement
 12. A print advertisement
 13. Through a retailer
 14. Email from [UTILITY]
 96. Other (Please explain) **[OPEN-ENDED]**
 98. I don't know **[EXCLUSIVE]**

[DISPLAY QError! Reference source not found. **IF Q**Error! Reference source not found.**=5]**

6. Was the information you received from friends, family, or colleagues positive or negative? Please use a scale from 1 (extremely negative) to 5 (extremely positive). **[INSERT SCALE AS DEFINED, WITH 98 = I DON'T KNOW]**
7. When did you hear about those rebates or services?
 1. In the past two weeks
 2. 3 to 6 weeks ago
 3. More than 6 weeks ago
 98. I don't know
8. Are you interested in receiving any of the following? **[INSERT GRID WITH, 1 = YES, 2 = NO, 98 = I DON'T KNOW] [MULTISELECT] [RANDOMIZE]**
 1. a rebate for an ENERGY STAR clothes washer
 2. a rebate for an ENERGY STAR clothes dryer
 3. a rebate for an ENERGY STAR water heater
 4. a rebate for an ENERGY STAR gas boiler
 5. a rebate for an ENERGY STAR gas furnace
 6. a rebate for an ENERGY STAR Combination heater
 7. a free in-home audit to learn about ways to save energy and gas
 8. free installation of LED lightbulbs, faucet aerators and advanced power strips
 9. an energy assessment and incentives for multi-family buildings
 10. an instant discount for a smart thermostat
 11. an instant discount for high efficiency faucet aerators
 12. an instant discount for high efficiency showerheads
 13. a self-guided online home energy analysis
9. Are there any other products or services you believe **[UTILITY]** should offer to help improve the comfort or efficiency of your home?
[OPEN-ENDED]
10. We understand it is not always possible to make home improvements and energy efficiency upgrades to your home. Which of the following best describes your authority to make decisions?
 1. No authority- as a renter I am not permitted to make any repairs, improvements or upgrades
 2. Some authority - as a renter I am permitted to make some improvements or upgrades
 3. Full authority – I am the homeowner
 4. Full authority - as part of my rent agreement I am required to maintain/repair equipment
 96. Other (please describe): **[OPEN ENDED]**

98. I don't know

[DISPLAY Q11 IF Q10=2, 3, 4, 96, 98 AND Q2=1]

11. Why haven't you participated in any of [UTILITY]'s programs?

[MULTISELECT] [RANDOMIZE 1-5]

1. It seems inconvenient
2. Time it would take to participate
3. Not interested in what [UTILITY] is offering
4. Not interested in reducing my gas usage
5. Don't have the authority to participate in any of the programs

96. Other reason (please explain): **[OPEN ENDED]**

98. I don't know

[DISPLAY Q12 IF Q10<>3]

12. Which of the following are you responsible for paying? **[MULTISELECT]**

1. Gas
2. Electric
3. Water
4. None of the above

98. I don't know

[DISPLAY Q13 IF Q10=1 OR 2]

13. Have you spoken with your landlord about energy efficiency in your building?
What was your landlord's response?

[OPEN-ENDED]

14. What could [UTILITY] do to encourage you to participate in [UTILITY] programs?

[OPEN-ENDED]

[DISPLAY Q15 IF MARKETPLACE=1 AND QError! Reference source not found.=8]

15. What could [UTILITY] do to improve its online marketplace?

ELECTRIC UTILITY PROGRAM PARTICIPATION

16. Which of the following companies is your electric utility provider?

1. Public Service Electric & Gas (PSE&G)
 2. Jersey Central Power & Light (JCP&L)
 3. Atlantic City Electric (ACE)
 4. Rockland Electric Company (RECo)
96. Other (Please Write In): **[OPEN ENDED]**

[DISPLAY Q17 IF Q16=1-4]

17. In the last 12 months, have you participated in any of the following energy efficiency programs through [Q16 RESPONSE]? **[RANDOMIZE 1—9]**

1. Appliance rebates
2. HVAC and Water Heating Rebates
3. 0% APR financing for HVAC equipment through the On-Bill Repayment Program (OBRP)
4. Whole-house energy-saving solutions through the Home Performance with ENERGY STAR Program
5. A FREE in-home energy assessment with the Quick Home Energy Checkup (QHEC)
6. An on-site energy assessment and incentives for multi-family buildings
7. FREE home weatherization services for income-qualified customers
8. Discounted energy-saving products through the online [Q8 RESPONSE] Marketplace
9. Instant Home Energy Analysis survey on [UTILITY] website to create home energy profile
96. Other (Please specify) **[OPEN-ENDED]**
10. No - I have not taken advantage of any [Q16 RESPONSE] offerings **[EXCLUSIVE]**
98. I don't know

NEW JERSEY CLEAN ENERGY PROGRAM

18. Have you ever received a rebate or financial incentive from the New Jersey Clean Energy Program (NJCEP) through any of these programs? The New Jersey's Clean Energy Program is a statewide program that offers incentives, programs, and services to help save energy, money, and the environment. **[RANDOMIZE 1—8]**

1. Electric Vehicle Incentive Program
2. Home Performance with ENERGY STAR (home assessment and report with recommended improvements and available rebates)
3. Appliance Recycling
4. WARMAdvantage/COOLAdvantage (rebates for heating, cooling and water-heating equipment)
5. Other appliance rebates
6. Retail Lighting
7. Residential new construction
8. Comfort partners (a free program that helps income-eligible customers reduce their utility bills)
9. New Jersey Solar Program (Successor Solar Incentive, Registration Program, or Transition Incentive Program)

10. Other (Please specify) [OPEN-ENDED]
9. No - I have not taken advantage of any NJCEP offerings
[EXCLUSIVE]
98. I don't know

[DISPLAY Q19 IF Q18=1-10]

19. When was the last time you received a rebate or incentive from the NJCEP?
1. In the last 12 months
 2. More than 12 months ago
98. I don't know

[DISPLAY Q20 IF Q18=9 OR 98]

20. Before this survey, were you aware that the State of New Jersey offered residents rebates for energy efficient equipment and home improvements, or other services offered through the New Jersey Clean Energy Program?
1. Yes
 2. No
98. I don't know

NONPARTICIPANT SPILLOVER

[QUESTIONS RELEVANT TO NONPARTICIPANT SPILLOVER SCORING MAY BE INSERTED HERE WHEN AVAILABLE]

ENERGY EFFICIENCY KNOWLEDGE & ATTITUDES

21. How much do you agree or disagree with the following statements? **[INSERT 0-10 SCALE 0 = STRONGLY DISAGREE, 10 = STRONGLY AGREE, WITH 98 = I DON'T KNOW] [RANDOMIZE 1-9]**
1. Energy efficiency saves money.
 2. I have already done everything I can to improve the efficiency of my home.
 3. I am not very concerned about the amount of energy used in my home.
 4. I am too busy to worry about making energy-related improvements in my home.
 5. Scarce energy supplies will be a major problem in the future.
 6. There is very little I can do to reduce the amount of energy I am now using.
 7. It is possible to save energy without sacrificing comfort by being energy efficient.
 8. I know of steps I could take to reduce my household energy use.
 9. I intend to reduce my household energy use in the next 12 months.

22. On a 5-point scale, where 1 means “Not at all interested” and 5 means “Very interested”, how interested are you in making improvements to your home that would: **[INSERT SCALE: 1 = NOT AT ALL INTERESTED, 5 = VERY INTERESTED, 98 = DON'T KNOW]**
1. Increase its energy efficiency?
 2. Improve your comfort?
 3. Improve your health and safety?
23. How trustworthy is [UTILITY] as a source of information about saving energy in your home?
1. Very untrustworthy
 2. Somewhat untrustworthy
 3. Somewhat trustworthy
 4. Very trustworthy
98. I don't know
24. How interested are you in getting information on energy saving tips and rebate programs offered by [UTILITY]?
1. Not at all interested
 2. Slightly interested
 3. Moderately interested
 4. Very interested
98. I don't know
25. How satisfied are you with [UTILITY] as your natural gas service provider?
Please use a scale from 1 (very dissatisfied) and to 5 (very satisfied).
[INSERT SCALE: 1 (very dissatisfied) – 5 (very satisfied), 98 = I don't know]
26. Assuming everyone could choose their utility providers, what is the likelihood you would recommend [UTILITY] to a friend or colleague? Please use a scale from 0 (not at all likely) to 10 (extremely likely). **[INSERT 0-10 SCALE AS DEFINED ABOVE, WITH 98=I DON'T KNOW]**

HOUSEHOLD CHARACTERISTICS / DEMOGRAPHICS

27. Do you rent or own your home?

1. Rent
2. Own
96. Other (Please specify): **[OPEN-ENDED]**

28. Which of the following best describes your home?

1. Single-family detached
1. Duplex
2. Triple decker (e.g., three story house with each floor being a separate unit)
3. Apartment/condo in a 2-4 unit building
4. Apartment/condo in a 5+ unit building
5. Single family townhouse or row house (adjacent walls to another house)
6. Mobile home or trailer
96. Other (Please specify): **[OPEN-ENDED]**
98. I don't know

29. When was your home built?

1. Before 1960
2. 1960-1979
3. 1980-1999
4. 2000-2009
5. 2010 or later
98. I don't know

30. About how many square feet is your home? If you are unsure, an estimate is OK.

1. Less than 1,000 square feet
2. 1,000-1,999 square feet
3. 2,000-2,999 square feet
4. 3,000-3,999 square feet
5. 4,000-4,999 square feet
6. 5,000 or greater square feet
98. I don't know

31. What is the main fuel used for heating your home?

1. Electricity
2. Natural Gas
3. Propane
4. Oil
5. Other (Please specify): **[OPEN-ENDED]**
98. I do not recall

32. What fuel does your main water heater use?

1. Electricity
2. Natural Gas
3. Propane
4. Oil
5. Other (Please specify): **[OPEN-ENDED]**
98. I do not recall

33. What type of thermostat do you have in your home? **[MULTI-SELECT]**

1. Manual/non-programmable (allows users to directly set thermostat setpoints)
2. Programmable (allows users to program future setpoints, such as automatically adjusting temperature at night and in the morning)
3. A smart thermostat (programmable thermostat with ability to connect to web for additional features such as smartphone app communication, scheduling, and energy consumption tracking)
4. Do not have a thermostat **[EXCLUSIVE]**
98. I don't know **[EXCLUSIVE]**

34. What is your age?
1. Under 35 years old
 2. 35-55 years old
 3. Over 55 years old
 99. Prefer not to answer
35. What is the primary language spoken in your home?
1. English
 2. Spanish
 3. Chinese
 4. Hindi
 5. Gujarathi
 6. Portuguese
 7. Russian
 8. Tagalog
 9. Arabic
 10. Korean
 11. Polish
 96. Other (Please specify) **[OPEN-ENDED]**
 99. Prefer not to answer
36. Which of the following best describes the race or ethnic background you identify with? Please select all that apply.
1. Black or African American
 2. Hispanic or Latino/Latina
 3. American Indian and Alaska Native
 4. Asian
 5. Middle Eastern or North African
 6. Native Hawaiian and Other Pacific Islander
 7. White
 96. Not Listed (Please specify) **[OPEN-ENDED]**
 99. Prefer not to answer
37. Including yourself, how many people are living in your household? [DROP DOWN BOX – 1-14 or more, 99. Prefer not to answer]
38. Is your annual household income over or under [CUTOFF]?
- IF Q37 = 1 CUTOFF = \$33,976
- IF Q37 = 2 CUTOFF = \$45,776
- IF Q37 = 3 CUTOFF = \$57,576
- IF Q37 = 4 CUTOFF = \$69,376
- IF Q37 = 5 CUTOFF = \$81,176
- IF Q37 = 6 CUTOFF = \$92,976
- IF Q37 = 7 CUTOFF = \$104,776
- IF Q37 = 8 CUTOFF = \$116,576
- IF Q37 = 9 CUTOFF = \$128,376
- IF Q37 = 10 CUTOFF = \$140,176
- IF Q37 = 11 CUTOFF = \$151,976

IF Q37 = 12 CUTOFF = \$163,776
IF Q37 = 13 CUTOFF = \$175,576
IF Q37 = 14 CUTOFF = \$187,376

- 1. Over
- 2. Under
- 98. I don't know
- 99. Prefer not to answer

[DISPLAY Q39 IF Q38= 1]

39. Is your annual household income over or under [CUTOFF]?

IF Q37 = 1 CUTOFF = \$54,360
IF Q37 = 2 CUTOFF = \$73,240
IF Q37 = 3 CUTOFF = \$92,120
IF Q37 = 4 CUTOFF = \$111,000
IF Q37 = 5 CUTOFF = \$129,880
IF Q37 = 6 CUTOFF = \$148,760
IF Q37 = 7 CUTOFF = \$167,640
IF Q37 = 8 CUTOFF = \$186,520
IF Q37 = 9 CUTOFF = \$205,400
IF Q37 = 10 CUTOFF = \$224,280
IF Q37 = 11 CUTOFF = \$243,160
IF Q37 = 12 CUTOFF = \$262,040
IF Q37 = 13 CUTOFF = \$280,920
IF Q37 = 14 CUTOFF = \$299,800

- 1. Over
- 2. Under
- 98. I don't know
- 99. Prefer not to answer

THANK YOU

Thank you for your time in answering questions on behalf of [UTILITY].

DISQUALIFICATION MESSAGE

We're sorry but it looks like you do not qualify to take our survey.

8 Appendix B: HPwES Program Evaluation Report

8.1 Introduction

The Home Performance with ENERGY STAR (“HPwES”) program provides a holistic approach for customers to explore and invest in the efficiency and comfort of their homes.

There are two pathways for program participation. The first is through the Quick Home Energy Check (QHEC) program.⁵⁴ The QHEC contractor may refer participants to the HPwES program. The second is through direct participation – customers do not need to participate in QHEC to be eligible for HPwES incentives. All HPwES participants will start with a comprehensive energy audit. The audit involves development of an energy efficiency action-plan that includes recommendations for upgrades. Contractors use Snugg Pro home energy modeling software to estimate energy savings. Potential measures incentivized through the HPwES Program include but are not limited to insulation (required), air sealing (required), water heater replacement, and HVAC system improvements.

To qualify for the minimum rebate of \$2,000, the energy-saving work performed must save at least 5 percent of total energy consumption. Each percentage point above 5 percent receives an additional \$150, up to 25 percent, for a total maximum rebate of up to \$5,000 for the participant.⁵⁵ Additionally, contractors receive a \$500 production incentive for all completed HPwES projects.

To ensure the upgrades are accessible to customers, financing is available through either an On-Bill Repayment Program (up to \$10,000 over 7 years or \$15,000 over 10 years at 0 percent APR) or access to financing with similar terms.

The HPwES program is designed to review the entire status of a home, including equipment and envelope to achieve deeper energy savings. The program follows guidelines and qualifying criteria associated with the U.S. EPA HPwES program subject to enhancements to maximize participation and cost-effective energy savings opportunities.

HPwES projects typically save electric energy and natural gas, so electric utilities may bring customers into the program. ETG is considered the lead utility if a customer applies through ETG’s program, and they will work with the Statewide Coordinator and electric utility to allocate costs and energy savings appropriately for all customers participating in the HPwES Program.

⁵⁴ QHEC provides direct installation of LED lights, faucet aerators, showerheads, pipe insulation, and advanced power strip at no cost to the participant.

⁵⁵ Rebates are not to exceed 50% of the total job cost.

Table 8-1 compares Program Year 1 (PY1) projected program participation and savings to actual reported savings. The number of completed projects (N=11) was less than the projected number of projects (N=100). The reported savings per home (283 therms) were lower than projected savings of 329 therms per home. The evaluation found ex-post gross savings of **3,129.89 therms** for a **100.5 percent** realization rate (RR), **4,100 kWh**, **1.49 kW**, with lifetime savings of **73,498.44 therms** and **78,980 kWh**.

Table 8-1: ETG HPwES Participation and Savings for PY1 and Filed Plan Values

Metric	PY1 Ex-Ante	PY1 Ex- Post	PY1 Projected	PY2 Projected	PY3 Projected
Number of Participants	11	11	100	150	200
Net Annual Natural Gas Savings (therms)	3,114.50	3,129.87	32,991	49,486	65,981
Net Lifetime Natural Gas Savings (therms)	71,780.68	73,498.44	560,839	841,259	1,121,678
Net Lifetime Natural Gas Savings from Qualifying Low-Income Customers (therms)	0	0	-	-	-
Net Annual Electric Savings (kWh)	5,701	4,100	95,750	143,625	191,500
Net Lifetime Electric Savings (kWh)	102,965	78,980	1,627,754	2,441,631	3,255,508
Net Lifetime Electric Savings from Qualifying Low-Income Customers (kWh)	0	0	-	-	-
Net Annual Peak Demand Savings (kW)	0	1.5	3	5	6

8.2 Methodology

The evaluation of the PY1 HPwES program included impact and process evaluation components. The Evaluator (Cadmus, in partnership with ADM) acquired program tracking data, tax assessors’ and other publicly available residential data, and conducted interviews with program stakeholders to support the evaluation. This section describes the methodology the Evaluator used to review and calculate electricity and fuel savings that resulted from the program.

8.2.1 Estimating Gross Savings

This section details the impact analysis methodologies used for each measure category. The evaluator first reviewed detailed tracking data to understand its evaluability. The methods described in this section include some findings or high-level summaries from the tracking data review.

The 2020 State of New Jersey Energy Efficiency Technical Reference Manual (2020 NJ TRM) specifies that Home Performance with ENERGY STAR program contractors “must use software that meets a national standard for savings calculations from whole-house approaches such as home performance.” The contractors used Snugg-Pro home energy modeling software, which meets the RESNET standard criteria (see pg. 80 in the 2020 NJ TRM). The preferred evaluation method for this type of program is pre/post utility billing analysis. However, due to insufficient post-period utility consumption data, the Evaluators calculated savings at the measure-level using algorithms defined in the 2020 NJ TRM and conducted participant surveys for further verification. Table 8-2 lists the measures and applicable TRM reference.

Table 8-2: TRM Measure Summary

Measure	TRM
Residential Existing Homes Program – Air Sealing	2020 NJ TRM (pg. 70-71)
Residential Existing Homes Program – Insulation Upgrades	2020 NJ TRM (pg. 75-77)
Residential Gas HVAC – Gas Boilers and furnaces	2020 NJ TRM (pg. 23-24).
Stand Alone Storage Water Heaters	2020 NJ TRM (pg. 29)
Instantaneous Water Heaters	2020 NJ TRM (pg. 31)
Residential Electric HVAC - Central Air Conditioner	2020 NJ TRM (pg. 15)
Residential Electric HVAC - Air Source Heat Pump	2020 NJ TRM (pg. 15)
Residential Existing Homes Program – Duct Sealing and Repair*	2020 NJ TRM (pg.71-72)
HPwES Program (method used by program implementation contractors)	2020 NJ TRM (pg. 80-81)

*None reported in PY1

Table 8-3 provides a breakdown of weatherization and equipment upgrade measures implemented for each home and the associated savings per home for each measure category. The table also includes the total contribution of MMBtu savings for each measure, based on therms and kWh converted to MMBtu.⁵⁶ The reported therms savings account for 94 percent of the total MMBtu (i.e., the kWh contribution, most of which is attributed to Central AC replacements and insulation, is relatively insignificant).

⁵⁶ MMBtu estimated using: Therms x 10; and kWh x 0.003412

Table 8-3: Reported Ex-Ante Gross Savings by Measure

Measure Category	Number of Homes with Measure	Total therms	Therms per Home	kWh per Home	% Total MMBtu
Air Sealing	11	616	56.0	24.9	18.9%
Insulation	11	1,462	132.9	105.9	45.4%
Furnace	5	608	121.5	(0.1)	18.4%
Boiler	2	126	63.2	(3.1)	3.8%
Boiler Combi	0	-			0.0%
Storage DHW (Less than 55gal)	6	214	35.7	-	6.5%
Storage DHW (Greater than 55gal)	1	13	13.0	-	0.4%
Tankless DHW	2	75	37.7	(0.2)	2.3%
CAC	4	-	-	1,067.3	4.4%
Heat Pump	0	-			0.0%
Duct Sealing	0	-			0.0%
Total	11	3,114.50	283.14	518.3	100.0%

Figure 8-1 shows the therms savings by measure category, as percentage of total therms. The chart on the right represents reported savings, the left is evaluated savings. In either case, the equipment replacement measures make up about one-third of the total therms savings. The sections below detail the impact analysis methodologies for each measure included in the program.

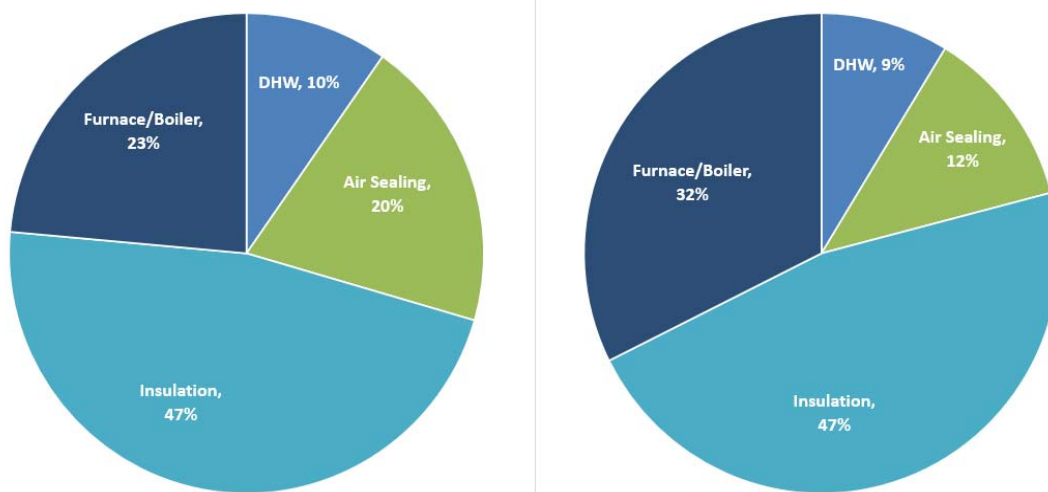


Figure 8-1: Comparing Reported (Left) and Evaluated (Right) Therms Savings

Insulation Upgrades

The highest impact measure in the program was insulation upgrades, with all program homes (N=11) completing some type of insulation improvement, with average reported savings of 133 therms per home (see Table 8-3). This savings value was due to a single home with significantly higher savings than the others increasing the average value.

At minimum, the 2020 NJ TRM protocol requires baseline and installed R-values and ft² of the area treated. Because the baseline R-values were not reported, the evaluator did not calculate savings using the R-values and ft² insulation added but reviewed the savings to ensure the reported estimates were reasonable and within range of expected savings based on a search of participant home sizes. Without more details from the Snugg Pro model inputs, the Evaluators decided to accept the model results for PY1 but reexamine these homes using a billing analysis along with gaining access to the Snugg Pro model inputs in PY2.

Air Sealing

The NJ TRM states air sealing involves a “package” of air sealing work which includes sealing “air leakage paths to reduce the natural air infiltration rate through the installation of products and repairs to the building envelope... Expected percentage savings is based on previous experiences with measured savings from similar programs.”

The expected savings (listed in Table 8-4) are based on the square footage of the conditioned space of the home.

Table 8-4: NJ TRM Air Sealing Savings per 1,000 ft² of Conditioned Space

Climate Zone	Vintage	kWh / 1,000 ft²	Therms / 1,000 ft²
5 (ETG)	Average	12	19

Home square footage was not reported, so the Evaluators used online resources⁵⁷ to determine the area of the conditioned space (total ft²) of each home.

HVAC Replacements

Some participant homes (36 percent, 4 of 11) replaced their existing central air conditioner with a high efficiency air conditioner. The rate of replacement of heating systems was higher: (64 percent, 7 of 11) homes replaced either a boiler (n=2) or furnace (n=5).

The system efficiency baseline standards of non-condensing natural gas heating systems have not materially changed over the last 20 years. The degradation in efficiency of non-

⁵⁷ <https://njpropertyrecords.com/> and <https://zillow.com>

condensing natural gas furnaces is unknown unless measured.⁵⁸ Furthermore, the evaluator plans to conduct a billing analysis which will determine gross therms savings of all participant homes. However, electric billing analysis is not planned so the evaluator focused evaluation efforts on review of air conditioner replacement electric savings.

Water Heater Replacements

The 2020 NJ TRM algorithm for storage and instantaneous water heaters is:

$$Fuel\ Savings\ (MMBtu/yr) = \left(1 - \left(\frac{UEF_b}{UEF_q}\right)\right) \times Baseline\ Water\ Heater\ Usage$$

Equation 22

Where:

- UEF_b = Uniform energy factor of the baseline water heater
- = 0.6483 – (0.0017×Storage Volume) if less than or equal to 55-gallon first hour rating
- = 0.7897 – (0.0004× Storage Volume) if larger than 55-gallon first hour rating
- = 0.81 for instantaneous water heaters
- UEF_q = Uniform energy factor of the qualifying energy efficient water heater
- Baseline Water Heater Usage*⁵⁹ = 23.6 MMBtu/yr

Most homes (nine of 11) had their water heater replaced. Two homes had tankless water heaters installed, seven had storage water heaters installed. The evaluator used reported UEF values to calculate savings and relied on the measure description to determine storage capacity because model numbers and actual storage capacity were not reported. Six of seven storage water heaters were reported: “Storage DHW (less than 55 gal)”.

Also of note is that two of seven storage water heaters were for fuel switching customers and were reported with baseline fuel types of “oil” or “propane”. Reported gas savings for these measures were lower,⁶⁰ 2.9 therms for one, 37.6 therms for the other.

⁵⁸ One method of measurement is flue gas combustion analyzer.

⁵⁹ The baseline water heater usage value from the 2020 NJ TRM was used to evaluate PY1. This measure was since updated in the 2021 and 2022 TRM Addendum.

⁶⁰ Typically, savings are 50+ therms for condensing water heater replacing standard efficiency.

8.2.2 Process Evaluation Approach

The process evaluation was designed to explore the HPwES program's design and implementation, barriers to participation, and outcomes. To investigate these areas, the evaluator reviewed program documents, interviewed program staff, and interviewed implementation staff.

Program Design and Implementation

As an initial step in the process evaluation, the evaluator reviewed program filings regarding development and implementation and any available marketing materials and websites to understand the program design and to develop interview and survey questions.

The evaluator used interviews with program staff to explore their roles marketing, administering, and implementing the program, as well as their experiences with it. The process evaluation sought to answer the following research questions:

- How well did the program staff and implementation staff work together? Are there data tracking and communication efficiencies that can be gained?
- How do customers learn about the program?
 - Identify participation through QHEC versus direct participation in HPwES or other ways (e.g., called an HVAC contractor for system repair/replacement).
 - What is the cross-program participation of all HPwES program participants?
- What role did participation in other efficiency programs (e.g. QHEC, efficient products, legacy state-run program) play in their decision to participate?
- Did the program's implementation reflect its design?
- Is lead- and partner-utility coordination working as expected?
- Are there ways to improve the design or implementation process?
 - For example, can ETG use Home Energy Report (HER) information to target customers with the greatest savings potential?
- What challenges does the necessity of an in-depth energy audit by BPI-certified contractor create for contractors? For participants?
- Are the participants experiencing the expected benefits (e.g., increased comfort, reduced maintenance) or other unexpected benefits?
- What measures are contractors recommending that have the lowest participant adoption? Why?
- What are the participant characteristics and are they different from eligible residential customers not participating?

- Were there any significant changes or new obstacles during the program year?
- Were there any outside or external barriers that influenced the program?

Participation Barriers

The evaluator used interviews with program staff to explore participation barriers, asking questions such as:

- When customers are not at all interested in participating in the program, what are the reasons? Based on your customer interactions, what do you perceive could bolster the interest of these customers?
- What are the obstacles to getting partially interested customers involved with the program? Are there ways that those obstacles could be mitigated?
- Have there been challenges with marketing?
- Are there any specific measures for which the current incentive caps prohibit uptake? If so, what are they and how much would incentives need to be increased to enable implementation?
- What percentage of completed audits do not go on to install weatherization measures?

Outcomes

To assess program outcomes, the evaluator asked questions that addressed participant satisfaction from program staff's perspective. These questions are used to answer research questions such as:

- Were the customers satisfied with their experience? What are the causes of dissatisfaction?
- Is the program adequately serving different types of customers (e.g., based on homeownership, income level, education level, geographic area, ethnicity, preferred spoken language)?
- Looking forward, what are key impediments and drivers to program success?

8.2.3 Sampling

The evaluator reviewed project details for all projects. Given the low participation in PY1, sampling was not required.

8.3 Impact Evaluation Results

The evaluator reviewed tracking data to ensure that each measure met program qualifications, that each was installed in the PY1, and that there were no duplicates or otherwise erroneous entries.

Program annual and lifetime savings are summarized in Table 8-5 through Table 8-8 and discussed in detail by measure category in the following sections.

Table 8-5: HPwES Gross Annual Savings (Therms)

Measure Category	Quantity (Count of Homes w/ Measure)	Ex-Ante Savings (therms)	Ex-Post Savings (therms)	Therms RR
Air Sealing	11	616	382.1	62%
Insulation	11	1,462	1,461.6	100%
Furnace	5	608	838.6	138%
Boiler	2	126	174.5	138%
Boiler Combi	0	-	-	NA
Storage DHW (Less than 55gal)	6	214	203.3	95%
Storage DHW (Greater than 55gal)	1	13	(2.8)	NA
Tankless DHW	2	75	72.6	96%
CAC	4	-	-	100%
Heat Pump	0	-	-	NA
Duct Sealing	0	-	-	NA
Total	11	3,114.50	3,129.87	100.5%

Table 8-6: HPwES Gross Annual Savings (kWh)

Measure Category	Quantity (Count of Homes w/ Measure)	Ex-Ante Savings (kWh)	Ex-Post Savings (kWh)	kWh RR
Air Sealing	11	274	502	1.83
Insulation	11	1,165	1,165	1.00
Furnace	5	(0)	-	0.00
Boiler	2	(6)	-	0.00
Boiler Combi	0	-	-	NA
Storage DHW (Less than 55gal)	6	-	-	NA
Storage DHW (Greater than 55gal)	1	-	-	NA
Tankless DHW	2	(0)	-	NA
CAC	4	4,269	2,434	0.57
Heat Pump	0	-	-	NA
Duct Sealing	0	-	-	NA
Total	11	5,701	4,100	71.9%

ETG reported 0 demand savings. The Home Performance with ENERGY STAR section of the protocol does not include demand savings algorithms but software should be capable of estimating and reporting demand savings. The evaluator estimated an energy-to-demand factor using a neighboring utilities 2021 residential sector load data (PSE&G RS: non-electric heat rate class) for the summer on-peak demand period defined in the 2020 NJ TRM (Monday-Friday, 12-8pm, June – August). The energy to demand factor (0.000364 kW/kWh) provides a conservative⁶¹ estimate of demand savings.

⁶¹ This estimates average summer demand savings, not critical peak hour. The factor for peak hour is 0.000747 kW/kWh.

Table 8-7: HPwES Gross Demand Reduction (kW)

Measure Category	Quantity (Count of Homes w/ Measure)	Ex-Ante Savings (kW)	Ex-Post Savings (kW)*	kW RR
Air Sealing	11	0	0.18	NA
Insulation	11	0	0.42	NA
Furnace	5	0	-	NA
Boiler	2	0	-	NA
Boiler Combi	0	0	-	NA
Storage DHW (Less than 55gal)	6	0	-	NA
Storage DHW (Greater than 55gal)	1	0	-	NA
Tankless DHW	2	0	-	NA
CAC	4	0	0.89	NA
Heat Pump	0	0	-	NA
Duct Sealing	0	0	-	NA
Total	11	0	1.49	NA

*All demand values in table based on 0.000364 kW/kWh energy to demand savings factor.

Table 8-8 shows measure-level and total lifetime kWh and therms savings. Lifetime savings were calculated for each measure by multiplying ex-post annual savings by the expected useful life (EUL) for that measure.

Table 8-8. HPwES Gross Lifetime Savings

Measure Category	Quantity (Count of Homes w/ Measure)	EUL	Lifetime Savings (Therms)	Lifetime Savings (kWh)
Air Sealing	11	15	5,731	7,523
Insulation	11	30	43,848	34,955
Furnace	5	20	16,772	-
Boiler	2	20	3,489	-
Boiler Combi	0	20	-	-
Storage DHW (Less than 55gal)	6	11	2,236	-
Storage DHW (Greater than 55gal)	1	11	(31)	-
Tankless DHW	2	20	1,452	-
CAC	4	15	-	36,503
Heat Pump	0	15	-	-
Duct Sealing	0	18	-	-
Total	11	23.5*	73,498	78,980

*Based on lifetime/annual therms. EUL based on kWh savings is 19.3 years.

The following sections address the installed measures. Heat pumps and duct sealing are examples of measures that are eligible but were not implemented in PY1. These measures are expected in future participant homes.

8.3.1 Insulation Upgrades

All homes completed some type of insulation improvement resulting in average modeled savings of 133 therms per home. The tracking database included the treatment area (in ft²) and the therms and kWh savings associated with each insulation measure.

The 2020 NJ TRM protocol requires baseline and installed R-values and ft² of the area treated. Because the baseline R-values were not reported, the evaluator did not calculate savings using the R-values and ft² insulation added but reviewed the savings to ensure the reported estimates were reasonable and within range of expected savings.

Homes had an average of 1,336 ft² of insulation added, saving 133 therms per home, 0.099 therms/ ft². This savings value was due to a single home with significantly higher savings than the others increasing the average value. This is comparable to the savings estimated using the 2020 NJ TRM methodology for improving R-8 insulation to R-18. This

value (0.099 therms/ ft²) is relatively high – it cannot be achieved⁶², for example, by improving insulation having existing R-value greater than about R-15.

Most reported insulation measures had reasonable savings estimates. Figure 8-2 shows all measure-level insulation savings reported in terms of therms per ft². The figure shows 25 values for 11 homes because homes had more than one type of insulation measure.

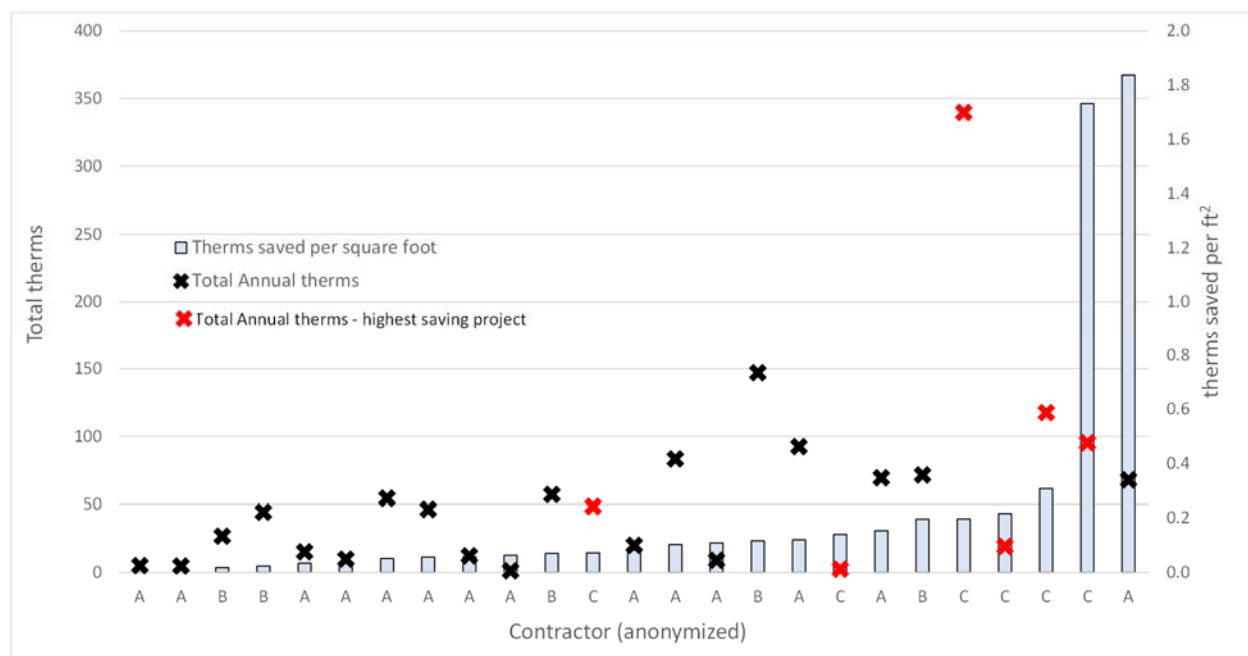


Figure 8-2: Therms Savings per ft² for all participant homes

Two insulation measures had reported savings that were significantly higher than all other insulation measures (evident in Figure 8-2, the two right-most columns). The baseline R value must be less than R-1 to achieve savings of this magnitude, which is unrealistic. However, the treatment area was low for these (about 50 ft²) so the total savings (see x values in Figure 8-2) did not significantly impact the total therms savings for the program.

Figure 8-2 includes red x values to point out insulation savings reported for one project – the home with the highest savings. A home of this size (1,743 ft²) would not typically have 600+ therms savings potential for insulation improvement.

Pictures of this home (publicly available from realtor.com) also show radiators (typically associated with a boiler) and window air conditioners. This matches the information reported in the tracking data. The Evaluators inspected pictures whenever available and did not identify any misalignment between pictures and reported equipment.

⁶² Typical R-value of insulated 2x4 wall (~R-15) cannot achieve savings of this magnitude. The maximum possible savings, by improving by an infinitely high R-value, for home in ETG climate zone, is about 0.1 therms/ft²

Table 8-9 provides all measure details for this home’s insulation measures. Baseline and post-install R values are not included.

Table 8-9: All Measure-level Details Reported for Project with Highest Therms Savings

Measure Description	Quantity ft ²	Reported Measure Cost	Reported kWh Saved	Reported therms Saved
Attic Floor Insulation	674	\$4,315	2.3	48.6
Above Grade Wall Insulation	1,727	\$4,790	16.1	339.7
Basement Wall Insulation	89	\$534	0.9	19.3
Attic/Roof/Ceiling Insulation	382	\$2,404	5.5	117.5
Crawl Space Wall Insulation	55	\$1,128	4.5	95.2
Above Grade Wall Insulation	18	\$170	0.1	2.5
Total	2,945	\$13,341	29.4	622.9

Figure 8-3 shows measure category savings for all homes, with the red arrow pointing out the high therms savings home. The light blue lines in the figure represent therms savings attributed to insulation measures.

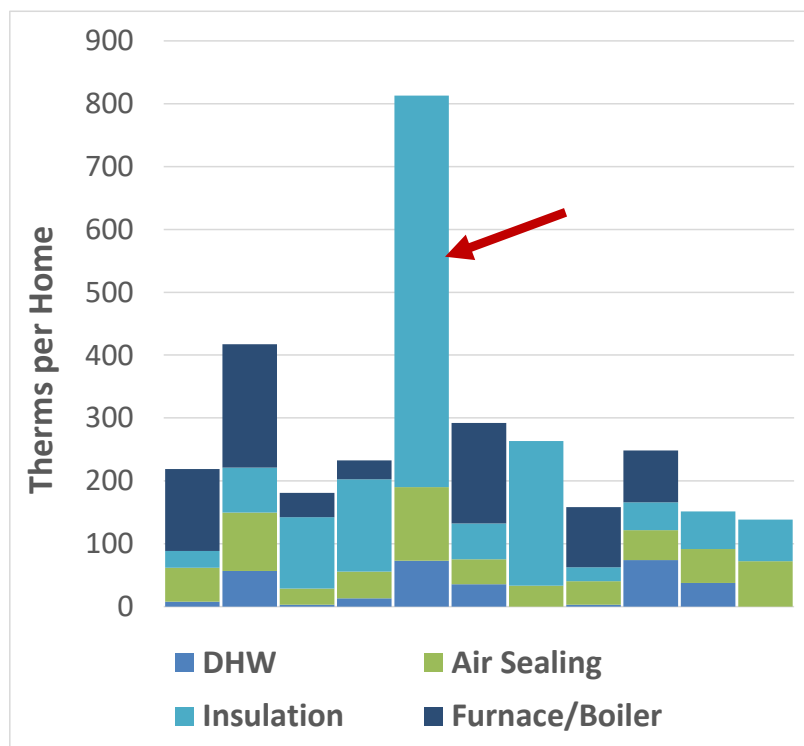


Figure 8-3: Reported Therms Savings by Measure Category for all Homes (N=11)

Though the reported insulation savings for this project are high and probably not realistic, the Evaluator chose to apply a realization rate of 1.0 for all homes’ insulation savings

because all other projects had reasonable therms savings estimates. Furthermore, the Evaluator did not have detailed information to calculate and justify an alternate savings estimate⁶³ for this home but the Evaluator will reexamine these homes using a billing analysis along with gaining access to the Snugg Pro model inputs in PY2.

8.3.2 Air Sealing

The expected savings (listed in Table 8-4) are based on the square footage of the conditioned space of the home. Home square footage was not reported, so the Evaluators used online resources⁶⁴ to determine average area for a sample of homes.

Table 8-10: NJ TRM Air Sealing Savings per 1,000 ft² of Conditioned Space

Savings Type	NJ TRM Estimate: Savings / 1,000 ft ²	Sample ft ²	Ex-Ante per home	Ex-Post per home	RR
kWh	12	2,135 (n=8)	24.9	25.6	1.03
therms	19		56.0	40.6	0.72

* Square footage found from publicly available data for 8 of 11 homes

The average modeled therms savings was about 30 percent higher than the 2020 NJ TRM estimate, and the 2020 NJ TRM and reported kWh savings estimates were similar.⁶⁵

8.3.3 HVAC Replacements

Some participant homes (36 percent, four of 11) replaced their existing central air conditioner with a high efficiency air conditioner. The rate of replacement of heating systems was higher: (64 percent, 7 of 11) homes replaced either a boiler (n=2) or furnace (n=5).

The system efficiency baseline standards of non-condensing natural gas heating systems have not materially changed over the last 20 years⁶⁶. Air conditioner minimum efficiency, however, has increased significantly. Furthermore, the Evaluators do not plan to conduct electric billing analysis, so they conducted a thorough review of air conditioner savings.

⁶³ For example, if R-values were available, the evaluators could use the TRM algorithm to estimate savings

⁶⁴ <https://njpropertyrecords.com/> and <https://zillow.com>

⁶⁵ Ex post values do not match savings reported in Table 8-5 and Table 8-6. Savings in Table 8-10 use actual square footage of the home, which the evaluator updated in October 2022, after initially reporting savings in Table 8-5 and Table 8-6 in September 2022. Savings in Table 8-5 and Table 8-6 are based on evaluation of SJG’s HPwES program, which had more projects (N=235) and included more detailed data.

⁶⁶ E.g., 78% AFUE to 81% for furnaces

8.3.4 Central Air Conditioner Replacements

The blue-shaded cells in Table 8-11 represent all available data from the tracking database for central air conditioner installations.

Table 8-11: Review of Central Air Conditioner Modeled Savings

Cost	Reported Install Type	Capacity	SEER	NJ TRM TOS Savings (13 SEER Baseline)	Modeled kWh Savings	Early Retirement SEER
\$5,000	Installed				311	
\$6,000	Installed				1,388	
\$6,500	Replaced	2.38 tons	16	247	393	11.710
\$12,250	Replaced	2.38 tons	16	247	2,177	5.275

The evaluator calculated the bold values in Table 8-11 using the 2020 NJ TRM algorithm for central air conditioners and the 2020 NJ TRM’s EFLH value of 600 hours:

$$\begin{aligned}
 \text{Energy Savings} \left(\frac{kWh}{yr} \right) &= \text{Tons} \times 12 \frac{kBtuh}{ton} \times \left(\frac{1}{SEER_b} - \frac{1}{SEER_q} \right) \times EFLH_c \\
 &= 28.560 \times \left(\frac{1}{13} - \frac{1}{16} \right) \times 600 = \mathbf{247 kWh}
 \end{aligned}$$

Equation 23

Capacity (in tons) and SEER values were reported for two of the four homes. The modeled savings do not align with the 2020 NJ TRM estimate for time of sale (TOS) central air conditioner installation (247 kWh).

Central air conditioner replacements in the HPwES program are a retrofit measure, so a 13 SEER TOS baseline may be conservative. Therefore, the evaluator used the modeled savings and 2020 NJ TRM algorithm to calculate an early retirement SEER value that would produce the modeled savings, for example:

$$28.560 \times \left(\frac{1}{SEER_{early\ retirement}} - \frac{1}{16} \right) \times 600 = 2,177 kWh$$

Equation 24

Solving for the early retirement SEER parameter (the only unknown variable in Equation 24), we calculated the baseline efficiency necessary to generate modeled savings: **5.275 SEER** in this example.

The evaluator used the Mid-Atlantic TRM⁶⁷ method to estimate baseline SEER for the air conditioners replaced (approximately 11.9 SEER represents the operating efficiency for a population of central air conditioners averaging 15-years old in 2022).

Following the same process, using Equation 24 and assuming a 2.38-ton 11.9 SEER system is replaced by a 16 SEER of equal capacity, we solve for EFLH:

$$28.560 \times \left(\frac{1}{11.9} - \frac{1}{16} \right) \times \mathbf{EFLH} = 2,177 \text{ kWh}$$

The result is EFLH of 3,540 hours, which is improbable for homes in ETG service territory.

Considering the data limitations and wide-ranging modeled savings for the air conditioner replacements, the evaluator chose to apply a realization rate⁶⁸ of 0.57 to the total reported central air conditioner savings. The Evaluator will have access to Snugg Pro inputs in PY2 which will be used to examine these savings estimates in more detail.

8.3.5 Boiler and Furnace Replacements

The tracking database did not include efficiency or capacity for boiler and furnace replacements for either existing or new systems, so the evaluator was unable to calculate savings using the 2020 NJ TRM algorithm. The average modeled savings was:

- Boilers: 63.2 therms saved (n=2)
- Furnaces: 121.5 therms saved (n=5)

The modeled savings are relatively conservative,⁶⁹ so the evaluator chose to apply a realization rate of 1.38 which is the estimate from PY1 analysis of South Jersey Gas HPwES furnace and boiler replacements.

8.3.6 Water Heater Replacements

The 2020 NJ TRM algorithm for storage and instantaneous water heaters is:

⁶⁷ Page 75 of Mid-Atlantic TRM v10. Based on Itron and Cadmus unpublished analysis of standard efficiency units by age of unit from Energy Information Administration, Residential Energy Consumption Survey, 2015, AHRI historical shipments data

(<http://www.ahrinet.org/Resources/Statistics/Historical-Data/Central-Air-Conditioners-and-Air-Source-Heat-Pumps.aspx>), and Energy Star historical shipments data (https://www.energystar.gov/ia/partners/downloads/unit_shipment_data/2015_USD_Summary_Report.pdf?52f9-67a), and mortality curve assumptions drawn from Cory Welch, Estimating the Useful Life of Residential Appliances, ACEEE Summer Study 2010 paper (<http://aceee.org/files/proceedings/2010/data/papers/1977.pdf>).

⁶⁸ RR estimate from analysis of South Jersey Gas tracking data (n=170 air conditioner replacements). SJG is the sister natural gas utility to ETG and is running nearly identical HPwES programs.

⁶⁹ Assuming: 80% AFUE baseline, 95% AFUE installed, 80 kbtu input capacity, 965 EFLH is 145 therms.

$$Fuel\ Savings\ (MMBtu/yr) = (1 - \frac{UEF_b}{UEF_q}) \times Baseline\ Water\ Heater\ Usage$$

Equation 25

Where:

- UEF_b = Uniform energy factor of the baseline water heater
- = 0.6483 – (0.0017×Storage Volume) if less than or equal to 55-gallon first hour rating
- = 0.7897 – (0.0004× Storage Volume) if larger than 55-gallon first hour rating
- = 0.81 for instantaneous water heaters
- UEF_q = Uniform energy factor of the qualifying energy efficient water heater
- Baseline Water Heater Usage* = 23.6 MMBtu/yr

Most projects (9 of 11) included water heater replacement. Table 8-12 includes all tracking data and for domestic hot water (DHW) replacements and compares modeled savings to savings estimated using the 2020 NJ TRM method. The evaluator used reported UEF values to calculate savings and relied on the reported measure description (see left column, Table 8-12) to estimate storage capacity because water heater model numbers and actual storage capacity were not included in the tracking database.

Table 8-12: Therms Savings by Water Heater Type

Reported Measure Description	Modeled Therms Savings	NJ TRM Therms Savings	UEF _b	UEF _q	RR
Storage DHW (less than 55gal)	7.57	40.4	0.5718	0.69	534%
Storage DHW (less than 55gal)	56.65	45.9	0.5718	0.71	81%
Storage DHW (less than 55gal)	2.9	71.4	0.5718	0.82	2463%
Storage DHW (greater than 55gal)	13	30.5	0.7577	0.87	234%
Tankless DHW	72.57	72.8	0.8100	0.95	48%
Storage DHW (less than 55gal)	35.68	43.2	0.5718	0.7	121%
Tankless DHW	2.9	46.9	0.8100	0.82	99%
Storage DHW (less than 55gal)	73.78	40.4	0.5718	0.69	55%
Storage DHW (less than 55gal)	37.6	37.6	0.5718	0.68	100%
Total (average)	33.6	47.7			115%

Two of seven natural gas fired storage water heaters had fuel type reported as “oil”, yet therms savings was reported for these measures. The evaluator was unable to assess the actual fuel type. The Evaluator will have access to Snugg Pro inputs in PY2 which will be used to examine these savings estimates in more detail.

8.4 Process Evaluation Results

The process-related data collection activities for the HPwES program evaluation included facilitated discussions led by ADM, with utility management and program implementation staff. Results are summarized by key themes and findings.

8.4.1 Program Participation

The number of planned participants in PY1 – PY3 is 820 homes, with a target of 100 homes in PY1. The PY1 HPwES program did not meet the target, with 11 completed projects reported. This shortfall was unexpected. ETG staff's initial expectations were that the Moderate-Income Weatherization (MI-Wx) program would have less participation than HPwES. Staff assumed MI-Wx would have excess budget and HPwES participation would be limited due to budget constraints. By the end of PY1, the opposite had occurred.

In response to low HPwES program participation, ETG staff planned to prioritize the program in their marketing materials. For example, at the end of July 2022, ETG sent out an email which focused on HPwES at the highest level. The top three quarters of the page focused on HPwES, and all other residential programs were mentioned in lesser and smaller modules.

Three contractors participated in the program in PY1 and ETG staff did not identify any constraints in their approved contractors' bandwidth or general ability and readiness to support the HPwES program.

The program implementation contractor (Honeywell) manages QHEC and HPwES programs. Honeywell attempts to follow up with QHEC participants to gauge interest in participation in the HPwES program.

8.4.2 Other Insights and Observations

Project Costs: The project cost before incentives was \$18,419 and after incentives (which averaged \$3,745, not including \$500 contractor incentive), eight of 11 of the projects had a total cost less than the \$15,000 On-Bill-Repayment (OBR) cap. Therefore, most participants were able to participate with low or no upfront out of pocket costs. Additionally, PY1 offered deferred payments – participants were not required to make any OBR payments until July 2022.

The average project cost (\$18,419) is significantly higher than the incentive cap for the MI-Wx program (\$6,000 for weatherization measures, \$1,500 for health and safety

expenses). MI-Wx project costs do not exceed the incentive cap, meaning HPwES projects were more costly but could save more energy.

QA/QC: A QA/QC process was recently established. ETG hired a 3rd party contractor, PSD, to inspect quality of work, verify the work on the invoice matches work performed, and identify missed opportunities.

Recent Ownership transitions: 6 of the 11 HPwES homes were recently sold (four in 2020, two in 2021).

Age of Participant Homes: Homes averaged 60 years old, the newest was built in 1996, the oldest in 1926. Homes built within the last 40 years averaged 2,587 ft². The older half of the participant homes averaged 1,667 ft².

IRA: The Inflation Reduction Act (IRA)⁷⁰ will provide federal income tax credits related to many of the HPwES measures beginning 2023, including:

- Home Energy Audit
- Windows and doors
- Envelope-related measures for any weatherization component that meets prescriptive criteria for most recent IECC, including air sealing.
- High-efficiency HVAC equipment (primarily heat pumps)
- Electric panel upgrades

Tracking Data did not include utility consumption data, diagnostic test data, model numbers, or baseline equipment details. The evaluator met with representatives from Snugg Pro to discuss data reporting options. They determined that additional information can be provided if proper data sharing permission is granted.

Tracking data included measure cost. Installation cost was not itemized. Table 8-13 lists average reported measure cost.

⁷⁰ https://www.aceee.org/sites/default/files/pdfs/home_energy_upgrade_incentives_9-27-22.pdf

Table 8-13: Measure Summary – Average Cost Per Measure

Measure Category	Quantity (Count of Homes w/ Measure)	Ex-Ante Savings per home (therms)	Measure Cost per Home
Air Sealing	11	56.0	\$1,741
Insulation	11	132.9	\$5,459
Furnace	5	121.5	\$8,520
Boiler	2	63.2	\$10,813
Boiler Combi	0		
Storage DHW (Less than 55gal)	6	35.7	\$2,917
Storage DHW (Greater than 55gal)	1	13.0	\$4,500
Tankless DHW	2	37.7	\$3,718
CAC	4	-	\$7,438
Heat Pump	0		
Duct Sealing	0		
Total	11	283.1	\$18,419

8.5 Conclusions and Recommendations

Conclusion: The average savings per home (283 therms, around 24 percent of annual therms consumption) is reasonable, considering the high rate of replacement of heating systems in addition to weatherization measures. However, the ex-post savings estimates, and realization rates are not based on empirical data, meaning the realization rate (100.4 percent for therms savings) is subject to change.

Recommendation: The PY1 realization rates should not be included in the TRM update because the Evaluator will conduct a pre/post billing analysis for PY2. The results of that analysis will provide a high rigor estimate of actual program impacts.⁷¹

Conclusion: Participation was lower than expected, possibly because the program was not aggressively marketed.

Recommendation: ETG should consider program optimization options that include the forthcoming Inflation Reduction Act (IRA) incentives for home weatherization

⁷¹ The evaluators found 6 of 11 homes were recently sold. This should be monitored and considered at the time of billing data request.

and efficiency measures. The IRA incentives may also impact HPwES program attribution.

Conclusion: ETG has recently hired a 3rd party contractor, PSD, to address QA/QC needs. Additional data, insights, and observations from PSD will support the next evaluation.

Recommendation: ETG should provide the QA/QC data to the Evaluators, who will leverage the data collected by PSD to inform the second, enhanced rigor evaluation while reducing customer contact points.

Conclusion: The tracking database did not include all details and data necessary to estimate savings using NJ TRM algorithms. This is not a high priority however, because Evaluators expect to conduct pre/post natural gas billing analysis to determine ex-post therms savings. However, they could calculate a more accurate estimate of electric savings if additional details were reported.

Recommendation: Make the Snugg Pro inputs available for M&V verification. If the Evaluators need to calculate savings using a TRM-based approach in future program years (e.g., due to low participation or insufficient post-period data), then the Evaluators and ETG should coordinate with implementation and Snugg Pro staff to establish reporting protocols so that the evaluator has access to all model inputs.

8.6 Barriers to Participation

The lack of program recognition by ETG customers was likely due to a lack of effective marketing. This is actively being addressed for PY2 through highlighting the program in all customer marketing materials.

8.7 Evaluability Recommendations

Make Snugg Pro modeling inputs available to the Evaluator. The Evaluator was not able to verify the savings for most measures in the program in PY1 due to there not being enough homes for a regression analysis and the modeling inputs not being available. Some specific examples are:

- **Include an estimate of home Square Footage in the tracking data** to facilitate accurate calculations for Air Sealing.
- **Include baseline SEER and EFLH in the tracking data** being used to calculate central AC replacement savings.
- **Include efficiency or capacity for boiler and furnace replacements** for new or existing systems in the tracking data.

9 Appendix C: QHEC Program Evaluation Report

9.1 Introduction

The Quick Home Energy Checkup (QHEC) program provides customers with no cost energy efficiency audits to educate residential customers of energy saving opportunities. In addition to the energy efficiency audit, customers will be offered same-day installation of select energy efficient measures. For this program year, these technologies included LED bulbs, energy and water saving showerheads, kitchen faucet aerators, bathroom faucet aerators, advanced power strips, and pipe wrap. This program also educated residential customers on other program opportunities and enhanced incentives for qualifying customers. In the 2021 program year (PY1) the company provided 1,083 customers with 2,897 measures with a total of 6,407.69 therms gas savings, 102,712 kWh electricity savings, and 7.62 kW demand savings.

The program design is illustrated as a logic map in in Figure 9-1, developed from developed from conversations with program and implementation staff, a review of program documentation, and the Evaluator's experience with similar programs. The logic map is meant to capture dynamic program design to assist program staff, trade allies, and evaluators to understand the program's underlying operations.

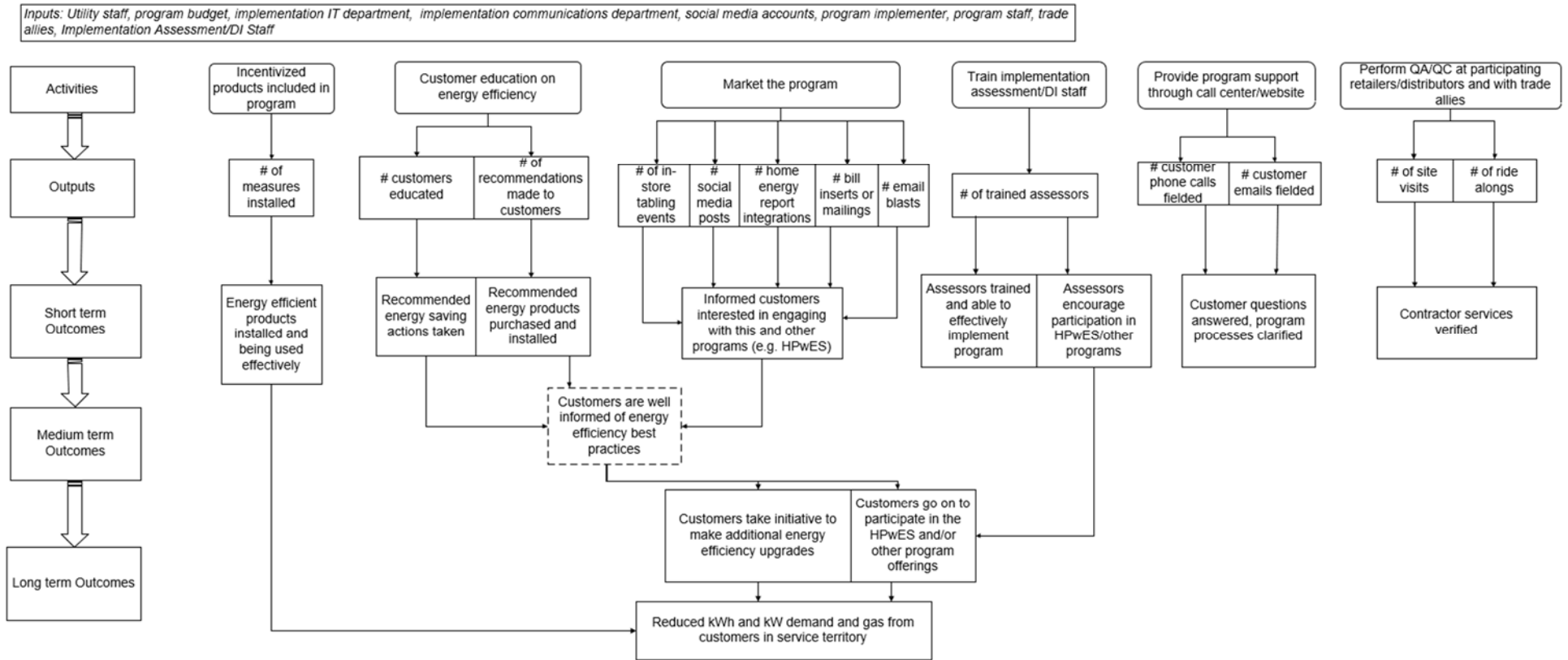


Figure 9-1: QHEC Program Logic Model

9.2 Methodology

This section describes the methodology the Evaluator used to calculate electricity and gas savings that resulted from the program.

During its evaluation, the Evaluator:

- Quantified the number of program participants and installed measures.
- Conducted three customer surveys to collect additional data needed to calculate program savings.
- Calculated the energy (kWh) and gas savings (therms/yr) attributable to the program.

The impact evaluation methodology used for each measure is described in detail in the following sections.

9.2.1 Estimating Gross Savings

Deemed savings values and algorithms from the 2020 State of New Jersey Energy Efficiency Technical Reference Manual (NJ TRM) and 2021 NJ TRM were used to determine verified gross energy impacts and lifetime savings. The Evaluator followed all updates and guidelines prescribed in the Coordinated Measure List. Table 9-1 summarizes the TRM's used in the impact analysis.

Table 9-1: TRM Summary

Measure	TRM
LED Bulbs	2020 NJ TRM (pg. 64)
Tier 1 and Tier 2 Advanced Power Strips	2020 NJ TRM (pg. 53)
Low Flow Aerators	2021 NJ TRM (pg. 84)
Showerheads	2021 NJ TRM (pg. 53)
Pipe Insulation	2020 NJ TRM (pg. 174)

The sections below detail the impact analysis methodologies for each installed measure.

LED Bulbs

The Evaluator calculated the energy savings of LED bulbs using Equation 26, Equation 27, and

$$Watts_b = \text{Wattage of baseline connected fixture or lamp (Table 9-2)}$$

<i>Watts_q</i>	=	Wattage of qualifying connected fixture or lamp
<i>Qty_b</i>	=	Quantity of baseline fixtures or lamps
<i>Qty_q</i>	=	Quantity of qualifying fixtures or lamps
<i>Hrs</i>	=	Annual lighting operating hours
	=	Interior, 1,205 hours
	=	Exterior, 2,007 hours
<i>CF</i>	=	Coincidence factor
	=	0.08
<i>HVAC_e</i>	=	HVAC interaction factor for electric energy savings
	=	0.051
<i>HVAC_d</i>	=	HVAC interaction factor for peak demand reduction
	=	0.155
<i>HF</i>	=	Heating factor, or percentage of lighting savings that must be heated
	=	Interior, 0.47
	=	Exterior, 0.00
<i>nHeat</i>	=	Efficiency of heating system
	=	0.8
<i>%FH</i>	=	Percentage of homes using fossil fuel heat
	=	0.8

Equation 28 (2020 NJ TRM (pg. 64) and the 2022 NJ TRM Addendum). ETG provided LED baseline wattages ETG included in Table 9-2.

$$Energy\ Savings\ (kWh/yr) = \left(\frac{(Watts_b * Qty_b) - (Watts_q * Qty_q)}{1000 \frac{Watts}{kW}} \right) * Hrs * (1 + HVAC_e)$$

Equation 26

$$Peak\ Demand\ Savings\ (kW) = \left(\frac{(Watts_b * Qty_b) - (Watts_q * Qty_q)}{1000 \frac{Watts}{kW}} \right) * CF * (1 + HVAC_d)$$

Equation 27

$$\begin{aligned}
 & \text{Fuel Penalty } \left(\frac{\text{therms}}{\text{yr}} \right) \\
 &= \left(\left(\frac{(Watts_b * Qty_b) - (Watts_q * Qty_q)}{1000 \frac{\text{Watts}}{\text{kW}}} \right) * Hrs * HF * \left(\frac{0.003412}{nHEAT} \right) * \%FH \right) * 10
 \end{aligned}$$

Where:

- Watts_b* = Wattage of baseline connected fixture or lamp (Table 9-2)
- Watts_q* = Wattage of qualifying connected fixture or lamp
- Qty_b* = Quantity of baseline fixtures or lamps
- Qty_q* = Quantity of qualifying fixtures or lamps
- Hrs* = Annual lighting operating hours
 - = Interior, 1,205 hours
 - = Exterior, 2,007 hours
- CF* = Coincidence factor
 - = 0.08
- HVAC_e* = HVAC interaction factor for electric energy savings
 - = 0.051
- HVAC_d* = HVAC interaction factor for peak demand reduction
 - = 0.155
- HF* = Heating factor, or percentage of lighting savings that must be heated
 - = Interior, 0.47
 - = Exterior, 0.00
- nHeat* = Efficiency of heating system
 - = 0.8
- %FH* = Percentage of homes using fossil fuel heat
 - = 0.8

Equation 28

Table 9-2: LED Baseline Wattage Equivalency⁷²

Measure Name	Baseline Wattage	Bulb Wattage
Specialty Candelabra	25	5
Specialty Downlight	55	8
	65	8
	75	11
	90	18
Specialty Globe	25	6
	40	6
Standard	100	15
	60	9
	75	11

LEDs savings were calculated using the following variable values from the 2022 NJ TRM Addendum.

- HVACe* = HVAC interaction factor for electric energy savings
 - = interior, 0.023
 - = exterior, 0.00
- Hrs* = Annual lighting operating hours
 - = Interior, 679 hours
 - = Exterior, 1,643 hours
- Measure Life* = 4.0

For this measure, variables used from the program tracking data include:

- *Wattsq*
- *Qtyq*
- Location of qualifying fixture or lamp (Interior, Exterior)

⁷² ETG provided a wattage equivalency table with the LED measure descriptions in the QHEC program.

Tier 1 and Tier 2 Advanced Power Strips

The Evaluator calculated the energy savings of advanced power strips using deemed values from the 2020 NJ TRM (pg. 53) included in Table 9-3.

Table 9-3: Deemed Savings for Advanced Power Strips

Tier	kWh/yr	kW
Advanced Power Strips – Tier 1	102.8	0.012
Advanced Power Strips – Tier 2	246.0	0.039

For this measure, kWh and kW savings are deemed and did not require variables from the program tracking data other than the quantity of power strips installed.

Faucet Aerators

The Evaluator calculated gas (therms) and electric (kWh) savings of low-flow faucet aerators using Equation 29 (2021 NJ TRM, pg. 84) and following the Coordinated Measure List modification that hours (H) should be defined as minutes (M). Savings were also calculated using the 2022 NJ TRM addendum.

$$\begin{aligned}
 & \text{Fuel Savings (therms/yr) or Electric Savings } \left(\frac{kWh}{yr} \right) \\
 & = N * M * D * (F_b - F_q) * (8.33 * DT / EFF) / C
 \end{aligned}$$

Equation 29

Where:

- N* = Number of fixtures
- M* = Hours per day of device usage
= 30 minutes
- D* = Days per year of device usage
= 260 days
- F_b* = Baseline device flow rate (gal/m)
= 2.2 gpm
- F_q* = Low flow device flow rate (gal/m)
≤ 1.5 gpm (kitchen, bathroom)
- Heat content of water* = 8.33 (Btu/gal/°F)

<i>DT</i>	=	Difference in temperature (°F) between cold intake and output
	=	25°F
<i>EFF</i>	=	Efficiency of water heating equipment
	=	80 percent natural gas
	=	97 percent electric
<i>C</i>	=	Conversion factor from Btu to therms or kWh
	=	100,000 for gas water heating (therms)
	=	3,413 for electric water heating (kWh)

For this measure, savings depends on water heater fuel type. If ex-ante gas savings were reported in the tracking data for a given premise, then only ex-post gas savings were calculated. If ex-ante electric savings were reported in the tracking data for a given premise, then only ex-post electric savings were calculated. The quantity installed in each premise was also taken from program tracking data.

Showerheads

The Evaluator calculated gas and electric savings of low-flow showerheads using Equation 2, 6, 7 (2021 NJ TRM, pg. 53).

$$kWh \text{ Annual Savings} = \text{Water Savings} \left(\frac{\text{gals}}{\text{year}} \right) \times (T_{\text{shower}} - T_{\text{main}}) \times \left(\frac{8.33}{3412} \right) \times \left(\frac{1}{UEF_{\text{elec}}} \right)$$

Equation 30

Therms Annual Savings

$$= \text{Water Savings} \left(\frac{\text{gals}}{\text{year}} \right) \times (T_{\text{shower}} - T_{\text{main}}) \times 8.33 \times \left(\frac{1}{UEF_{\text{gas}}} \right) \times \left(\frac{1 \text{ therm}}{100,000 \text{ Btu}} \right)$$

Equation 31

Water Savings $\left(\frac{\text{gals}}{\text{year}} \right)$

$$= (GPM_{\text{baseline}} - GPM_{\text{ee}}) \times \text{Throttle}_{\text{factor}} \times \frac{\text{minutes}}{\text{shower}} \times \frac{\text{showers}}{\text{day}} \times 365 \frac{\text{days}}{\text{year}}$$

Equation 32

Where:

T_{shower}	=	105°F
T_{main}	=	60.6°F
UEF_{elec}	=	Uniform Energy Factor for electric water heaters
	=	0.9197
UEF_{gas}	=	Uniform Energy Factor for gas water heaters
	=	0.56
8.33	=	Conversion factor for energy required (Btu) to heat one gallon of water by 1°F
GPM_{baseline}	=	2.5
GPM_{ee}	=	2.0
$\text{Throttle}_{\text{factor}}$	=	0.9
<i>minutes/shower</i>	=	8.2
<i>showers/day</i>	=	2.03
1,000,000	=	Conversion factor from Btu to therms
3,412	=	Conversion factor from Btu to kWh

For this measure, savings depends on water heater fuel type. If ex-ante gas (therms) savings were reported in the tracking data for a given premise, then only ex-post gas savings were calculated. Likewise, if ex-ante electric savings were reported in the tracking data for a given premise, then only ex-post electric savings were calculated. The quantity installed in each premise was taken from program tracking data.

2022 Addendum Aerators and Showerheads

Gas (therms) and electricity (kWh) savings calculations for low flow aerators and showerheads from the 2022 NJ TRM addendum are shown in Equation 33 and Equation 34 below.

$$\begin{aligned} \text{Energy Savings (kWh/yr)} &= \%Electric\ DHW * (GPM_base - GPM_ee) * kWh/\Delta GPM \end{aligned}$$

Equation 33

$$\begin{aligned} \text{Natural Gas Impact (therm)} &= \%Gas\ DHW * (GPM_base - GPM_ee) * therm/\Delta GPM \end{aligned}$$

Equation 34

Where:

- %Electric DHW* = proportion of water heating supplied by electricity
= 2.3 percent (from participant survey)
- GPM_base* = Flow rate of the baseline showerhead (gallons per minute)
= showerheads, 2.5
= aerators, 2.2
- GPM_ee* = Flow rate of the efficient showerhead (gallons per minute)
= showerheads, 2.0
= kitchen aerators, 1.8
= bathroom aerators, 1.5
- kWh/ΔGPM* = Electric energy savings of efficient showerhead per gallon per minute (GPM)
= showerheads, 390.1
= aerators, 63.7
- %Gas DHW* = proportion of water heating supplied by natural gas
= 95.5 percent (from participant survey)

therm/ΔGPM = natural gas energy savings of efficient showerhead per gallon per minute (GPM)
 = showerheads, 16.8
 = aerators, 5.0

Pipe Insulation

The Evaluator calculated energy savings of hot water pipe insulation using Equation 35 and Equation 36 (2020 NJ TRM, pg. 186) with a unit correction.⁷³ The North American Insulation Manufacturers Association 3E Plus Version 4.1 heat loss calculation tool was used to calculate Savings Factors (SF).⁷⁴

$$Fuel\ Savings\ \left(\frac{therms}{yr}\right) = \frac{SF * L * \left(\frac{Oper\ Hrs}{EFF}\right) * M}{1,000,000}$$

Equation 35

$$Electric\ Energy\ Savings\ (kWh/yr) = SF * L * Oper\ Hrs / EFF/C$$

Equation 36

Where:

SF = Savings Factor calculated using 3E Plus Version 4.1 tool, Btu/hr-ft (see Table 9-4)
L = Length of pipe from water heating source to hot water application, ft
Oper Hrs = hours per year fluid flows in pipe, hours
 = 4,282 hrs/year
EFF = Efficiency of equipment providing heat to the fluid
 = Natural gas, 80 percent
 = Electric, 97 percent
M = Constant to convert MMBtu to therms
 = 10
C = Conversion factor from Btu to kWh
 = 3,413 for electric water heating (kWh) for electric water heating

⁷³ The fuel savings equation in the 2020 NJ TRM omitted dividing by 1,000,000 to convert Btu to therms/year.

⁷⁴ The Evaluator added 0.75" insulation to Table 9-4.

Table 9-4: Savings Factors by Nominal Pipe Size

Nominal Pipe Size (Inches)	Savings (Btu/hr-ft)			
	0.5" Insulation	0.75" Insulation	1.0" Insulation	1.5" Insulation
0.50	47	50	53	56
0.75	58	61	64	68
1.00	72	77	82	85
1.25	89	94.5	100	107
1.50	100	107.5	115	120
2.00	128	135.5	143	148
2.50	153	162	171	182
3.00	195	208	221	230
3.50	224	232.5	241	248
4.00	232	247.5	263	274

For this measure, savings depends on water heater fuel type. If ex-ante gas savings (therms) were reported in the tracking data for a given premise, then only ex-post gas savings were calculated. Likewise, if ex-ante electric savings were reported in the tracking data, then only ex-post electric savings were calculated. The length of pipe wrap installed, the thickness of the insulation, and the nominal pipe size were also taken from program tracking data.

9.2.2 Process Evaluation Approach

The process evaluation was designed to explore the QHEC Program’s design, barriers to participation, implementation, and outcomes. To investigate these areas, the Evaluator reviewed program documents, spoke with program staff, and conducted customer surveys.

Research Questions

Process evaluation activities sought to answer the following research questions and offer specific recommendations related to each research topic to support program improvements.

- How well did the program staff, implementation staff, and auditors work together? Are there data tracking and communication efficiencies that can be gained?
- How are the program operations designed and what are the perceived outcomes – are these being fulfilled as expected? Are there ways to improve the design or implementation process?

- Is there cross participation between the QHEC program and other programs offered by the Company? Has participation in the QHEC program influenced customers to participate in the Home Performance with Energy Star program? If not, can the lack of cross participation be tied to customer perceptions or is it a flaw in the program design/delivery?
- Are there underlying assumptions about the operation and design that are being made about how it will unfold?
- Beyond the first program year: Were there any significant changes or new obstacles to program delivery for any of the channels? Were there any outside or external barriers that influenced the program's success?
- What are the end user experiences with scheduling and participating in the QHEC?
- What are the end user experiences with the measures installed through the program?
- What are the end user experiences with the auditors? Were participants satisfied with these experiences? What are the causes of dissatisfaction?
- How are customers learning about the program? Are the marketing efforts effective and useful or are customers finding out about the program in other ways?
- How is the program designed and what are the perceived outcomes? Are these being fulfilled as expected? Are there ways to improve the design or implementation process?
- Are there any underlying assumptions about the operation and design of the program that are masking inefficiencies or other problems?
- How does the program design and performance compare to other, similar programs (within state) as well as to industry best practices?
- How well did the program staff, implementation staff, and auditors work together? Are there data tracking and communication efficiencies that can be gained?
- What are the end user and auditor experiences throughout the program?
- How do customers learn about the program? Are the marketing efforts effective and useful or are customers finding out about the program in other ways?
- Are there any barriers to customer participation and/or uptake of energy efficient behaviors or products following participation? Are customers seeking additional program offerings based on their experience with the QHEC?

Barriers to Participation

The Evaluator used its interviews with program and implementation staff to explore their roles marketing, administering, and implementing the program, as well as their experiences with it. The participant customer survey inquired with customers regarding how they learned about the program and asked about the participation process and customer experiences (e.g., sign up process, scheduling, audit experience).

Outcomes

To understand program outcomes, the QHEC customer surveys asked questions about program and utility service satisfaction. These questions were used to answer research questions such as:

- Were customers satisfied with their experience with the QHEC, the auditor, and the measures installed by the auditor? What are the causes of dissatisfaction?
- Were participating customers inspired to participate in other program offerings, change their behavior to reduce energy consumption, or install additional energy efficient measures based on their experience with the QHEC Program? If not, why? And are there ways in which the QHEC Program (or other offerings) could be improved to encourage customers to take additional steps towards being more energy efficient?
- Did customers feel as though they learned about energy efficiency from their participation in the QHEC program? If not, what did they already know / what information did they receive that was not new to them?
- Is the program adequately serving different types of customers (e.g., based on homeownership, income level, education level, geographic area, ethnicity)?
- Were there any significant changes or new obstacles? Were there any outside or external barriers that influenced the program?
- Looking forward, what are key barriers and drivers to success within this market?

9.3 Impact Evaluation Results

9.3.1 Sampling Results

The Evaluator completed a census review of all measures listed in the tracking system to ensure appropriate use of deemed savings values, to check that all variables were being tracked that were required to calculate both gross and net savings, and to identify key issues.

A random sample of participants was drawn and invited to participate in a participant follow-up survey. The sample included customers who received measures that make up

at least 80 percent of the overall program savings and measures that account for five percent or more of the program level savings.

To ensure statistical significance that meets the SWE guidelines, samples were compiled to achieve a relative precision of ±10 percent at the 90 percent confidence interval at the program level and ±15 percent at the 85 percent confidence interval at the measure level.⁷⁵ As an example, the sample size calculation for achieving 90 percent confidence with 10 percent precision is shown in Equation 37.

$$n_0 = \frac{N \times \frac{1}{4}}{(N - 1) \times \frac{D^2}{Z_{\alpha/2}^2}}$$

Equation 37

Where:

- n_0 = Minimum sample size
- N = Population size
- $Z_{\alpha/2}$ = Z value at 90 percent confidence interval
- = 1.645
- $\frac{1}{4}$ = The maximum value of $p(1-p)$ at $p=1/2$, a conservative estimate
- D = Relative Precision
- = 0.10

Data collected via the follow-up surveys informed the impact evaluation as well as process evaluation activities. The Evaluators administered participant surveys online through email invitations. The Evaluator designed the survey instrument to collect useful and detailed information while minimizing respondent burden. The survey sample response results are shown in Table 9-5.

⁷⁵ If program participation for a specific measure subgroup exceeds or is projected to exceed 1,000, then the sample size will be adjusted to achieve ±15% at the 90% confidence interval.

Table 9-5: QHEC Participants & Ex-Ante Annual Savings

Measure Category	Participants	Measure Quantity	Ex-Ante Savings (therms)	Percent of Annual Gas Savings	Required responses to meet 85/15	Responses Achieved	Final Confidence Interval
Showerheads	114	134	4,569.73	76%	21	23	85/13.5
Faucet Aerators	101	142	723.36	12%	21	22	85/13.6
Pipe Insulation	207	966	709.85	12%	22	38	85/10.6
Advanced Power Strips	147	147	N/A	N/A	N/A	25	85/13.1
LEDs	514	1,508	N/A	N/A	N/A	45	85/10.3
Total	1,083	2,897	6,002.94	100%	64	153	85/5.4

9.3.2 Gross Impact Evaluation Results

The Evaluator reviewed all measures in the tracking data to ensure each measure was program eligible, installed in the 2021 project year, and that there were no duplicates or otherwise erroneous entries.

The Evaluator calculated ex post gross impact savings as indicated in Section 9.2.1. Program savings are summarized in Table 9-6 and

Table 9-7 and discussed in detail by measure category in the following sections.

Table 9-6: Gross Annual Gas Savings

Measure Category	Quantity	Ex-Ante Savings (therms)	Ex-Post Savings (therms)	RR therms
Advanced Power Strips	147	N/A	N/A	N/A
Faucet Aerators	142	723.36	1,854.09	256%
LEDs	1,508	N/A	N/A	N/A
Pipe Insulation	966	709.85	2,260.30	318%
Showerheads	134	4,569.73	2,293.29	50%
Total	2,897	6,002.94	6,407.69	107%

Table 9-7: Gross Annual Electric Savings

Measure Category	Quantity	Ex-Ante Savings (kWh)	Ex-Ante Demand Reduction (kW)	Ex-Post Savings (kWh)	Ex-Post Demand Reduction (kW)	RR kWh	RR kW
Advanced Power Strips	147	15,112	1.76	12,089	1.41	80%	80%
Faucet Aerators	142	260	N/A	1,322	N/A	508%	N/A
LEDs	1,508	32,373	3.23	86,574	6.20	267%	192%
Pipe Insulation	966	321	N/A	1,437	N/A	449%	N/A
Showerheads	134	2,569	N/A	1,289	N/A	50%	N/A
Total	2,897	50,634	4.99	102,712	7.62	203%	153%

LED Bulbs

A variety of LED bulbs were installed for customers including standard, specialty globe, specialty downlight, and specialty candelabra bulbs. Wattage equivalencies ranged from 25W to 100W. A total of 1,508 bulbs were installed for 514 customers resulting in a total annual energy savings of 86,574 kWh and 6.20 kW. Savings were calculated in accordance with the 2020 NJ TRM.

Table 9-8: LED Bulb Annual Energy Savings kWh/kW

Measure Name	Quantity	Ex-Ante Savings (kWh)	Ex-Ante Demand Reduction (kW)	Ex-Post Savings (kWh)	Ex-Post Demand Reduction (kW)	RR kWh	RR kW
LED Specialty Candelabra 25w Equivalent	121	1,681	0.17	3,105	0.22	185%	130%
LED Specialty Downlight 55w Equivalent	8	256	0.03	467	0.03	183%	133%
LED Specialty Downlight 65w Equivalent	172	4,421	0.44	12,333	0.89	279%	201%
LED Specialty Downlight 75w Equivalent	15	438	0.04	1,191	0.09	272%	199%
LED Specialty Downlight 90w Equivalent	36	1,275	0.13	3,217	0.23	252%	184%
LED Specialty Globe 25w Equivalent	38	528	0.05	896	0.07	170%	124%
LED Specialty Globe 40w Equivalent	458	6,999	0.70	19,327	1.41	276%	202%
LED Standard 100w Equivalent	40	1,584	0.16	4,528	0.30	286%	192%
LED Standard 60w Equivalent	521	12,304	1.23	33,459	2.40	272%	195%
LED Standard 75w Equivalent	99	2,888	0.29	8,050	0.57	279%	198%
Total	1,508	32,373	3.23	86,574	6.20	267%	192%

Discussion of Realization Rates

Realization rates for electric savings ranged from 124 percent to 286 percent. TRM equations for lighting measures changed in the Coordinated Measure List during the evaluation period, affecting ex-ante HOU values. The Evaluator used HOU values provided in the 2020 NJ TRM for interior and exterior installation locations. The difference

between ex-ante and ex-post HOU values resulted in realization rates over 100 percent. A survey-derived in-service rate of 98 percent was applied to ex-post electricity savings.

Tier 1 and Tier 2 Advanced Power Strips

Advanced power strips were available to participants in two different categories, tier 1 and tier 2; however, ETG QHEC participants only received tier 1 advanced power strips during the first program year. The 2020 NJ TRM was used to calculate energy savings for advanced power strips. Table 9-9 reports the annual savings for advanced power strips.

Table 9-9: Advanced Power Strip Gross Annual Electric Savings

Measure Name	Quantity	Ex-Ante Savings (kWh)	Ex-Ante Demand Reduction (kW)	Ex-Post Savings (kWh)	Ex-Post Demand Reduction (kW)	RR kWh	RR kW
Advanced Power Strips - Tier 1	147	15,112	1.76	12,089	1.41	80%	80%
Total	147	15,112	1.76	12,089	1.41	80%	80%

Discussion of Realization Rates

The Evaluator calculated the savings generated from advanced power strips using deemed savings in the 2020 TRM. A survey-derived in-service rate of 80 percent was applied to advanced power strip savings, resulting in a realization rate of 80 percent.

Faucet Aerators

Faucet aerators were available to participants in two different categories, bathroom faucet aerators and kitchen faucet aerators. The 2020 NJ TRM was used to calculate fuel and energy savings for bathroom and kitchen faucet aerators with an approved correction to the algorithm (see section 9.2.1 for more details). Table 9-10 and Table 9-11 report annual savings for aerators and showerheads.

Table 9-10: Faucet Aerator Gross Annual Gas Savings

Measure Name	Quantity	Ex-Ante Savings (therms)	Ex-Post Savings (therms)	RR therms
Bathroom Faucet Aerator	115	639.36	1,498.77	234%
Kitchen Faucet Aerator	27	84.00	355.33	423%
Total	142	723.36	1,854.09	256%

Table 9-11: Faucet Aerator Gross Annual Electric Savings

Measure Name	Quantity	Ex-Ante Savings (kWh)	Ex-Post Savings (kWh)	RR kWh
Bathroom Faucet Aerator	115	217.80	978.85	449%
Kitchen Faucet Aerator	27	42.35	343.45	811%
Total	142	260	1,322	508%

Discussion of Realization Rates

The Evaluator calculated the savings generated from low flow aerator measures using variables in the 2020 TRM for residential installation (pg.182). However, the ex-ante savings appear to have been derived from the algorithm listed for aerator installations in low-income homes (pg.35 of the TRM), which results in lower savings per aerator. The realization rates for bathroom faucet aerators were impacted by the survey-derived in-service rate, which the Evaluator found to be 95 percent (the in-service rate for kitchen faucet aerators was 100 percent).

Showerheads

Showerheads were available to participants in two different categories, handheld efficient flow showerheads and standard efficient flow showerheads. The 2021 NJ TRM was used to calculate fuel and energy savings for efficient flow showerheads. Table 9-12 and Table 9-13 report annual savings for showerheads.

Table 9-12: Showerhead Gross Annual Gas Savings

Measure Name	Quantity	Ex-Ante Savings (therms)	Ex-Post Savings (therms)	RR therms
Handheld Efficient Flow Showerhead	60	2,051.13	1,029.27	50%
Standard Efficient Flow Showerhead	74	2,518.60	1,264.02	50%
Total	134	4,569.73	2,293.29	50%

Table 9-13: Showerhead Gross Annual Electric Savings

Measure Name	Quantity	Ex-Ante Savings (kWh)	Ex-Post Savings (kWh)	RR kWh
Handheld Efficient Flow Showerhead	60	1,284	644	50%
Standard Efficient Flow Showerhead	74	1,284	644	50%
Total	134	2,569	1,289	50%

Discussion of Realization Rates

The Evaluator calculated the savings generated from low-flow efficient showerhead measures using variables in the 2021 TRM as specified in the coordinated measure list. The evaluator used the default efficient flow rate of 2.0 gallons per minute since the actual flowrate of the showerheads installed was not available. The Evaluator was unable to verify ex-ante per unit savings. The survey-derived in-service rate applied to showerheads was 100 percent.

Pipe Insulation

Pipe insulation was available to participants in ½” and ¾” thickness for ½” pipes. For PY1 the average length of pipe insulation per participant in the QHEC program was 4.7 feet. Table 9-14 and Table 9-15 report annual savings for pipe insulation.

Table 9-14: Pipe Insulation Gross Annual Gas Savings

Measure Name	Quantity ⁷⁶	Ex-Ante Savings (therms)	Ex-Post Savings (therms)	RR therms
Pipe Insulation ½ in (per linear ft.)	303	155.65	654.98	421%
Pipe Insulation ¾ in (per linear ft.)	663	554.20	1,605.32	290%
Total	966	709.85	2,260.30	318%

⁷⁶ Quantity is length (feet) of installation installed

Table 9-15: Pipe Insulation Gross Annual Electric Savings

Measure Name	Quantity ⁷⁶	Ex-Ante Savings (kWh)	Ex-Post Savings (kWh)	RR kWh
Pipe Insulation ½ in (per linear ft.)	303	146	783	538%
Pipe Insulation ¾ in (per linear ft.)	663	175	654	374%
Total	966	321	1,437	449%

Discussion of Realization Rates

The Evaluator calculated the savings generated from pipe insulation using variables in the 2020 NJ TRM (pg. 186) for residential installations as specified in the coordinated measure list. The ex-ante savings used the calculation for installations in low-income homes (2020 NJ TRM, pg. 38). Additionally, the realization rate was impacted by the survey-derived in-service rate of 92 percent.

9.3.3 Net Savings

Net savings refer to savings that are attributed to the program efforts after accounting for:

- Free ridership, the portion of gross energy impacts that would have occurred even in the absence of the program.
- Spillover, additional program-induced energy savings, generated by both participants and non-participants, for which the program didn’t provide any specific financial incentives.

The NJ Board of Public Utilities stipulated that NTG is set to 1.0 for the first triennium of the program. After the initial triennium, data used to calculate NTG will be collected using a battery of approved free ridership and spillover questions in customer surveys.

9.3.4 Lifetime savings

Lifetime savings were calculated using expected useful lifetime (EUL) values from the 2020 NJ TRM. Ex-post annual savings were multiplied by the EUL to obtain lifetime savings, shown in Table 9-16 and Table 9-17.

Table 9-16: Lifetime Gas Savings

Measure Category	Quantity	Ex-Post Savings (therms)	Measure Life	Lifetime Savings (therms)
Advanced Power Strips	147	N/A	8	N/A
Faucet Aerators	142	1,854.09	10	18,540.94
LEDs	1,508	N/A	15	N/A
Pipe Insulation	966	2,260.30	11	24,863.33
Showerheads	134	2,293.29	7.5	17,199.67
Total	2,897	6,407.69	9.5	60,603.95

Table 9-17: Lifetime Electric Savings

Measure Category	Quantity	Ex-Post Savings (kWh)	Measure Life	Lifetime Savings (kWh)
Advanced Power Strips	147	12,089	8	96,714
Faucet Aerators	142	1,322	10	13,223
LEDs	1,508	86,574	15	1,298,604
Pipe Insulation	966	1,437	11	15,812
Showerheads	134	1,289	7.5	9,667
Total	2,897	102,712	14	1,434,020

9.3.5 Data Review

The Evaluator reviewed program tracking data for all measures included in PY1. The Evaluator provides the following findings as part of its review of program tracking data.

Missing quantity field. During the first months of the program, the program tracking data records did not include a quantity field. As a result, ex-ante savings were incorrectly calculated for records with a measure quantity other than one. ETG added the quantity data element mid-cycle.

9.3.6 Opportunity to Improve Realization Rates

Realization rates reflect the ratio of forecasted savings to verified savings. Realization rates close to 100 percent reflect an accurate forecast of program performance. The Evaluator provides the following recommendations to improve realization rates.

Add product model numbers to tracking data. Program tracking data did not include product model numbers to verify products specifications such as baseline and efficient wattages for LED lightbulbs and flow rates for aerators and showerheads. In the absence of product specifications, ex-post savings were calculated with deemed average values that are less accurate than actual specification values.

Ensure program tracking data follows the agreed on savings algorithms agreed on in the Coordinated Measure List. Realization rates were the most impacted by differences in savings methodology calculations. Updating the program data savings calculations to adhere to the agreed upon Coordinated Measure List methodologies will improve realization rates.

9.4 Process Evaluation Results

The process-related data collection activities for the QHEC evaluation included a facilitated discussion with program staff and surveys of participating customers.

9.4.1 Program Staff Facilitated Discussions

The Evaluator conducted four discussions with ETG, SJI, Uplight, and Honeywell staff to investigate the design and implementation of ETG's residential energy efficiency programs, with focus on the Behavioral, QHEC, and Energy Efficient Product (EEP) programs. The summary information presented here was synthesized from four discussions held with utility, implementation, EM&V, and marketing staff.

The discussions were held from July to September 2022 and included five calls, ranging from 45-90 minutes. The five calls included:

- Honeywell program staff (August 2022): Honeywell's program manager, district manager, and solution architect.
- Uplight staff (August 2022): Uplight's client solutions director and solutions manager.
- Honeywell marketing staff (September 2022): Honeywell's marketing manager and program manager.
- ETG staff (July 2022): ETG's energy efficiency manager and energy efficiency analyst.

SJI's EM&V manager attended each call. ADM also held a call with South Jersey Gas staff; that discussion helped build understanding of ETG's programs, as the two companies share a parent company and collaborate and benefit from synergies that arise from consistent program design and implementation strategies and efforts. SJI's director of energy efficiency attended the SJI staff call. The Evaluator received additional follow-

up information from SJI's financial planning analyst, program staff, and marketing manager via email.

ETG has strong working relationships with the residential program implementation vendors, though there were some initial challenges. ETG's energy efficiency manager stated that there is good communication and strong working relationships with the program's implementation vendors. Because there had been some "false starts", "hiccups", and some issues with vendors executing the guidance that ETG has provided, the program manager had recently started requiring implementation program managers and ETG's energy efficiency analysts to have re-occurring one-on-one meetings with each program's implementation staff. Honeywell contacts acknowledged that there had been communication challenges in PY1, but the solution architect and program manager observed there had been process improvements made to improve accountability and focus through more open-dialogue and frequent communication. Uplight's solutions manager characterized their working relationship with utility staff as having "hit its stride" and noted that there had been strong communication throughout the entire year.

The transition from NJCEP to utility-run energy efficiency programs required significant coordination and resources. Utility staff noted that though generally "not changed much" from the customer perspective, there were back-end challenges as well as issues related to contractor engagement and awareness. From an administrative perspective, SJI's director observed that not all utilities had their programs ready at the same time. SJI's director noted during the transition phase that there was a learning curve – contractors were accustomed to a single state run program and now had to navigate utility programs, with different forms and implementation contractors. Training sessions were held by ETG for contractors to ease the transition. Correspondingly, Honeywell's program manager noted that the programs had been "in flux" and alluded to start-up efforts and coordination with other utilities as having required time and resources. Honeywell's marketing manager noted that the most significant challenge in PY1 had been the development, coordination and revision of application forms and website materials to align and ensure consistency across gas and electric utilities.

Staff facilitated discussions indicate there are sufficient QA/QC procedures and policies in place, though the ability to assess effectiveness of QA/QC procedures is limited because of the recent start date of the third-party inspector. Multiple parties are involved in project quality control activities. ETG staff "shadows" vendors and has done site visits for programs to familiarize themselves with the programs and to look for areas of improvement. In July 2022, SJI hired Performance Systems Development (PSD) to conduct third-party inspections and check for missed opportunities, health and safety issues and verify that documented work had been completed.

- **Utility staff shared an example QC inspection report and customer survey report that the third-party inspector completed for an ETG HW-HVAC**

Program. The QC inspection report included information regarding the status of the installed measure, safety issues, photos of the measure, as well as additional observations and potential missed opportunities. The customer survey report included customer satisfaction questions about the program, rebate process, contractor, measure instructions, newly installed equipment, as well as a question if the customer had noticed improved comfort and utility usage post-measure installation.

- **Honeywell conducts inspections and has internal QC targets.** For the QHEC program, there is a quality assurance requirement for the first two QHEC visits for each new subcontractor. The Honeywell contacts noted that after quality assurance checks, Honeywell staff may provide supplemental training if needed.

Multiple parties are involved in marketing, using a variety of methods. ETG, Honeywell, and Uplight use a variety of strategies including emails, bill inserts, and search engine optimization to promote the residential programs. Honeywell leads marketing efforts for the residential portfolio of programs whereas Uplight cross-promotes programs through the behavioral program and conducts targeted outreach for the Online Marketplace program. All marketing is coordinated through ETG's marketing team and ETG approves all marketing efforts.

Marketing the programs requires coordination between implementation and SJI staff as well as with other utilities. Honeywell's solution architect observed that marketing and outreach for the residential programs in New Jersey differs from other states in that the state required all utilities to coordinate energy efficiency programs. He observed that there is a requirement to present customers with both gas and electric offerings that are available and for all utilities to provide consistent messaging. The solution architect suggested that though the requirement to have consistent marketing entails a higher level of coordination compared to other states, there is less market confusion, and more value is provided to customers. Honeywell's marketing manager stated that they actively marketed all of ETG's residential programs. All the programs are featured on the ETG website.

Data tracking and reporting requires coordination from utility and implementation staff. Utility and implementation contacts indicated that internal and coordinated data tracking systems are sufficient, but they have experienced some challenges collaborating and ensuring timely and accurate data management. Utility staff noted that there had been some initial "time lag" issues related to Honeywell and Uplight having internal tracking systems and needing to transfer data to the utility tracking and reporting system but was unaware of the exact extent of the issues. Honeywell's program manager noted that there had been data tracking and reporting obstacles related to their internal system and its alignment with the statewide coordinator's system. Uplight's solution manager

described their program tracking procedures and observed that coordination of tracking and reporting processes was running “pretty smoothly most of the time.”

SJI’s financial planning analyst observed that consolidated reporting is working well as it allows them to create quarterly reports for the BPU, as well as internal dashboards. He noted working with AEG on putting together a process to flag measure-level therms savings if they fall outside of an acceptable range.

Awareness and other utility programs, coupled with a limited marketing budget are perceived as barriers to success. SJI’s director of energy efficiency said that recruiting customers to participate in programs other than EEP Downstream has been a challenge, as they are still building awareness, and electric utilities have the same offerings and may have more aggressive marketing or deeper connections to their customers. The director reflected that their first year had broad-based marketing and suggested that during year two they have challenged Honeywell to focus marketing on programs that generate the most energy savings. Honeywell’s marketing manager noted the program’s budget limits the amount of outreach that can be performed, further he indicated the need for reduced spending and marketing activities in PY2. He stated that Honeywell had recently provided utility staff an in-depth budget analysis and observed that they were providing data-driven recommendations to focus on activities which spur the most engagement.

The QHEC program will not meet its goals in PY1; it is enrolling a sufficient number of customers, but it is not finding enough measure installation opportunities per home. ETG staff stated that the QHEC program measures do not offer substantial opportunities to generate gas savings. Similarly, Honeywell’s program manager observed that the program does not garner gas savings specifically.

Findings from facilitated discussions suggested the QHEC’s strength is its cross-promotional potential. The QHEC program’s main goal is cross-promotion, and ETG’s energy efficiency manager described that program as a “light audit and marketing visit” with the main goal of acting as a “feeder” into its other programs (e.g., Home Performance with Energy Star and Moderate Income Home Weatherization). Honeywell’s program manager suggested that the QHEC program being offered parallel to the HPwES program was a strength. He stated that customers can either “dip their toe in the water” and only opt to participate in the QHEC or take a “dive in deep” with additional energy efficiency improvements through the HPwES.

There is an opportunity to increase customer engagement with other programs after their QHEC participation. Customers are generally satisfied with the QHEC program’s audit and receiving the no-cost measures, but there are opportunities to better integrate and promote ETG’s other program offerings to encourage greater engagement and provide customers a more seamless participation process.

Smart thermostats were being considered as a direct installation QHEC measure.

Thermostatic control valves for showers were added for PY2. Though there is some concern about cannibalizing savings from other programs, the ETG energy efficiency manager noted that in ETG's previous iteration of this program, they had been installing smart thermostats for any interested customer. Honeywell contacts also noted the possible addition of smart thermostats to the QHEC program and the addition of thermostatic control valves for showers in PY2.

Scheduling delays associated with the program launch have been addressed. The program launched in the Summer 2021, though visits did not begin until Fall. SJI's EM&V manager noted that the COVID-19 pandemic presented challenges and concerns regarding in-person home visits during PY1, especially initially. At the outset of the program there had been some delay in scheduling, but the backlog was remedied by the Winter of 2021/2022 and at the time of the Evaluator's call, ETG staff indicated that there were no issue scheduling customers "within a couple weeks of enrollment."

Customer cancellations, measure-level refusals, and supply chain issues are minor barriers to implementation success for the QHEC program. Occasionally fixture compatibility and measure refusals were noted, though staff found that the program implementation contractor does not identify specific products that are refused. Contacts confirmed that occasionally fixtures were not compatible with the program's high efficiency faucet aerators, but generally noted customer satisfaction with the audit and direct install measures. Honeywell staff observed that the cancelation and reschedule rates were similar to other direct install/audit programs. Supply chain issues were noted during the call with ETG staff as having had minor effects on the QHEC program as Honeywell had not been able to maintain an inventory of handheld low-flow showerheads during PY1.

9.4.2 QHEC Survey Results

The Evaluator conducted an email survey of QHEC participants in July and August 2022. The sample for the survey included all PY1 participants with valid email addresses. A total of 300 customers participated in the QHEC program through June 2022 and 267 (89 percent) had email addresses in program tracking data.

The Evaluator emailed an invitation to all contacts with a valid email address. Customers received up to three reminders. Three customers were disqualified from taking the survey as they indicated they did not recall participating in the program. About 3 percent of email survey invitations bounced. In total 56 customers that participated in the QHEC Program completed the survey (21 percent response rate) and provided feedback regarding the sign-up process, visit, and measures installed (if applicable).

Most respondents were homeowners and reported living in single-family homes with gas home and water heating. Eighty-four percent of respondents said they lived with no more

than three other people. Table 9-18 summarizes QHEC respondents' home characteristics.

Table 9-18: QHEC Respondent Home Characteristics

Question	Response	Percent (n=56)
Do you own or rent your home?	Rent	4%
	Own	96%
Which of the following best describes your home type?	Single-family	75%
	Duplex	5%
	Apartment/condo in a 2-4 unit building	7%
	Single family townhouse or row house	13%
When was your home built?	Before 1960	54%
	1960 to 1979	11%
	1980 to 1999	20%
	2000 to 2009	16%
Including yourself, how many people currently live in your household?	1	13%
	2	50%
	3	11%
	4	11%
	5	4%
	6 or more	9%
	Prefer not to say	4%
About how many square feet is your home?	Less than 1,000 square feet	9%
	1,000-1,999 square feet	34%
	2,000-2,999 square feet	32%
	3,000-3,999 square feet	7%
	4,000 or more square feet	4%
	Don't know	14%
What is the main fuel used to heat your home?	Electricity	4%
	Natural gas	95%
	Oil	2%
What is the main fuel used to heat your water?	Electricity	13%
	Natural gas	84%
	Oil	2%
	Don't know	2%

QHEC is serving ETG customers from various demographic groups, though half of respondents identified as white and nearly half said their income was more than 400 percent of the Federal Poverty Level (FPL). Respondents were somewhat evenly split between identifying as 35-55 years old and over 55 years old. Twenty-three percent of respondents noted that their income was below 250 percent of the Federal Poverty Level (FPL) and seven percent said it was between 250 percent and 400 percent of the FPL.⁷⁷ Table 9-19 provides additional self-reported survey-taker demographic information.

Table 9-19: QHEC Respondent Demographics

Question	Response	Percent (n=56)
What is your age?	Under 35 years old	11%
	35-55 years old	41%
	Over 55 years old	45%
	Prefer not to answer	4%
How would you identify your race or ethnicity?	Asian	21%
	Black/African American	11%
	Caucasian/White	50%
	Hispanic or Latino	9%
	Not Listed (not specified)	2%
	Prefer not to say	14%
What is the primary language spoken in your home?	English	89%
	Spanish	2%
	Hindi	2%
	French	2%
	Other (Not specified)	2%
	Prefer not to answer	4%

Bill inserts and marketing emails to customers drive customer awareness for the QHEC program. Sixty-three percent of customers indicated they learned about the QHEC Program from a bill insert or an email from Elizabethtown Gas. Figure 9-2 displays customers’ source of program awareness.

⁷⁷ Forty-six percent said their income was more than 400% of the FPL. Twenty-three percent of respondents either preferred not to state (18%) or did not know (5%) their household income.

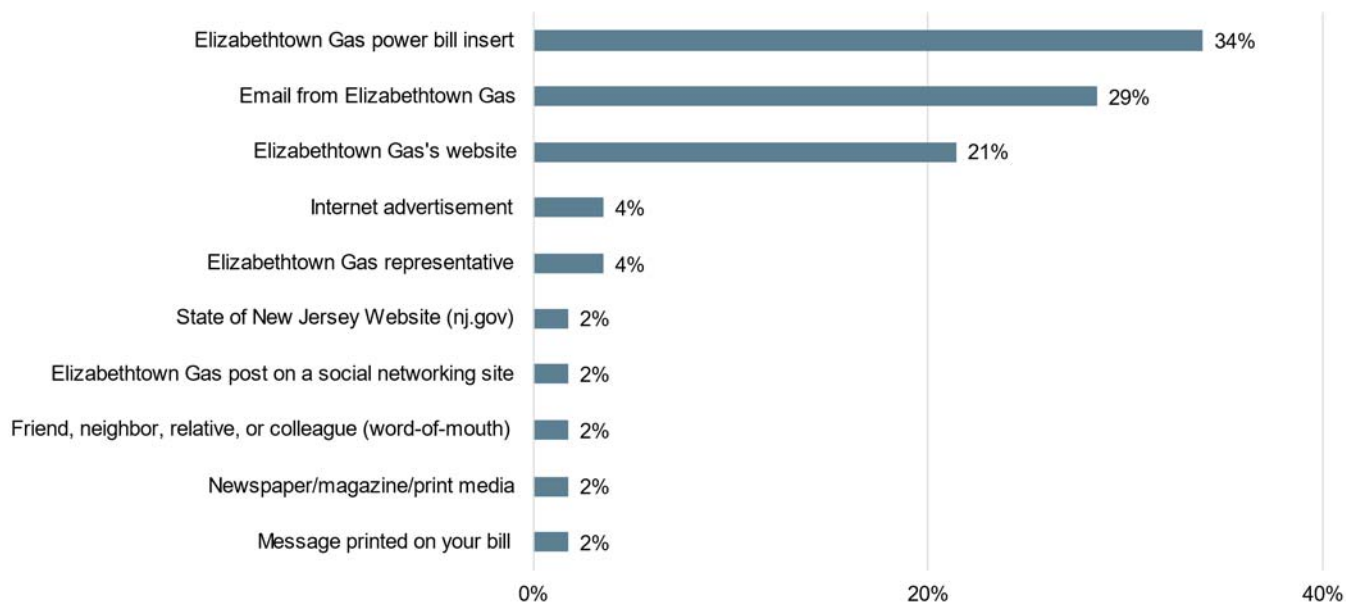


Figure 9-2: QHEC Participants’ Sources of Program Awareness (n=56)

The QHEC sign-up process is easy to navigate. Eighty-four percent of respondents said it was easy to sign up for the QHEC Program.⁷⁸ Customers who indicated the process was difficult were given an opportunity to provide open-ended feedback. Two customers (four percent) provided open-ended feedback; both suggested additional staff to answer and return phone calls and one proposed adding an online booking tool.

Reasons for signing up varied, though learning about home energy use was a primary motivation. Twenty-seven percent of QHEC participants noted that learning about their home’s energy use was their only reason for signing up, while nine percent noted verifying their home was already efficient as their only reason for signing up. Table 9-20 displays the reasons customers signed up for QHEC.

⁷⁸ n=56. Rated the ease of signing up for the program a 4 or 5 out of 5 on a scale from 1 (very difficult) to 5 (very easy).

Table 9-20: Reasons Customers Signed Up for QHEC⁷⁹

Response	Percent (n=56)
To learn more about my home's energy use	55%
To reduce my gas use	46%
To reduce my electricity use	45%
To verify my home is already energy efficient	36%
To reduce my water use	20%
To get information about a particular piece of equipment	13%
To receive a free showerhead (write in response)	2%

The QHEC program provides a consistent participation experience. Seventy-nine percent of customers said they had been given information about other ETG programs and 89 percent said they received an energy assessment report with recommendations. Eighty-eight percent spoke with the auditor about ways they could save energy. Overall customers agreed that the home auditor was knowledgeable, presentable, and professional (see Figure 9-3).

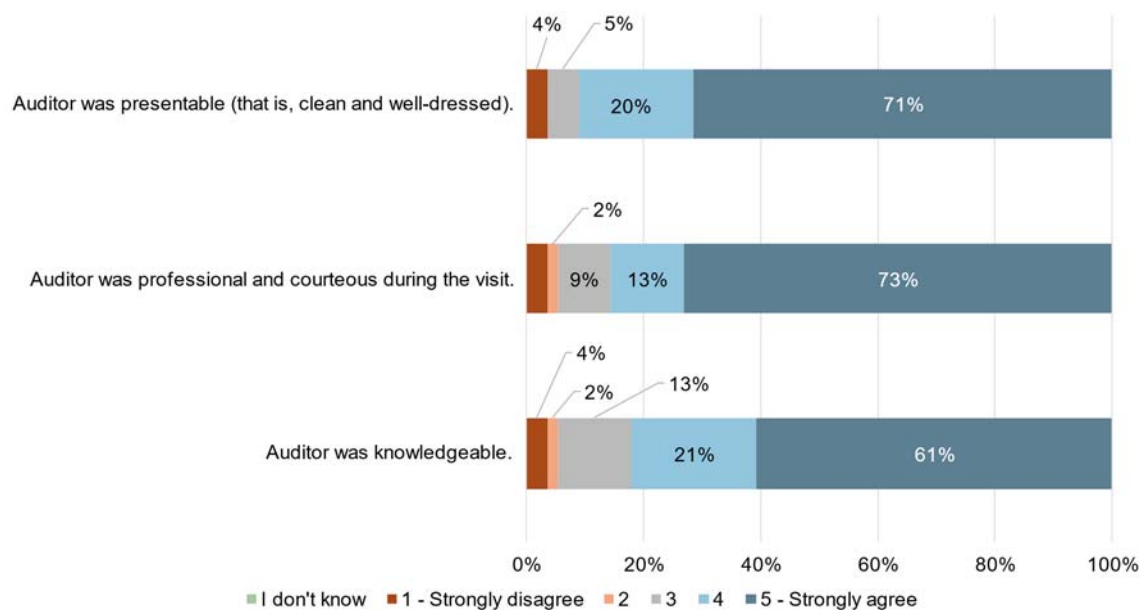


Figure 9-3: Level of Agreement with Statements Regarding QHEC Auditor (n=56)

Customers find the information provided during the home visit and within the summary report helpful. Most customers that received the written energy assessment

⁷⁹ Sums to more than 100% because respondents could select more than one reason.

report found it helpful. Customers provided similar ratings for discussion with the home auditor about saving energy (see Figure 9-4). Eighteen percent of customers indicated they did not find either the report or discussion helpful. Ten percent suggested improving the auditor or report recommendations to be more detailed, specific to their home, or less expensive. Four percent noted interest in additional measures be provided through the program with one respondent requesting the inclusion of smart thermostats and attic insulation and one requesting additional lightbulbs. The remaining four percent made comments regarding their interaction with the auditor, noting that they perceived lack of patience when speaking with them or effort during their visit.

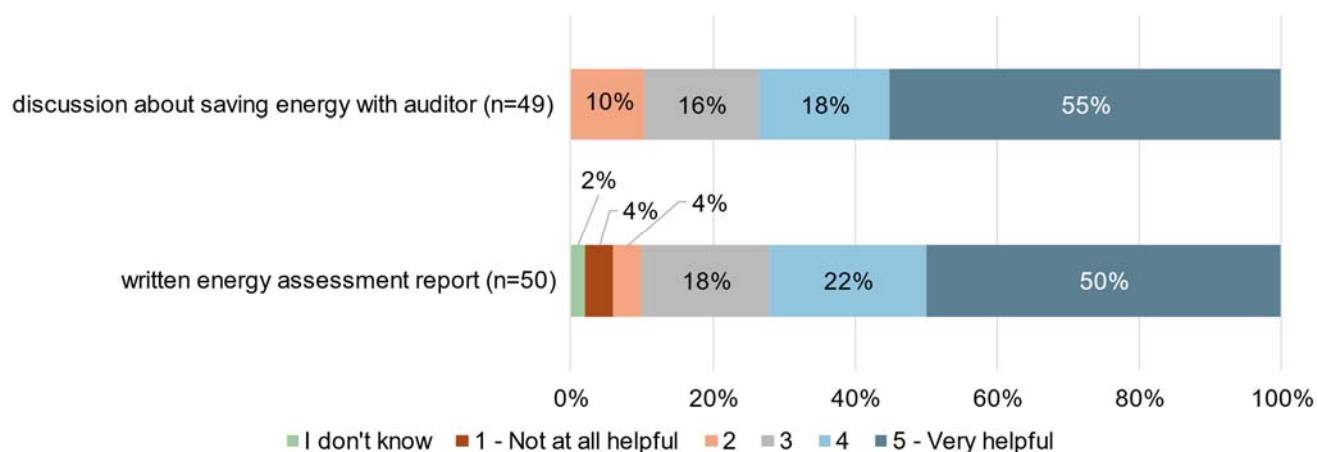


Figure 9-4: How helpful were the discussion with the auditor and/or the written energy assessment report?

The amount customers report learning from the QHEC varies. While 28 percent of respondents indicated they learned a substantial amount from their participation, five percent said they learned nothing. Figure 9-5 displays how much customers’ reported learning about energy efficiency through the QHEC program. Customers that rated the amount they learned a 1 or 2 were given the opportunity to elaborate (n=8). Half of these customers were interested in a more in-depth audit that provided more detailed or specific recommendations. Half also specifically noted interest in learning about how to improve air leakage, insulation, or their home’s envelope. One customer noted that the auditor was training additional staff and perceived this to affect the level of attention given to their audit.

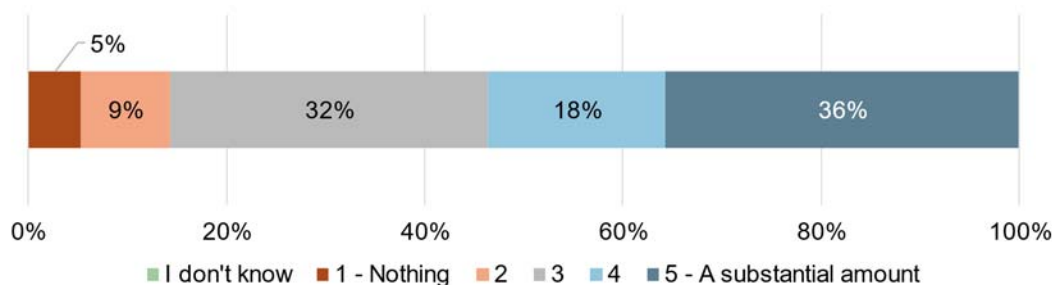


Figure 9-5: How much did you learn about energy efficiency from your participation in this program? (n=56)

Customers were satisfied with the QHEC measures and the program overall. The majority of participants indicated satisfaction with the measures they received and the program overall. Figure 9-6 displays customer satisfaction with the program overall. Seventy-four percent of customers said they were satisfied with the measures they received.⁸⁰ Nine percent indicated they were dissatisfied with one or more of the measures they received and were prompted to provide a comment. These customers indicated the measures were not functioning properly (showerheads, aerators, advanced power strips).

Sixty-four percent of respondents said they had recommended the program to someone else and of the 20 who had not recommended the program, over a third said they would recommend it.⁸¹ When asked what they would change about the QHEC program, 34 percent of respondents said they either would not change anything or did not know what they would change. Figure 9-6 displays customer satisfaction and Table 9-21 displays recommendations to improve the program. Seven percent of customers provided write-in comments and elaborated on measures they would have liked to receive through the audit (LEDs, insulation, weatherstripping, showerhead, and thermostats).

⁸⁰ Rated their satisfaction a 4 or 5 for each measure they received through the QHEC program.

⁸¹ Rated their likelihood of recommending the program a 7 or higher on a scale from 0 (not at all likely) to 10 (extremely likely).

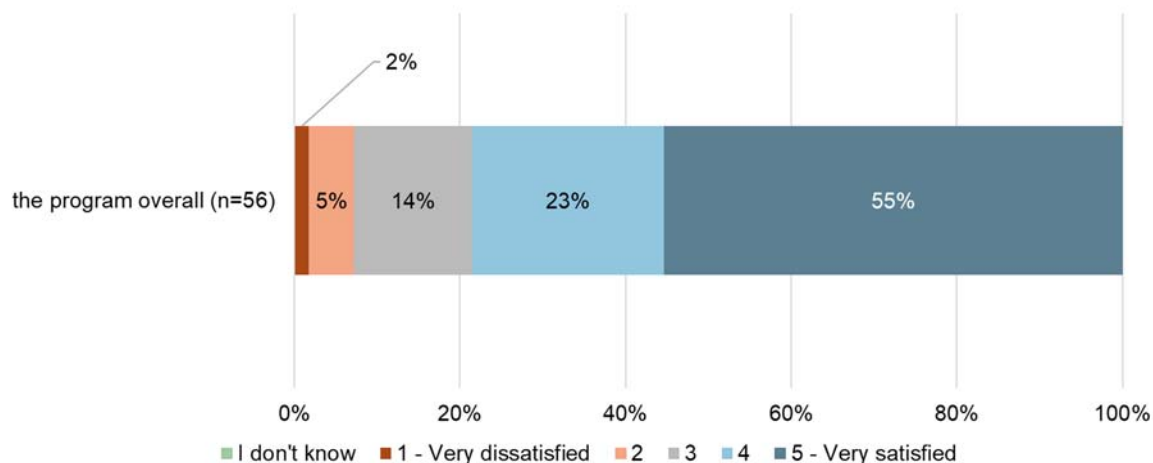


Figure 9-6: QHEC Customer Satisfaction

Table 9-21: QHEC Respondent Recommendations to Improve Program⁸²

Response	Percent (n=56)
Prompted Responses – Selected All That Apply	
Provide additional energy saving improvements through the program	52%
Elizabethtown Gas could provide more info about how much I will save by making recommended changes	29%
Auditor could provide more information	18%
Elizabethtown Gas should improve program marketing	13%
Speed up audit scheduling process	11%
Improve the program application process	7%

Customers that participate in the QHEC Program tended to go on to complete additional energy efficiency actions that were recommended during the audit visit. The Evaluator asked respondents if they had completed actions from a list provided by ETG that is used by QHEC auditors. Eighty percent of respondents said they had taken one or more additional actions related to energy efficiency after participating in the QHEC Program (see Table 9-22). Reasons customers have not taken additional action included needing more information and not thinking recommended energy saving actions needed to be taken or would save energy (Table 9-21).

⁸² Respondents could provide more than one recommendation.

Table 9-22: Recommended Actions Taken by Customers After QHEC⁸³

Response	Percent (n=56)
Replaced non-LED light bulbs with LED bulbs	64%
Improved air sealing with foam in the attic, basement, or garage	20%
Programmed existing thermostat for additional savings	20%
Installed programmable or smart thermostat	18%
Purchased ENERGY STAR appliance(s)	11%
Added insulation in attic, basement, or crawlspace	16%
Replaced HVAC unit(s) with new ENERGY STAR unit.	7%
Replaced water heater(s) with new ENERGY STAR unit	5%
Installed advanced power strips	2%

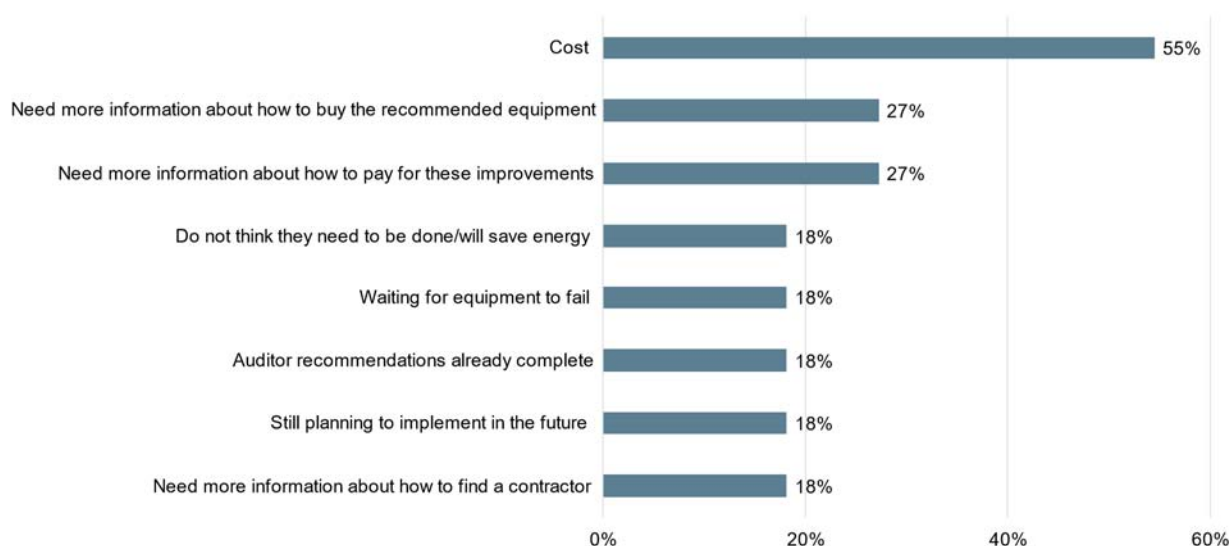


Figure 9-7: Reasons QHEC Participants Have Not Completed Recommendations⁸⁴(n=11)

Around 64 percent of QHEC participants do not go on to participate in other ETG residential programs. Regarding participation in other programs, 36 percent said they had participated in some other ETG offering after QHEC participation. Of the 20

⁸³ Sums to more than 100% because respondents could select more than one reason. Two percent of customers indicated they had installed or planned to install windows, though this was not in the list of recommended additional actions QHEC auditors provide customers.

⁸⁴ n=11.

respondents that had participated in an additional offering, 73 percent indicated their experience with QHEC was important in their decision to participate in other offerings.⁸⁵

Forty-three percent of respondents that indicated they had taken actions that are available through the HPwES program said they participated in that program (n=21). Seventy-eight percent of these customers said that their participation in the QHEC program was important in their decision to participate in HPwES program.

There is an opportunity to better inform QHEC participants about ETG’s other energy efficiency offerings. Of customers who had not participated in another program (n=35), half said they were aware of other programs. Of the customers who were not aware of other programs, a third said the QHEC home auditor had not spoken with them about ETG’s other energy efficiency programs or did not recall if their auditor had spoken about other programs. These customers cited a variety of reasons for not participating.

Regarding participation in other programs, 36 percent said they had participated in some other ETG offering after QHEC participation. Of those that had participated in an additional offering (n=20), the majority indicated their experience with QHEC was important in their decision to participate in other offerings.

Table 9-23: Reasons QHEC Participants Have Not Participated in Other ETG Offerings⁸⁶

Response	Percent (n=17)
Available programs are not applicable to my home	35%
Not interested	12%
I do not qualify	12%
Cost of participation, not ready to make purchase	12%
Did not have the time	6%
There are too many steps to participate	6%
I could not figure out how to apply or participate	6%
I already participated before QHEC participation (write in response)	6%
I don't know	12%

⁸⁵ Rated the level of importance of their QHEC experience a 7 or higher on a scale from 0 (not at all important) to 10 (very important).

⁸⁶ Sums to more than 100% because respondents could select more than one reason. Two percent of customers indicated they had installed or planned to install windows, though this was not in the list of recommended additional actions QHEC auditors provide customers.

9.5 Conclusions and Recommendations

Conclusion: Customers that participate in QHEC tend to go on to complete additional energy efficiency actions that are recommended during the visit. The Evaluator asked respondents if they had completed actions from a list provided by ETG that is used by QHEC auditors. Eighty percent of respondents said they had taken one or more additional actions related to energy efficiency after participating in the QHEC program. These actions did not include making large changes through other ETG residential programs.

Recommendation: Ensure the QHEC program's auditor explains ETG's other offerings and their applicability thoroughly and clearly. QHEC participants noted being unaware of other offerings or perceiving other offerings as not applicable to their homes, suggesting an opportunity for enhancing explanations and outreach provided by the QHEC auditor to customers during the visits.

Conclusion: There is an opportunity to better inform QHEC participants about ETG's other energy efficiency offerings. Of customers who had not participated in another program (n=35), 49 percent said they were aware of other programs.

Recommendation: Different marketing approaches should be considered for QHEC. Bill inserts and marketing emails to customers drove customer awareness for the QHEC program, but the Evaluators have found that across the country utility customers rarely read bill inserts, so there could be a significant number of customers still not aware of the program.

Conclusion: The QHEC Program will not meet its energy saving goals in PY1. The program is enrolling a sufficient number of customers, but it is not finding enough measure installation opportunities per home. ETG staff stated that the QHEC program measures do not offer substantial opportunities to generate savings. Similarly, Honeywell's program manager observed that the program does not garner gas savings specifically.

Recommendation: Consider including additional gas saving measures in the program measure mix. Since the program is not finding enough measure installation opportunities per home, additional measures such as exterior door weather stripping, water heater temperature setbacks, thermostatic radiator valves, thermostatic shower valves, window treatments, and smart thermostats could provide additional savings opportunities for the program.

Conclusion: Customer cancellations, measure-level refusals, and supply chain issues are minor barriers to implementation success for the QHEC program. Occasionally fixture compatibility and measure refusals were noted, though staff found that the program implementation contractor does not identify specific products that are refused. Implementation staff observed that the cancelation and reschedule rates were

similar to other direct install/audit programs. Supply chain issues were noted during the call with ETG staff as having had minor effects on the QHEC program as Honeywell had not been able to maintain an inventory of handheld low-flow showerheads during PY1.

Recommendation: Have a tracking data field for refused, unavailable, or incompatible measures during Direct Install visits. With lower-than-expected therms savings and measure installs in PY1, this type of accountability could provide ETG and the implementation contractor with invaluable information on why some measures are not being installed.

9.6 Barriers to Participation

Most QHEC participants do not go on to participate in other ETG residential programs. Awareness is a significant barrier to additional program participation. Regarding participation in other programs, 36 percent said they had participated in some other ETG offering after QHEC participation. Of customers who had not participated in another program (n=35), 49 percent said they were aware of other programs. Only 11 QHEC participants participated in the Moderate Income program following their QHEC visit and all other cross program participation between the QHEC and EEP programs was either un-tracked or prior to the QHEC energy assessment.

The transition from NJCEP to utility-run energy efficiency programs required significant coordination and resources. Utility staff noted that though generally the programs had “not changed much” from the customer perspective, there were back-end challenges as well as initial issues related to contractor engagement and awareness as the program transitioned from NJCEP. From an administrative perspective, SJI’s director observed that not all utilities had their programs ready at the same time. Honeywell’s program manager noted that the programs had been “in flux” and alluded to start-up efforts and coordination with other utilities as having required time and resources. Honeywell’s marketing manager noted that the most significant challenge in PY1 had been the development, coordination and revision of application forms and website materials to align and ensure consistency across gas and electric utilities.

Awareness and other utility programs, coupled with a limited marketing budget are perceived as barriers to success. SJI’s director of energy efficiency said that recruiting customers to participate in programs was initially a challenge, as they are still building awareness for programs, and electric utilities have the same offerings and may have more aggressive marketing or deeper connections to their customers. Honeywell’s marketing manager noted the program’s budget limits the amount of outreach that can be performed, further he indicated the need for reduced spending and marketing activities in PY2.

Customer cancellations, measure-level refusals, and supply chain issues are minor barriers to implementation success for the QHEC program. Occasionally fixture compatibility and measure refusals were noted, though staff noted that the program implementation contractor does not note specific products that are refused. Contacts confirmed that occasionally fixtures were not compatible with the program's high efficiency faucet aerators, but generally noted customer satisfaction with the audit and direct install measures. Honeywell staff observed that the cancelation and reschedule rates were similar to other direct install/audit programs. Supply chain issues were noted during the call with ETG staff as having had minor effects on the QHEC program as Honeywell had not been able to maintain an inventory of handheld low-flow showerheads during PY1. Utility staff noted also that the COVID-19 pandemic presented challenges regarding in-person home visits, especially initially.

9.7 Evaluability Recommendations

Add Aerator flowrate into the tracking data. The Evaluator was unable to verify ex-ante per unit savings due to the lack of reported flowrate for the new aerators in the tracking data. The evaluator used the default efficient flow rate of 2.0 gallons per minute since the actual flowrate of the showerheads installed was not available.

Improve program tracking data quality by adding product model numbers to tracking data. Program tracking data did not include product model numbers to verify products specifications. In the absence of product specifications, ex-post savings were calculated with deemed average values that are less accurate than actual specification values.

Improve realization rates by ensuring that program tracking data follows the agreed-on savings algorithms agreed on in the Coordinated Measure List. Realization rates were the most impacted by differences in savings methodology calculations. Updating the program data savings calculations to adhere to the agreed upon Coordinated Measure List methodologies will improve realization rates.

Consider the energy savings value of a professionally installed smart thermostat. Though the QHEC program did claim savings for smart thermostat installations, 6 thermostats were installed by QHEC auditors (3 of which were purchased through the online marketplace during the program year). In other neighboring states, savings for smart thermostats vary based on installation type (professional vs. customer)⁸⁷ and added savings from the QHEC auditor's professional smart thermostat installation could support program savings goals.

⁸⁷ E.g., Pennsylvania Technical Reference Manual, Volume 2: Residential Measures, page 47.

9.8 Research Questions for PY2

The Evaluator noted additional data collection in PY2 would be required to continue to develop understanding of program design and barriers to program success. Specifically, the Evaluator did not investigate NTG for the QHEC Program. The Evaluator will incorporate an approved battery of free ridership and spillover questions to the QHEC survey for PY2; the net savings battery of questions was not approved by the SWE at the time of survey administration for PY1.

The Evaluator plans to conduct auditor interviews and ride-alongs in PY2 to provide responses to the following research questions and topics:

- From your experience with the customers you come into contact with, do you think the QHEC Program is missing a certain type of customer who could be brought into the program?
- What feedback about the program have you gotten from customers?
- For implementation staff: Has any customer feedback effected the program operations?
- For field auditors: Has any customer feedback changed how you interact with customers?
- From your perspective, what could be done to improve the impact of the program on customer behavior or interest in adopting more energy efficient measures?
- What could be done to improve the customer experience – either with the auditor or with the measures installed at the time of the audit?
- How could the program improve the adequacy of the direct install measures to promote customer participation in the program?
- Assess the pre- and post-conditions of a sample of participating homes and collect qualitative information regarding the quick home energy assessment participation process and customer experience in the program.

9.9 Surveys

Client: SJIU
 Program: Quick Home Energy Checkup Program
 Group: Participants
 Mode: Email

RESEARCH OBJECTIVES

Evaluation Question	Survey Question
What are the end user and auditor experiences like throughout the program?	Q3-Q48
How do customers learn about the program? Are the marketing efforts effective and useful or are customers finding out about the program in other ways?	Q2
Are there any barriers to customer participation and/or uptake of energy efficient behaviors or products following participation? Are customers seeking out additional program offerings based on their experience with the QHEC?	Q53-Q59
Were customers satisfied with their experience with the QHEC, the auditor, and the measures installed by the auditor? What are any causes of dissatisfaction?	Q41
Were participating customers inspired to participate in other program offerings, change their behavior to reduce energy consumption, or install additional energy efficient measures based on their experience with the QHEC Program? If not, why?	Q52-Q59, Q9-Q17, Spillover battery
Did customers feel as though they learned about energy efficiency from their participation in the QHEC program? If not, what did they already know / what information did they receive that was not new to them?	Q6-Q8
Is the program adequately serving different types of customers (e.g., based on homeownership, income level, education level, geographic area, ethnicity)?	Q58-Q69
Were customers satisfied with their experience with the QHEC, the auditor, and the measures installed by the auditor? What are any causes of dissatisfaction?	Q42-Q50, Q52, Q59

PREDEFINED VARIABLES

Variable	Definition
UTILITY	Name of utility
ADDRESS	Street address
DATE	Installation date (date audit occurred)
LED	1 = measure installed, 0 = measure not installed
SHOWERHEAD	1 = measure installed, 0 = measure not installed
PIPEWRAP	1 = measure installed, 0 = measure not installed
THERMOSTAT	1 = measure installed, 0 = measure not installed
APS	1 = measure installed, 0 = measure not installed
LED_QTY	LED quantity
BATHROOM_AERATOR_QTY	Bathroom aerator quantity
KITCHEN_AERATOR_QTY	Kitchen aerator quantity
SHOWERHEAD_QTY	Showerhead quantity
APS_QTY	Smart Power strip quantity

EMAIL SURVEY MESSAGE

Subject: Help Improve [UTILITY]'s Energy Efficiency Programs

Reply To: adm-surveys@admenergy.com

From Name: [UTILITY]

[UTILITY] is interested in gathering feedback regarding the Quick Home Energy Checkup you had at your home.

Your responses will be kept anonymous and confidential. The feedback you provide will be used to help improve the program in the future.

Click here to provide feedback: [SURVEY LINK]

We would greatly appreciate your taking a few minutes to provide your feedback. If you have questions or require technical assistance, please respond to this email or contact us at adm-surveys@admenergy.com.

If you wish to no longer receive emails about this survey, please click on the "Unsubscribe" link below. Thank you in advance for your time!

Kind Regards,

ADM Associates / Contractor to [UTILITY]

SCREENING

1. Do you recall having a [UTILITY] Quick Home Energy Checkup at [ADDRESS] on or around [DATE]? During a Quick Home Energy Checkup an auditor may have come to your home and assessed your home's energy usage. They may have also installed low flow faucet aerators, a low flow showerhead, LED light bulbs, pipe insulation, smart strips, or a smart thermostat.
 1. Yes
 2. No [THANK AND TERMINATE]

AWARENESS/SCHEDULING

2. How did you first learn that you could get energy saving equipment directly installed in your home through [UTILITY]'s Quick Home Energy Checkup Program? **[RANDOMIZE RESPONSES]**
 1. Newspaper/magazine/print media
 2. [UTILITY] power bill insert
 3. Message printed on your bill
 4. [UTILITY]'s website
 5. Friend, neighbor, relative, or colleague (word-of-mouth)
 6. [UTILITY] representative

- 7. Retailer/store
 - 8. Community event
 - 9. [UTILITY] post on a social networking site (e.g., Facebook or Twitter)
 - 10. Post by someone other than [UTILITY] on a social networking site (e.g., Facebook or Twitter)
 - 11. Internet advertisement
 - 12. Radio
 - 13. Email from [UTILITY]
 - 96. Other (Please Specify): ____
 - 98. I don't know
3. On a scale from 1 to 5, with 1 being "very difficult" and 5 being "very easy," how would you rate signing up for your Quick Home Energy Checkup? [INSERT SCALE AS DEFINED ABOVE WITH 98 = I don't know]

[DISPLAY Q4 IF Q3=1 OR 2

- 4. How would you improve the scheduling process?
[OPEN-ENDED]

AUDIT EXPERIENCE

- 5. Why did you decide to have a Quick Home Energy Checkup? [Select all that apply] **[RANDOMIZE RESPONSES]**
 - 1. To learn more about my home's energy use
 - 2. To reduce my water use
 - 3. To reduce my electricity use
 - 4. To reduce my gas use
 - 5. To get information about a particular piece of equipment, (Please specify) **[OPEN-ENDED]**
 - 6. To verify that my home is already energy efficient
 - 96. Other (Please specify) **[OPEN-ENDED]**
 - 98. I don't know
- 6. On a scale from 1 to 5, where 1 is "nothing" and 5 is "a substantial amount", how much did you learn about energy efficiency from your participation in this program? [INSERT SCALE AS DEFINED, WITH 98= I DON'T KNOW]

[DISPLAY Q7 IF Q6<3]

- 7. What were you hoping to learn?
[OPEN-ENDED]

[DISPLAY Q8 IF Q6>2]

- 8. Did the amount you learned meet your expectations? Use a scale where 1 is "not at all" and 5 is "completely". [INSERT SCALE AS DEFINED, WITH 98= I don't know]

9. When you had your Quick Home Energy Checkup, did the home auditor...
- i. give you an energy assessment report with energy efficiency recommendations?
 - ii. talk to you about ways you could save energy in your home?
 - iii. provide you with information about other [UTILITY] energy efficiency programs during your appointment?
1. Yes
 2. No
 98. I don't know

[DISPLAY Q10 IF Q9.1 = 1]

10. On a scale from 1, meaning "not at all helpful," to 5, meaning "very helpful," how helpful was the written energy assessment report? [INSERT SCALE AS DEFINED ABOVE WITH 98 = I don't know]

[DISPLAY Q11 IF Q10 = 1 OR 2]

11. How could the energy assessment report be more helpful?

[DISPLAY Q12 IF Q9.2 = 1]

12. On a scale from 1, meaning "not at all helpful," to 5, meaning "very helpful," how helpful was the discussion about saving energy with auditor? [INSERT SCALE AS DEFINED ABOVE WITH 98 = I don't know]

[DISPLAY Q13 IF Q12 = 1 OR 2]

13. How could the auditor have been more helpful?

[OPEN-ENDED]

14. Since your Quick Home Energy Checkup on or around [DATE], have you completed any of the following energy efficiency improvements? (Select all that apply) **[RANDOMIZE RESPONSES]**

1. Improved air sealing with foam sealant or caulking in the attic, basement, and garage
2. Added insulation in attic, basement, and crawlspace
3. Replaced HVAC unit(s) with new ENERGY STAR unit(s)
4. Replaced water heater(s) with new ENERGY STAR unit(s)
5. Upgraded to an ENERGY STAR tankless water heater
6. Programmed existing thermostat for additional savings
7. Installed programmable thermostat
8. Purchased ENERGY STAR appliance(s)
9. Replaced CFL light bulbs with LED bulbs

96. Other (Please specify): **[OPEN-ENDED]**

97. No - I have not made any of these improvements **[EXCLUSIVE]**

[DISPLAY Q15 IF Q14 = 1, 2, 3, 7]

15. One or more of the improvement(s) you mentioned are rebated through the [UTILITY]'s Home Performance with Energy Star Program. Did you participate in this program?
1. Yes
 2. No
 98. I don't know

[DISPLAY Q16 IF Q15 = 1]

16. On a scale from 0 to 10 where 0 represents "not at all important" and 10 represents "very important", how important was your experience with the Quick Home Energy Checkup in your decision to participate in the Home Performance with Energy Star Program? [INSERT SCALE AS DEFINED WITH DON'T KNOW=98, REFUSED=99]

[DISPLAY Q17 IF Q14 = 10]

17. What are the reasons you have not made the recommended improvements? (Select all that apply) **[RANDOMIZE RESPONSES]**
1. Cost
 2. Do not have time
 3. Waiting for equipment to fail
 4. Do not think they need to be done/will save energy
 5. Do not own the property
 6. Need more information about how to pay for these improvements
 7. Need more information about how to find a contractor to do these improvements
 8. Need more information about how to buy the recommended equipment
 9. Still planning to implement in the future
 96. Other (Please specify) **[OPEN-ENDED]**
 98. I don't know
18. On a scale from 1 to 5, where 1 is "strongly disagree" and 5 is "strongly agree", please rate your level of agreement with the following statements regarding your home auditor.
1. Strongly Disagree
 - 2.
 - 3.
 - 4.
 5. Strongly Agree

98. I don't know

- a. The home auditor was knowledgeable.
- b. The home auditor was professional and courteous during the visit.
- c. The home auditor was dressed professionally (that is, clean and well-dressed).

[DISPLAY Q19 IF ANY Q18A-C < 3]

19. Can you please tell us more about why you rated the home auditor as you did?

[OPEN-ENDED]

PROGRAM INSTALLATION VERIFICATION

[DISPLAY Q20 IF LED= 1]

20. Program records indicate you received [LED_QTY] LED light bulbs. Is that correct?

- 1. Yes
- 2. No
- 98. I don't know

[DISPLAY Q21 IF Q20= 2]

21. What is the correct number of LED light bulbs that you received through the program?

[OPEN-ENDED]

[DISPLAY Q22 IF Q21>0 OR Q20=1]

22. How many of those [DISPLAY LED_QTY IF Q20 = 1, ELSE Q21 RESPONSE] LED light bulbs are currently:

- Installed:
- In storage:
- Discarded or given away:

[DISPLAY Q23 IF Q22>0]

23. Where are the LED bulbs installed? [grid format, first bulb, second bulb, etc. Only display appropriate number of bulbs based on LED_QTY IF Q20 = 1, ELSE Q21 RESPONSE]

- Inside:
- Outside:
- I don't know:

[DISPLAY Q24 IF BATHROOM_AERATOR_QTY>0]

24. Program records indicate you received [BATHROOM_AERATOR_QTY] bathroom faucet aerator(s). Is that correct?
1. Yes
 2. No
 98. I don't know

[DISPLAY Q25 IF Q24= 2]

25. What is the correct number of bathroom faucet aerators that you received through the program?
[OPEN-ENDED]

[DISPLAY Q26 IF Q25>0 OR Q24=1]

26. How many of the [DISPLAY BATHROOM_AERATOR_QTY IF Q24 = 1, ELSE Q25 RESPONSE] bathroom faucet aerator(s) are currently installed?
[OPEN-ENDED]

[DISPLAY Q27 IF KITCHEN_AERATOR_QTY>0]

27. Program records indicate you received [KITCHEN_AERATOR_QTY] kitchen faucet aerator(s). Is that correct?
1. Yes
 2. No
 98. I don't know

[DISPLAY Q28 IF Q28= 2]

28. What is the correct number of kitchen faucet aerators that you received through the program?
[OPEN-ENDED]

[DISPLAY Q29 IF Q28>0 OR Q27=1]

29. How many of the [DISPLAY KITCHEN_AERATOR_QTY IF Q27 = 1, ELSE Q28 RESPONSE] kitchen faucet aerator(s) are currently installed?
[OPEN-ENDED]

[DISPLAY Q30 IF SHOWERHEAD= 1]

30. Program records indicate you received [SHOWERHEAD_QTY] low flow showerhead(s). Is that correct?
1. Yes
 2. No
 98. I don't know

[DISPLAY Q31 IF Q30= 2]

31. What is the correct number of low-flow showerhead(s) that you received through the program?

[OPEN-ENDED]

[DISPLAY Q32 IF Q31>0 OR Q30=1]

32. How many of the [DISPLAY SHOWERHEAD_QTY IF Q30 = 1, ELSE Q31 RESPONSE] low-flow showerhead(s) are currently installed?

[OPEN-ENDED]

[DISPLAY Q33 IF APS= 1]

33. Program records indicate you received [AP_QTY] advanced power strip(s). Is that correct?

1. Yes
2. No
98. I don't know

[DISPLAY Q34 IF Q33= 2]

34. What is the correct number of advanced power strip(s) that you received?

[OPEN-ENDED]

[DISPLAY Q35 IF Q33 = 1 OR Q34>0]

35. How many of the [DISPLAY AP_QTY IF Q34 = 1, ELSE Q35 RESPONSE] power strip(s) are currently installed?

[OPEN-ENDED]

[DISPLAY Q36 IF Q35 = 0]

36. Why haven't you installed the advanced power strip(s)?

1. I don't have a good place to install the power strip(s)
2. I had trouble installing the power strip(s)
3. I plan to but haven't had the opportunity
96. Other (Please specify) **[OPEN-ENDED]**
98. I don't know

[SHOW Q37 IF THERMOSTAT =1]

37. Program records indicate that you had a smart thermostat installed, is that correct?

1. Yes
2. No
98. I don't know

[SHOW Q38-Q39 IF Q37 =1]

38. Is the new smart thermostat currently installed and working?

Yes
No
98. I don't know

39. Did the home auditor show you how to use the smart thermostat?

1. Yes
2. No
98. I can't recall

[SHOW Q40 IF PIPEWRAP =1]

40. Program records indicate that you had water heater pipe wrap installed, is that correct?

1. Yes
2. No
98. I don't know

MEASURE SATISFACTION

41. On a scale from 1 to 5, where 1 is "very dissatisfied" and 5 is "very satisfied", how satisfied or dissatisfied are you with the ...

1. Very Dissatisfied
- 2.
- 3.
- 4.
5. Very Satisfied
98. I don't know

- a. [DISPLAY IF Q20=1 OR Q21>0] Light bulb/s
- b. [DISPLAY IF Q24=1 OR Q25>0] Bathroom Faucet Aerator/s
- c. [DISPLAY IF Q27=1 OR Q28>0] Kitchen Faucet Aerator/s
- d. [DISPLAY IF Q30=1 OR Q31>0] Low Flow Showerhead/s
- e. [DISPLAY IF Q33=1 OR Q34>0] Advanced Power Strip/s
- f. [DISPLAY IF Q40=1] Water heater pipe wrap
- g. [DISPLAY IF Q37=1] Smart thermostat installation
- h. the Quick Home Energy Check Up program overall

[SHOW Q42 IF Q41A = 1 OR 2]

42. Why are you dissatisfied with your new LED light bulb/s?

[OPEN-ENDED]

[SHOW Q43 IF Q41B = 1 OR 2]

43. Why are you dissatisfied with your new bathroom faucet aerator/s?

[OPEN-ENDED]

[SHOW Q44 IF Q41C = 1 OR 2]

44. Why are you dissatisfied with your new kitchen faucet aerator/s?

[OPEN-ENDED]

[SHOW Q45 IF Q41D = 1 OR 2]

45. Why are you dissatisfied with your new low flow showerhead/s?

[OPEN-ENDED]

[SHOW Q46 IF Q41E = 1 OR 2]

46. Why are you dissatisfied with your new advanced power strip/s?

[OPEN-ENDED]

[SHOW Q47 IF Q41F = 1 OR 2]

47. Why are you dissatisfied with your new water heater pipe wrap?

[OPEN-ENDED]

[SHOW Q48 IF Q41H = 1 OR 2]

48. Could you please elaborate on your rating of your overall experience?

[OPEN-ENDED]

SATISFACTION

49. Have you recommended the Quick Home Energy Checkup to others?

1. Yes
2. No
98. I don't know

[DISPLAY Q50 IF Q49=2, 98]

50. What is the likelihood you would recommend the Quick Home Energy Checkup to a friend, colleague, or relative? Please use a scale from 0 (not at all likely) to 10 (extremely likely). [INSERT SCALE AS DEFINED, WITH 98= I don't know]

51. What would you change about the [UTILITY] Quick Home Energy Checkup, if anything? **[RANDOMIZE RESPONSES]**

1. . Would not change anything
2. Improve the program application process
3. Speed up audit scheduling process
4. Auditor could provide more information
5. [UTILITY] should improve program marketing
6. [UTILITY] could provide more info about how much I will save by making recommended changes
7. Provide additional energy saving improvements through the program
96. Other (Please specify) **[OPEN-ENDED]**
98. I don't know

[DISPLAY Q52 IF Q15=1]

52. Since participating in the Quick Home Energy Checkup and the Home Performance with Energy Star Programs, have you taken advantage of any of these other [UTILITY] offerings? **[RANDOMIZE RESPONSES]**

1. Appliance Rebates
2. HVAC and Water Heating Rebates
3. 0% APR financing for HVAC equipment through the On-Bill Repayment Program (OBRP)
4. An on-site energy assessment and incentives for multi-family buildings
5. Discounted energy-saving products through the online [UTILITY] Marketplace
6. FREE home weatherization services for income-qualified customers
7. Instant Home Energy Analysis survey on [UTILITY] website to create home energy profile
96. Other (Please specify) **[OPEN-ENDED]**
8. No - I have not taken advantage of any other [UTILITY] offerings **[EXCLUSIVE]**

[DISPLAY Q53 IF Q52 IS NOT DISPLAYED]

53. Since participating in the Quick Home Energy Checkup, have you taken advantage of any of these other [UTILITY] offerings? **[RANDOMIZE RESPONSES]**

1. Appliance Rebates
2. HVAC and Water Heating Rebates
3. 0% APR financing for HVAC equipment through the On-Bill Repayment Program (OBRP)
4. An on-site energy assessment and incentives for multi-family buildings
5. FREE home weatherization services for income-qualified customers

6. Discounted energy-saving products through the online [UTILITY] Marketplace
7. Instant Home Energy Analysis survey on [UTILITY] website to create home energy profile
96. Other (Please specify) **[OPEN-ENDED]**
9. No - I have not taken advantage of any other [UTILITY] offerings **[EXCLUSIVE]**

[DISPLAY Q54 IF Q53=9]

54. Before taking this survey, were you aware of other [UTILITY] incentive or rebate programs for energy efficient equipment or improvements?
1. Yes
 2. No

[DISPLAY Q55 IF Q52=1-6, 96 OR Q53=1-8, 96]

55. On a scale from 0 to 10 where 0 represents “not at all important” and 10 represents “very important”, how important was your experience with the Quick Home Energy Checkup in your decision to take advantage of those other [UTILITY] programs or offerings? **[INSERT SCALE AS DEFINED WITH DON'T KNOW=98, REFUSED=99]**

[DISPLAY Q56 IF Q52=2 AND Q54=1]

56. Why haven't you participated in any other [UTILITY] programs or offerings? (Please select all that apply) **[MULTISELECT] [RANDOMIZE RESPONSES]**
1. Did not have the time
 2. Not interested
 3. Available programs are not applicable to my home
 4. There are too many steps to participate
 5. I could not figure out how to apply or participate
 96. Other (Please describe) **[OPEN-ENDED]**
 98. I don't know **[MAKE EXCLUSIVE]**

[DISPLAY Q57 IF Q52=8 AND Q53=9]

57. On a scale from 0 to 10 where 0 represents “not at all important” and 10 represents “very important”, how important was your experience with the Quick Home Energy Checkup in your decision not to take advantage of those other [UTILITY] programs or offerings? **[INSERT SCALE AS DEFINED WITH DON'T KNOW=98, REFUSED=99]**

HOUSEHOLD CHARACTERISTICS / DEMOGRAPHICS

58. Do you rent or own your home?

1. Rent
2. Own
96. Other (Please specify) **[OPEN-ENDED]**

59. Which of the following best describes your home?

1. Single-family
1. Duplex
2. Triple decker (e.g., three story house with each floor being a separate unit)
3. Apartment/condo in a 2-4 unit building
4. Apartment/condo in a 5+ unit building
5. Townhouse or row house (adjacent walls to another house)
6. Mobile home or trailer
96. Other (Please specify) **[OPEN-ENDED]**
98. I don't know

60. When was your home built?

1. Before 1960
2. 1960-1979
3. 1980-1999
4. 2000-2009
5. 2010 or later
98. I don't know

61. About how many square feet is your home? If you are unsure, an estimate is OK.

1. Less than 1,000 square feet
2. 1,000-1,999 square feet
3. 2,000-2,999 square feet
4. 3,000-3,999 square feet
5. 4,000-4,999 square feet
6. 5,000 or greater square feet
98. I don't know

62. What is the main fuel used for heating your home?

1. Electricity
2. Natural Gas
3. Propane
4. Oil
5. Other (Please specify) **[OPEN-ENDED]**
98. I do not recall

63. What fuel does your main water heater use?

1. Electricity
2. Natural Gas
3. Propane
4. Oil
5. Other (Please specify) **[OPEN-ENDED]**
98. I do not recall

64. What is your age?

1. Under 35 years old
2. 35- 55 years old
3. Over 55 years old
98. I prefer not to answer

65. What is the primary language spoken in your home?

1. English
2. Spanish
3. Chinese
4. Hindi
5. Gujarathi
6. Portuguese
7. Russian
8. Tagalog
9. Arabic
10. Korean
11. Polish
96. Other (Please specify) **[OPEN-ENDED]**
99. I prefer not to answer

66. [UTILITY] is committed to providing energy efficiency programs to all customers in the communities they serve. Please share your ethnicity to help us understand the diversity of our program participants. (Please select all that apply)

1. Black or African American
2. Hispanic or Latino/Latina
3. American Indian and Alaska Native
4. Asian
5. Middle Eastern or North African
6. Native Hawaiian and Other Pacific Islander

- 7. White
- 96. Not Listed (Please specify):
- 99. I prefer not to answer

67. Including yourself, how many people are living in your household? [DROP DOWN BOX – 1-14 or more, 99. Prefer not to answer]

68. Is your annual household income over or under [CUTOFF]?

- IF Q67 = 1 CUTOFF = \$33,976
- IF Q67 = 2 CUTOFF = \$45,776
- IF Q67 = 3 CUTOFF = \$57,576
- IF Q67 = 4 CUTOFF = \$69,376
- IF Q67 = 5 CUTOFF = \$81,176
- IF Q67 = 6 CUTOFF = \$92,976
- IF Q67 = 7 CUTOFF = \$104,776
- IF Q67 = 8 CUTOFF = \$116,576
- IF Q67 = 9 CUTOFF = \$128,376
- IF Q67 = 10 CUTOFF = \$140,176
- IF Q67 = 11 CUTOFF = \$151,976
- IF Q67 = 12 CUTOFF = \$163,776
- IF Q67 = 13 CUTOFF = \$175,576
- IF Q67 = 14 CUTOFF = \$187,376

- 1. Over
- 2. Under
- 98. I don't know
- 99. I prefer not to answer

[DISPLAY Q69 IF Q68= 1]

69. Is your annual household income over or under [CUTOFF]?

IF Q67 = 1 CUTOFF = \$54,360

IF Q67 = 2 CUTOFF = \$73,240

IF Q67 = 3 CUTOFF = \$92,120

IF Q67 = 4 CUTOFF = \$111,000

IF Q67 = 5 CUTOFF = \$129,880

IF Q67 = 6 CUTOFF = \$148,760

IF Q67 = 7 CUTOFF = \$167,640

IF Q67 = 8 CUTOFF = \$186,520

IF Q67 = 9 CUTOFF = \$205,400

IF Q67 = 10 CUTOFF = \$224,280

IF Q67 = 11 CUTOFF = \$243,160

IF Q67 = 12 CUTOFF = \$262,040

IF Q67 = 13 CUTOFF = \$280,920

IF Q67 = 14 CUTOFF = \$299,800

1. Over

2. Under

98. I don't know

99. I prefer not to answer

THANK YOU

Thank you for participating in this survey. Have a great day!

TERMINATION PAGE

Thank you for your time – however, this survey is meant only for customers who recall having a Quick Home Energy Checkup from [UTILITY].

10 Appendix D: MI Weatherization Program Evaluation Report

10.1 Introduction

The Moderate-Income Weatherization program provides an opportunity for moderate-income⁸⁸ customers to receive energy efficiency measures and upgrades at no additional cost. Customers with income between 250 percent and 400 percent of the federal poverty guideline are eligible for the Moderate-Income Weatherization Program.

Customers meeting income eligibility requirements undergo an audit conducted by a Building Performance Institute (BPI)-certified participating contractor. Based on the in-home audit recommendations, a program participant may receive weatherization measures (insulation and air sealing) at no cost. Homeowners with nonfunctional heating and/or cooling systems may also be eligible to receive repairs or replacement at no additional cost. The program includes a budgetary cap on each project (\$6,000) with additional funding for health and safety expenses (\$1,500). During the audit, participants may receive behavioral suggestions to improve efficiency of the home, including review of thermostat control strategy and water heater temperature setpoints.

The Moderate-Income Weatherization projects typically save electric energy and natural gas, so electric utilities (primarily JCP&L, also PSE&G in Union County) may bring customers to the program. ETG is considered the lead utility if a customer applies through ETG's program, and they will work with the Statewide Coordinator and electric utility to allocate costs and energy savings appropriately for all customers participating in the program.

Table 10-1 compares Program Year 1 (PY1) projected program participation and savings to actual reported savings. The number of completed projects (N=64) was less than half the projected number of projects (N=150). The reported savings per home (208 therms) were higher than projected savings of 164 therms per home. This resulted in ex-post gross savings of **13,008.75 therms** for a **98 percent** realization rate (RR), **17,701 kWh**, **6.44 kW**, with lifetime savings of **324,610.74 therms** and **493,592 kWh**.

⁸⁸ New Jersey's previous low-income energy efficiency program, "Comfort Partners", will continue to be co-managed by New Jersey and the utility companies. This comprehensive energy efficiency solution for low-income customers in New Jersey is not addressed in this evaluation since it is a Co-Managed Program under Societal Benefits Clause funding.

Table 10-1: ETG Moderate-Income Weatherization Participation and Savings for PY1 Ex-Ante and Filed Plan Values

Metric	PY1 Reported	PY1 Projected	PY2 Projected	PY3 Projected
Number of Participants	64*	150	250	500
Net Annual Natural Gas Savings (therms)	13,297	24,658	41,097	82,194
Net Lifetime Natural Gas Savings (therms)	328,948	452,738	754,563	1,509,126
Net Lifetime Natural Gas Savings from Qualifying Low-Income Customers (therms)	328,948	452,738	754,563	1,509,126
Net Annual Electric Savings (kWh)	20,722	134,044	223,406	446,812
Net Lifetime Electric Savings (kWh)	493,592	1,787,910	2,979,851	5,959,701
Net Lifetime Electric Savings from Qualifying Low-Income Customers (kWh)	493,592	1,787,910	2,979,851	5,959,701
Net Annual Peak Demand Savings (kW)	0	3	6	12

*73 projects reported in tracking data, 64 were completed projects (9 projects presumed to have completed audit phase but weatherization work had not yet been completed).

10.2 Methodology

The evaluation of the PY1 Moderate-Income Weatherization program included impact and process evaluation components. The Evaluator (Cadmus, in partnership with ADM) acquired program tracking data, tax assessors’ data, and conducted interviews with program stakeholders and participants to support the evaluation. This section describes the methodology the Evaluator used to review and calculate electricity and fuel savings that resulted from the program.

The impact evaluation methodology is described in detail in the following sections.

10.2.1 Estimating Gross Savings

This section details the impact analysis methodologies used for each measure category. Algorithms from the 2020 New Jersey’s Clean Energy Program Protocols to Measure Resource Savings (“2020 TRM”) were used to determine verified gross energy impacts and lifetime savings. Table 10-2 lists the measures and applicable TRM reference.

Table 10-2: TRM Measure Summary

Measure	TRM
Residential Existing Homes Program – Air Sealing	2020 TRM (pg. 70-71)
Residential Existing Homes Program – Duct Sealing and Repair	2020 TRM (pg.71-72)
Residential Existing Homes Program – Insulation Upgrades	2020 TRM (pg. 75-77)
Residential Existing Homes Program – HVAC Replacements*	2020 TRM (pg. 23-24).
Gas Storage Tank Water Heater*	2020 TRM (pg. 29)
Direct-Install Deemed Savings Measures	LEDs: 2020 TRM (pg. 64) Smart Strips: 2020 TRM (pg. 53) Faucet aerators: 2020 TRM (pg. 182)* Direct-Install Showerheads**: 2021 TRM (pg. 84)
Boiler Reset Controls	2020 TRM (pg. 28)
HVAC Tune-Up	None

*Potential priority measure, however, none implemented in PY1.

Table 10-3 provides a breakdown of weatherization measures implemented for each home and the associated savings per home for each measure category. The table also includes the total contribution of MMBtu savings for each measure, based on therms and kWh converted to MMBtu.⁸⁹ The reported therms savings account for 95 percent of the total MMBtu (i.e., the kWh contribution is relatively insignificant).

Table 10-3: Reported Ex-Ante Gross Savings by Measure

Measure Category	Number of Homes with Measure	Total therms	Therms per Home	kWh per Home	% Total MMBtu
Insulation	56	8,529.46	152.31	200	63.6%
Air Sealing	58	2,366.25	40.80	77	18.0%
Duct Sealing	19	1,693.27	89.12	261	13.3%
HVAC Tune-up	6	710.14	118.36	17	5.1%
Boiler Reset Controls	4	-1.70*	-0.43	-	0.0%
Total	64	13,297.42	400.16	555	100%

*One project had -33.2 therms savings reported. The other three projects totaled 31.5 therms savings reported. The evaluators did not determine why negative savings were reported for one project.

⁸⁹ MMBtu estimated using: Therms x 10; and kWh x 0.003412

The sections below detail the impact analysis methodologies for each measure included in the program.

Residential Existing Homes Program – Air Sealing

The 2020 TRM states air sealing involves a “package” of air sealing work which involves sealing “air leakage paths to reduce the natural air infiltration rate through the installation of products and repairs to the building envelope... Expected percentage savings is based on previous experiences with measured savings from similar programs.”

The expected savings (listed in Table 10-4) are based on the square footage of the conditioned space of the home.

Table 10-4: NJ TRM Air Sealing Savings per 1,000 ft² of Conditioned Space

Climate Zone	Vintage	kWh / 1,000 ft ²	Therms / 1,000 ft ²
5 ETG	Average	12	19

Residential Existing Homes Program – Duct Sealing and Repair

The 2020 TRM (pg. 71) includes a savings methodology to estimate duct sealing which requires estimates of the following:

- Percentage of duct work found within the conditioned space
- Duct leakage evaluation (leaky, average, tight)
- Duct insulation evaluation (existing R-value)

This information was not available in the tracking data so the Evaluator compared the reported therms savings (89 therms/home, see Table 10-3) to various estimates using the TRM method and typical HVAC efficiency assumptions. The average savings is comparable to ducts located in an attic, with insulation added to improve the R-value from R-2 to R-8. The TRM uses subjective variables to address leakage (leaky, average, tight) which were not evaluated in PY1.

Residential Existing Homes Program – Insulation Upgrades

The highest impact measure in the program was insulation upgrades, with most homes completing some type of insulation improvement with average savings of 152 therms per home (see Table 10-3).

At minimum, the NJCEP protocol requires baseline and installed R-values and ft² of the area treated. Because the baseline R-values were not reported, the Evaluator did not calculate savings using the R-values and ft² insulation added but reviewed the savings to ensure the reported estimates were reasonable and within range of expected savings.

Residential Existing Homes Program – HVAC Replacements

HVAC replacements may be eligible; however, none was reported in PY1.

Gas Storage Tank Water Heater

Gas water heater replacements are an eligible measure; however, none was reported in PY1.

Direct-Install Deemed Savings Measures

The program did not include direct-install measures (comparable to measures offered through the QHEC program), which would typically be installed at the time of the initial audit. ETG staff indicated these measures will be offered in PY2 and PY3.

Tune-Ups and Boiler Reset Controls

The 2020 TRM does not include an approach to estimate savings for tune-ups but does include a measure for “boiler reset controls” which assumes 5 percent reduction in annual heating energy if outdoor temperature reset controls are implemented. The average boiler reset control savings was near 0 therms because one project reported negative therms savings nearly equal to the total savings from the other three projects. The average tune-up savings was 118 therms which is likely at least 10 percent of annual heating therms use.

10.2.2 Process Evaluation Approach

The process evaluation was designed to explore the Moderate-Income Weatherization program’s design and implementation, barriers to participation, and outcomes. To investigate these areas, the Evaluator reviewed program documents, interviewed program staff, and conducted in-depth interviews with program participants.

Program Design and Implementation

As an initial step in the process evaluation, the Evaluator reviewed program filings regarding development and implementation and any available marketing materials and websites to understand the program design and to develop interview questions.

The Evaluator used interviews with trade allies and program staff to explore their roles marketing, administering, and implementing the program, as well as their experiences with it. The process evaluation sought to answer the following research questions:

- How well did the program staff and implementation staff work together? Are there data tracking and communication efficiencies that can be gained?
- How do customers learn about the program?

- Identify participation through QHEC versus direct participation in Weatherization or other ways (e.g., called an HVAC contractor for system repair/replacement).
- What is the cross-program participation of all moderate-income weatherization program participants?
- What role did participation in other efficiency programs (e.g., QHEC, efficient products, legacy state-run program) play in their decision to participate?
- Did the program's implementation reflect its design?
- Is lead- and partner-utility coordination working as expected?
- Are there ways to improve the design or implementation process?
 - E.g., can ETG use Home Energy Report (HER) information to target customers with the greatest savings potential?
- What challenges does the necessity of an in-depth energy audit by BPI-certified contractor create for contractors? For participants?
- What challenges do health and safety measures present to contractors?
- Are the participants experiencing the expected benefits (e.g., increased comfort, reduced maintenance) or other unexpected benefits?
- What measures are contractors recommending that have the lowest participant adoption? Why?
- What are the participant characteristics and are they different from eligible residential customers not participating?
- What are the home characteristics and are they different (e.g., more suitable for weatherization improvement measures) from eligible residential customers not participating?
- Were there any significant changes or new obstacles during the program year (Focused especially on transition from state-run to utility-run program)?
- Were there any outside or external barriers that influenced the program?

Participation Barriers

The Evaluator used interviews with program staff and participants to explore participation barriers, asking questions such as:

- When customers are not at all interested in participating in the program, what are the reasons? Based on your customer interactions, what do you perceive could bolster the interest of these customers?
- What are the obstacles to getting partially interested customers involved with the program? Are there ways that those obstacles could be mitigated?

- Are participation rates of renters aligned with the market? If not, how can the program better recruit renters?
- Have there been challenges with marketing?
- Are there any specific measures for which the current incentive caps prohibit uptake? If so, what are they and how much would the incentives need to be increased to enable implementation?
- What percentage of completed audits do not go on to install weatherization measures?
- What are the main reasons customers receive an energy audit but ultimately choose not to participate?

Outcomes

To assess program outcomes, the Evaluator asked questions that addressed energy efficiency attitudes, behaviors, and program and utility service satisfaction. These questions are used to answer research questions such as:

- Were the customers satisfied with their experience? What are the causes of dissatisfaction?
- Is the program adequately serving different types of customers (e.g., based on homeownership, income level, education level, geographic area, ethnicity, preferred spoken language)?
- Looking forward, what are key impediments and drivers to program success?

10.2.3 Sampling

The sampling plan was not designed to meet SWE basic rigor guidelines,⁹⁰ which require a sample size sufficient to determine savings with relative precision of ± 10 percent at the 90 percent confidence interval at the program level and ± 15 percent at the 85 percent confidence interval at the measure level. The impact evaluation activities were limited because a pre/post billing analysis is planned for the subsequent evaluation, as this is the preferred method to estimate actual program impacts. Additionally, the number of completed projects was relatively low, so program experience and satisfaction may not yet reflect the experience of typical program participants. The Evaluator chose to conduct 5 in-depth participant interviews, which does not yield statistically significant outcomes, but can provide invaluable insights to support future evaluation efforts (e.g., survey design, EM&V approach).

⁹⁰ The evaluator and SWE discussed the evaluation approach, and the SWE recommended a small sample of in-depth interviews rather than attempting online surveys of all participants.

10.3 Impact Evaluation Results

The Evaluator reviewed tracking data to ensure that each measure met program qualifications, that each was installed in the PY1, and that there were no duplicates or otherwise erroneous entries.

Program annual and lifetime savings are summarized in Table 10-5 though Table 10-8 and discussed in detail by measure category in the following sections.

Table 10-5: MI Weatherization Gross Annual Savings (Therms)

Measure Category	Quantity (Count of Homes w/ Measure)	Ex-Ante Savings (therms)	Ex-Post Savings (therms)	Therms RR
Insulation	56	8,529.46	8,529.46	100%
Air Sealing	58	2,366.25	2,077.59	88%
Duct Sealing	19	1,693.27	1,693.27	100%
Tune-up	6	710.14	710.14	100%
Boiler Reset Controls	4	-1.70	-1.70	100%
Total	64	13,297.41	13,008.75	98%

Table 10-6: MI Weatherization Gross Annual Savings (kWh)

Measure Category	Quantity (Count of Homes w/ Measure)	Ex-Ante Savings (kWh)	Ex-Post Savings (kWh)	kWh RR
Insulation	56	11,223	11,223	100%
Air Sealing	58	4,462	1,442	32%
Duct Sealing	19	4,950	4,950	100%
Tune-up	6	100	100	100%
Boiler Reset Controls	4	-14	-14	100%
Total	64	20,722	17,701	85%

The “Residential Existing Homes Program” section of the protocol does not include demand savings algorithms for other measures. ETG reported 0 demand savings for all measures. The 2020 TRM does include the following demand savings algorithm for the duct sealing measure, based on annual cooling savings:

$$Peak\ Demand\ Savings\ (kW) = \frac{\Delta kWh_{cooling}}{EFLH_c} \times CF$$

Equation 38

The Evaluator estimated an energy-to-demand factor using a neighboring utilities 2021 residential sector load data (PSE&G RS: non-electric heat rate class) for the summer on-peak demand period defined in the 2020 TRM (Monday-Friday, 12-8pm, June – August). The energy to demand factor (0.000364 kW/kWh) provides a conservative⁹¹ estimate of demand savings.

Table 10-7: MI Weatherization Gross Demand Reduction (kW)

Measure Category	Quantity (Count of Homes w/ Measure)	Ex-Ante Savings (kW)	Ex-Post Savings (kW)	kW RR
Insulation	56	0	4.09	NA
Air Sealing	58	0	0.52	NA
Duct Sealing	19	0	1.80*	NA
Tune-up	6	0	0.04	NA
Boiler Reset Controls	4	0	-0.01	NA
Total	64	0	6.44	NA

*All demand values in table based on 0.000364 kW/kWh energy to demand savings factor. Using TRM method, assuming all reported kWh savings are “Cooling Energy Savings”, the demand savings for the duct sealing measure would be 5.7 kW.

Table 10-8 shows measure-level and total lifetime kWh and therms savings. Lifetime savings were calculated for each measure by multiplying ex-post annual savings by the expected useful life (EUL) for that measure.

Table 10-8. MI Weatherization Gross Lifetime Savings

Measure Category	Quantity (Count of Homes w/ Measure)	EUL	Lifetime Savings (Therms)	Lifetime Savings (kWh)
Insulation	56	30	255,883.66	336,689
Air Sealing	58	15	31,163.82	66,936
Duct Sealing	19	18	30,478.87	89,104
Tune-up	6	10	7,101.41	1,001
Boiler Reset Controls	4	10	-17.02	-138
Total	64	24.9	324,610.74	493,592

*Based on lifetime/annual therms. EUL based on kWh savings is 27.9 years.

⁹¹ This estimates average summer demand savings, not critical peak hour. The factor for peak hour is 0.000747 kW/kWh.

The following sections address the three measures that contributed a significant percentage of program savings or measure savings that require additional explanation.

Air Sealing

According to the 2020 TRM, a 2,000 ft² home in ETG service territory (climate zone 5) receiving a comprehensive package of air sealing measures would save 24 kWh and 38 therms annually (see Table 10-4). Building square footage was not included in the tracking data so the Evaluator used publicly available tax records (see example in Figure 10-1) to estimate building conditioned square footage for a sample of participants (n=21).

The screenshot shows a web interface for tax records with several data panels. The 'Building' panel contains the following data:

Field	Value
Class 4 Code	0
Building Class	28
Building Desc	2SF1G
Building Sq. Ft.	1,272
Year Built	1988

The 'Building Sq. Ft.' value of 1,272 is circled in red in the original image. Other panels include Lot information (Lot Acres: 0.29, Lot Sq. Ft.: 12,662.89), Exempt Property details, Property Stats (2 owners, 2 levels, 2 bedrooms, 2 bathrooms), Parcel Geometry (Acres: 0.15, Sq Ft: 6,361.17), and Census Data (State: 34, County: 007, Tract: 609201, Block: 3021, Full Code: 340076092013021).

Figure 10-1: Example Tax Record Excerpt Showing Conditioned Area (Sq Ft.)⁹²

The average size of homes receiving some type of air sealing measure was 1,965 ft². Following the 2020 TRM, this results in average savings of 35.8 therms. Figure 10-2 shows the distribution of reported savings for ETG homes receiving air sealing measures. Though the 2020 TRM was not used to estimate savings, the average reported savings (40.8 therms per home with air sealing) was comparable.

⁹² Available from: <https://njpropertyrecords.com/>

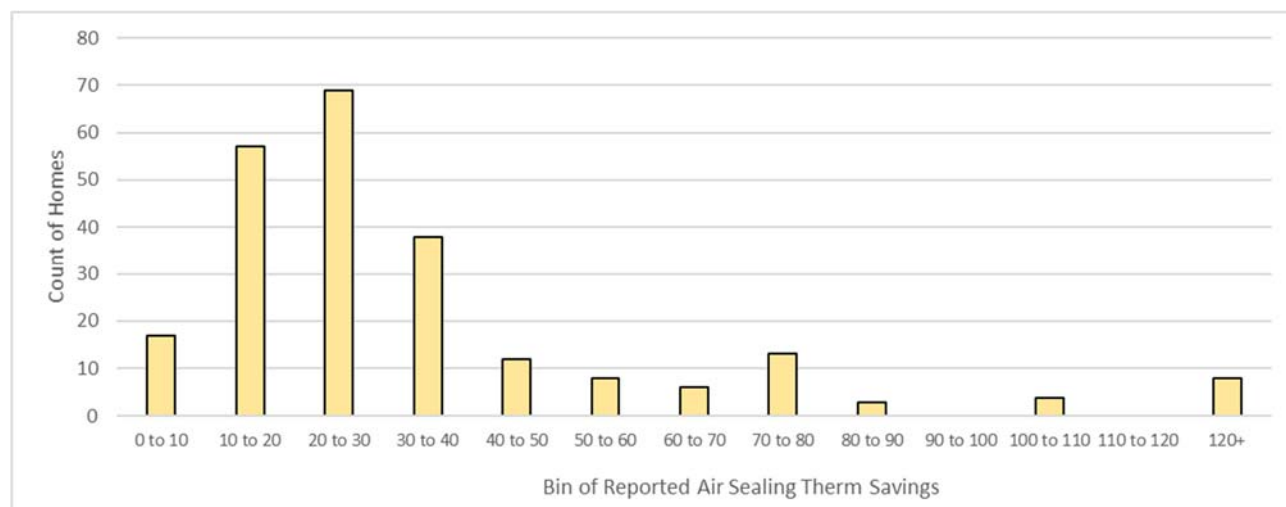


Figure 10-2: Histogram of Total Air Sealing Savings for ETG Homes

Duct Sealing and Repair

This information needed to use the 2020 TRM’s protocols to calculate duct sealing savings was not available in the tracking data. The 2020 TRM (pg. 71) includes a savings methodology to estimate duct sealing which requires estimates of:

- Percentage of duct work found within the conditioned space.
- Duct leakage evaluation (leaky, average, tight).
- Duct insulation evaluation (existing R-value).

The Evaluator compared the reported therms savings (89 therms/home, see Table 10-3) to various estimates using the 2020 TRM method and common assumptions. The average savings is comparable to ducts located in an attic, with insulation added to improve the R-value from R-2 to R-8. The 2020 TRM uses subjective variables to address leakage (leaky, average, tight) which were not evaluated in PY1.

Duct sealing savings (89 therms per project) may be approximately 10 percent of annual heating therms consumption. In the Evaluator’s experience, duct sealing savings of this order of magnitude may be detectable from billing analysis. This will require significantly more homes receiving duct sealing (at least 200) with a similar mix of other weatherization measures. If this quantity is not expected, more detailed information is required to better assess duct sealing savings using the prescribed method in the 2020 TRM or subsequent TRM updates.

Insulation

The tracking data includes treated area (in ft²) or linear footage, the R-value of insulation added, and an estimate of savings per square foot. The baseline R-values were not included in the tracking data. Figure 10-3 provides an example of the measure-level detail reported.

...CONTINUED

Work Order

ITEM	QTY	UNIT
ATTIC STAIR REPAIR (PERCENTAGE MARK-UP ON SUB WORK T&M) #235-S Mounting bracket is detaching. Auditor noted missing nuts on bolts.	1	each
BOXING/DAMMING FIXTURES-SEALED- END DUCT #211	13	each
INSULATE ATTIC		
BLOWN CELLULOSE FLOORED ATTIC INSULATION R20 #170	1032	sq. ft
Air sealing AEROSOL FOAM SEALANT #56 AEROSOL FOAM SEALANT (do not provide price per can)	120	lf
INSULATE CRAWL SPACE		
Air sealing AEROSOL FOAM SEALANT #56 AEROSOL FOAM SEALANT (do not provide price per can)	121	lf
Insulation FIBERGLASS PERIMETER INSULATION (R19) #299 FIBERGLASS PERIMETER INSULATION (R19)	363	sq. ft
SEAL AIR LEAKS		
Insulation RIGID BOARD PERIMETER INSULATION #303 RIGID BOARD PERIMETER INSULATION (1' - Priced to include installation in location requiring thermal and/or ignition barrier.) BASEMENT FRONT CEILING	10	lf

Figure 10-3: Example of Detailed Data Reported⁹³

Because the baseline R-values were not available, the Evaluator was unable to estimate savings using the 2020 TRM’s protocol. The Evaluator reviewed the savings to ensure the reported estimates were reasonable and within range of expected savings. Homes had an average of 856 ft² of insulation added, saving 152 therms per home, 0.18 therms/ft². This is comparable to the savings estimated using the 2020 TRM methodology for improving R-5 insulation to R-30. This value (0.18 therms/ft²) is relatively high – it cannot be achieved,⁹⁴ for example, by improving insulation having existing R-value greater than about R-8.

⁹³ Provided to Cadmus by program participant.

⁹⁴ Typical R-value of insulated 2x4 wall (~R-15) cannot achieve savings of this magnitude. The maximum possible savings, by improving by an infinitely high R-value, for home in ETG climate zone, is about 0.1 therms/ft²

Tune-Up and Boiler Reset Controls Measures

Six homes had boiler tune-ups, and another four had boiler reset controls measures. The 2020 TRM does not include an approach to estimate savings for tune-ups but does include a measure for “boiler reset controls” which assumes 5 percent reduction in annual heating energy if outdoor temperature reset controls are implemented. The average boiler reset control savings was near 0 therms because one measure had negative therms savings reported which negated the therms savings from the other three projects. The average tune-up savings was 118 therms per home which is likely at least 10 percent of annual heating therms use.

10.4 Process Evaluation Results

The process-related data collection activities for the MI Weatherization Program evaluation included facilitated discussions led by ADM, with utility management and program implementation staff. The Evaluator also conducted five in-depth interviews with program participants. Results are summarized by key themes and findings.

Participation Barriers

ETG staff described the program logic and provided thoughts on the program launch and design. ETG marketed the QHEC program to moderate income census tracts, hoping to use the QHEC program to identify and recruit MI Weatherization program participants. The total number of planned participants in PY1 – PY3 is 900, 150 of those in the first year. Participants incur no cost to improve the efficiency of their home, so one might presume this program would have relatively high uptake. As MI Weatherization program participation increased, the HPwES participation lagged, so ETG has focused more marketing efforts to increase uptake in the HPwES program.

ETG will continue to target the highest energy users in MI Weatherization census tracts which have the highest savings potential to maximize the program savings for this program, which by design, is limited to about 900 homes in the first 3-year program cycle.

The Evaluator asked participants for their **perspective on why someone might not want to participate in the program**. Some of the noteworthy suggestions were:

- Some people may not be comfortable with an unknown contractor in their home.
- Skepticism the program is actually free, or concern this sounds like a scam.
- One participant, a first-time homeowner in 2021, suggested owners of rental homes have little incentive to participate if tenet pays the utility bills.

Participants talked about the weatherization measures they received, and they offered some perspective on **additional weatherization opportunities not addressed by the program**. Three of five participants thought there were other weatherization improvement opportunities, including:

- Windows. Two participants said they wished the program could do something about their windows. Currently in the winter, they use window film to reduce heat loss and both “hate” installing window film (one typically just leaves window film on year-round).
- Areas of the home mentioned in the audit but not addressed. Two participants mentioned the auditor listed areas of the home that required additional insulation and thought this would have been addressed when the weatherization crew returned to do the work.

The level of effort required to participate was not an issue for the participants interviewed. The Evaluator asked participants about the level of effort and time required to participate, probing with examples like “did you have to move items, relocate for the day, etc.” None of the participants voiced complaints about the level of effort required, though one said they took almost a full day to move things and cover furniture with tarps.

The incentive cap (\$6,000 for MI weatherization and energy-saving HVAC improvements) may prevent contractors from addressing all cost-effective weatherization and HVAC savings opportunities. The average project cost for the HPwES program (~\$18,000 before incentives) is significantly higher than the incentive cap for the MI Weatherization program. Furthermore, none of the MI Weatherization projects included HVAC system replacements, indications the HPwES projects involve more work and effort and could save more energy in each home.

Program Launch and Awareness

The Evaluator asked participants how they heard about the program, and all recalled receiving a mailer (but could not necessarily recall whether this was a bill insert or flyer). One agreed the mailer was the best way to get their attention. Two said email or text messaging would be more effective for them personally (each noting they felt lucky to have noticed the program marketing materials).

Two participants said they called to schedule the initial audit in the fall of 2021 but did not hear back from anyone for “at least a few months”. Program staff confirmed audits were not being completed upon request at the time of program launch on July 1, 2021. Despite the delay, this did not inhibit participation of those interviewed. Additionally, the implementation contractor confirmed they worked through a backlog to reach out to anyone who had shown interest.

According to the participants interviewed, none of the program staff (auditor or installation contractors) that they interacted with encouraged them to participate in any of the other ETG energy efficiency programs. They understood that there’s a budget cap for the MI

Weatherization program and indicated they might be amenable to pay for additional work⁹⁵ if the energy efficiency measure(s) are cost effective from their perspective.

Other Insights and Observations

The in-depth stakeholder and participant interviews provided a wealth of insights and perspectives. This list summarizes those which the Evaluator found noteworthy:

- The program uses just one home performance contracting company who is prohibited from offering additional services (at a cost above the incentive cap). This approach is designed to maintain trust between participants and contractors. Participants understood that the incentive cap restricts the amount of work completed. None of the participants interviewed recalled having been encouraged to pursue other ETG energy efficiency program opportunities.
- Participants were impressed with the knowledge and professionalism of the auditor and installation contractors.
- Some participants may be reducing electric heat use. Two of five participants interviewed, both in homes with central gas furnace, mentioned they typically use electric space heaters in at least one room of the home. They will not know whether electric heaters are still needed until after the 2022/2023 winter.
- The QA/QC process was recently established. ETG hired a 3rd party contractor, PSD, to inspect quality of work, verify the work on the invoice matches work performed, and identify missed opportunities.

Also of note is the Inflation Reduction Act, which includes a variety of programs that will provide grants⁹⁶ or federal income tax credits related to many of the MI Weatherization measures beginning 2023 including:

- Home Energy Audit.
- Windows and doors.
- Envelope-related measures for any weatherization component that meets prescriptive criteria for most recent IECC, including air sealing.
- High-efficiency HVAC equipment (highest CEE Tier gas equipment and heat pumps).
- Electric panel upgrades.

Tracking Data Challenges

The Evaluator identified and selected a sample of projects for review and in-depth participant interview. Measure level details from program tracking data for one project

⁹⁵ Cadmus chose not to discuss the cost participants would be willing to contribute.

⁹⁶ Department of Energy's HOMES rebate will be available for all homeowners implementing whole-home retrofit projects that reduce energy by 15%. Availability pending DOE guidance and state energy office final plans. Expected incentive ranges from \$2,000 - \$4,000.

with very high therms savings (957 therms) are listed in Table 10-9. The Evaluator completed an in-depth interview with the participant who provided the scope of work they received from the auditor, which they reviewed during the interview. Table 10-9 shows the details from the work order for the project, which should align with the reported tracking data.

A thorough inspection to identify differences between the two datasets shows there are many. For example, one line item in tracking data (Table 10-9) shows units of 325 (presumably linear feet) and 16.3 total therms saved from air sealing. Another line item in the same table lists 130.1 therms savings for air sealing. The work order (Figure 10-4) includes 3 items for air sealing totaling 251 linear feet. Savings are not itemized by measure in the work order, but the estimated total savings for the project (see Figure 10-5) was 347 therms. The total savings estimate in the tracking data was significantly higher (957 therms). For comparison, the 2020 TRM estimate for whole home air sealing is 64 therms.⁹⁷

⁹⁷ The home is 3,368 ft². Savings for comprehensive air sealing is 19 therms /1000 ft²

Table 10-9: Example Tracking Data from One Project

Measure	Measure Category	Quantity (multiplier)	Per-unit Incentive	Total Incentive	Therms per unit	Total therms
Audit COMPREHENSIVE COMBUSTION TESTING	Audit	1	\$ 170.00	\$ 170	0	0.0
BLOWER DOOR TEST - INDIVIDUAL (includes equipment)	Audit	1	\$ 136.00	\$ 136	0	0.0
Audit - Single Fam. Electric & Gas	Audit	1	\$ 290.00	\$ 290	0	0.0
Audit CUSTOMER ENERGY EDUCATION-PRE-WEATHERIZATION	Audit	2	\$ 90.00	\$ 180	0	0.0
Moderate Income Custom Incentive	Audit	1		\$ 7,500		0.0
Air Sealing	Air Sealing	13		\$ -	0	0.0
AEROSOL FOAM SEALANT (do not provide price per can)	Air Sealing	325	\$ 1.35	\$ 439	0.0502	16.3
PREP OR FOLLOW-UP TO AIR SEAL	Air Sealing	2	\$ 125.00	\$ 250	0	0.0
Air sealing PREP OR FOLLOW-UP TO AIR SEAL OR INSUL	Air Sealing	2	\$ 125.00	\$ 250	0	0.0
Air Sealing	Air Sealing	325		\$ -	0.4004	130.1
Health & Safety	H&S	1		\$ -	0	0.0
BOXING/DAMMING OF CHIMNEYS	H&S	1	\$ 98.00	\$ 98	0	0.0
Health & Safety	H&S	1		\$ -	0	0.0
Health & Safety	H&S	1		\$ -	0	0.0
DRYER VENT REPLACEMENT (replace existing unit or a	H&S	2	\$ -	\$ -	0	0.0
POLY VAPOR BARRIER	H&S	450	\$ 1.50	\$ 675	0	0.0
Health and Safety VENT BATH EXHAUST FAN - vent ex	H&S	4	\$ 74.00	\$ 296	0	0.0
Insulation RIGID BOARD HOLE REPAIR/AIR SEALING	Insulation	178	\$ 9.45	\$ 1,682	0	0.0
Crawl Space Wall Insulation	Insulation	120		\$ -	0.7853	94.2
Insulation BLOWN CELLULOSE UNFLOORED ATTIC INSULAT	Insulation	480	\$ 4.43	\$ 2,126	0.7704	369.8
Insulation RIGID BOARD HOLE REPAIR/AIR SEALING	Insulation	160	\$ 9.45	\$ 1,512	0.7829	125.3
Attic Floor Insulation	Insulation	476		\$ -	0.2881	137.1
BOXING/DAMMING HEAT PRODUCING FIXTURES; METAL FLAS	Insulation	1	\$ 71.50	\$ 72	0	0.0
Insulation INSULATE && WEATHERSTRIP HORIZONTAL O	Insulation	1	\$ 164.58	\$ 165	0	0.0
FIBERGLASS PERIMETER INSULATION (R19)	Insulation	160	\$ 3.24	\$ 518	0.7347	117.6
EAVE OR SOFFIT CHUTES OR BAFFLES	Insulation	60	\$ 5.40	\$ 324	0	0.0
Reset controls for boiler	Tune-Up	1		\$ -	-33.22	-33.2
Total				\$ 16,683		957.2

Work Order			...CONTINUED Work Order		
ITEM	QTY	UNIT	ITEM	QTY	UNIT
HOME ENERGY AUDIT			ATTIC STAIR REPAIR (PERCENTAGE MARK-UP ON SUB WORK T&M) #235-S		
AUDIT - SINGLE FAM. ELECTRIC & GAS #3	1	each	Mounting bracket is detaching. Auditor noted missing nuts on bolts.	1	each
CUSTOMER ENERGY EDUCATION-PRE-WEATHERIZATION #611			BOXING/DAMMING FIXTURES-SEALED- END DUCT #211		
	2	hour		13	each
POST MEASURE TESTING			INSULATE ATTIC		
Audit COMPREHENSIVE COMBUSTION TESTING #600	1	each	BLOWN CELLULOSE FLOORED ATTIC INSULATION R20 #170	1032	sq. ft
COMPREHENSIVE COMBUSTION TESTING should include all of these tests whenever possible: for homes with atmospheric draft combustion appliances: GAS LEAK TESTING, AMBIENT AIR CO TESTING, CAZ PRESSURE TEST, SPILLAGE TESTING ON ALL APPLIANCES, FLAME ROLL OUT			Air sealing AEROSOL FOAM SEALANT #56	120	lf
			AEROSOL FOAM SEALANT (do not provide price per can)		
Audit BLOWER DOOR TEST - INDIVIDUAL #337	1	each	INSULATE CRAWL SPACE		
BLOWER DOOR TEST - INDIVIDUAL (includes equipment set-up & tear-down, diagnostic testing using gauges, manometers; report results on audit form) Max - 2 per home			Air sealing AEROSOL FOAM SEALANT #56	121	lf
			AEROSOL FOAM SEALANT (do not provide price per can)		
HEALTH AND SAFETY MEASURES			Insulation FIBERGLASS PERIMETER INSULATION (R19) #299		
Gas Leak Repair by Sub (PERCENTAGE MARK-UP SUB WORK T&M) #602B	6.14	each	FIBERGLASS PERIMETER INSULATION (R19)	363	sq. ft
Sub already contacted			SEAL AIR LEAKS		
VENT BATH EXHAUST FAN - vent existing fan to outside (PERCENTAGE IN-HOUSE MATERIAL MARK-UP) #491-M	2	each	Insulation RIGID BOARD PERIMETER INSULATION #303	10	lf
			RIGID BOARD PERIMETER INSULATION (1" - Priced to include installation in location requiring thermal and/or ignition barrier.)		
			BASEMENT FRONT CEILING		

Figure 10-4: Example Work Order for Same Project as in Table 10-9

Metrics			
FUELS	BASELINE	IMPROVED	SAVED
Total Fuel Energy Usage therms/year	1,427	1,080	347
Natural Gas Energy Usage therms/year	1,427	1,080	347
METRIC	BASELINE	IMPROVED	SAVED
Electric Energy Usage kWh/year	13,851	13,361	490
Total Energy Usage MMBtu/year	189.96	153.64	36.32
Fuel Energy Cost \$/year	\$ 1,354	\$ 1,026	\$ 328
Electric Energy Cost \$/year	\$ 2,195	\$ 2,118	\$ 77
Total Energy Cost \$/year	\$ 3,550	\$ 3,143	\$ 407

Figure 10-5. Participant Work Order Estimated Savings for Project in Table 10-9

The Evaluator discussed each line item in the work order with the participant and determined that some of the data in the tracking database, including total incentive amount and therms savings, is incorrect. The Evaluator reviewed measure-level details for other projects and found that the first group of completed projects (15 of 64) may have similar issues. The rest of the completed projects (49 of 64) do not appear to have this issue. The Evaluator did not attempt to work with the implementation team to better understand such discrepancies for several reasons:

- This was one of the first MI Weatherization projects. Subsequent projects' total savings were significantly lower and did not appear to have obvious discrepancies.
- Billing analysis is planned and will be used to determine evaluated savings in future evaluations.
- QA/QC site visits by PSD have commenced and these will provide more accurate verification details.

10.5 Conclusions and Recommendations

Conclusion: The ex-post savings and realization rates are not based on empirical data. The average savings per home (208 therms) is not unreasonable but may be high. The evaluation team independently calculated savings for air sealing, which impacted the realization rate, but accepted savings for other measures (i.e., assumed ex-ante = ex-post) because the tracking data did not include information required by the 2020 TRM protocols. Savings of 208 therms per home equates to a heat loss reduction or efficiency improvement of about 20 percent.

Baseline R-values were not reported so evaluators could not use the 2020 TRM algorithm to re-calculate insulation savings. Many of the reported insulation savings estimates (average insulation savings was ~0.18 therms/ft² area treated) can only be achieved⁹⁸ if in situ R-value is less than R-3.5.

The average reported savings for duct improvement (89 therms/home) is comparable to ducts located in an attic, with insulation added to improve the R-value from R-2 to R-8. Duct location was not recorded, but if ducts are located in conditioned or partially conditioned space (basements) the reported savings are undoubtedly too high because most supply air leakage and return air infiltration occurs within the home's thermal boundary.

⁹⁸ 2020 TRM Insulation Protocol, pg. 75:
$$\frac{\left(\frac{1}{R_b} - \frac{1}{R_q}\right) \times 5,160 \text{ HDD} \times 24 \times \text{Area}}{100,000 \frac{\text{Btu}}{\text{therm}} \times 80\% \text{ AFUE}}$$

Recommendation: ETG should implement the following list of tracking data improvements:

- Include conditioned square footage of each home.
- Include blower door test results.
- Include demand savings for all measures saving electric energy.
- For each insulation measure, in addition to square footage of area treated (was included), the R-value before (this was not provided) and R-value after improvement (this was included inconsistently).
- For the duct sealing measure:
 - Percentage of duct work located in conditioned space, and separate percent for supply and return.
 - Duct leakage assessment (leaky, average, tight) or actual leakage measurements (at 25 Pa, or preferably Normal System Operating Parameters (NSOP)).
 - Duct insulation (existing R-value, final R-value if insulation is added).

Conclusion: The results of pre/post monthly therms consumption billing analysis will provide a different estimate of actual program impacts per home. However, the number of MI Weatherization projects is too low⁹⁹ and the time to conduct pre/post billing analysis using 2023 winter billing data is insufficient. Consequently, at this time, evaluators do not plan to incorporate billing analysis results in the April 2023 TRM update.

Recommendation: Considering the number of ETG MI Weatherization projects to-date, an April 2023 TRM update is not advisable. However, Evaluators should coordinate with other utility evaluators to determine if billing analysis results could be combined to increase the population and improve precision. Evaluators may be able to use billing data through February 2023 to estimate pre/post impacts in time for a TRM update. Or they could use only the billing data prior to participation to determine annual heat load, which could be used to validate or update the insulation algorithm (pg. 75 of 2020 TRM).

The TRM working group should review the current demand savings for the primary MI Weatherization measures:

- **Air sealing** (pg. 70, 2020 TRM). This measure primarily saves heating energy, but also saves some cooling energy. However, without explanation, the TRM states:

⁹⁹ Typically, a sample of 500+ homes would be necessary to determine weather-related therms reduction of ~10%.

“there are no summer coincident electric peak demand savings estimated at this time.”

- **Insulation Upgrades** (pg. 75, 2020 TRM). The TRM includes cooling energy savings algorithm, and a coincidence factor is listed in the “Residential Insulation Upgrades” table, however a demand savings algorithm is not included.

Conclusion: The average HPwES project cost (\$18,000) was three times the MI Weatherization program incentive cap. Participants mentioned some weatherization measures were identified but not addressed. Additionally, most projects met the incentive cap. These findings suggest that the annual allocated program budget and per-home budget cap may limit program participation and impacts. Assuming ETG cannot increase the per-home incentive cap, participants may have more energy savings opportunities. Therefore, other programs (HPwES, Energy Efficient Products) may be of interest to participants.

Recommendation: ETG should work with the implementer, third-party verification contractor PSD, and the evaluation team, to review findings from QA/QC site visits to identify weatherization measures not addressed through the MI Weatherization program. When pre/post billing analysis results are available, this information could also be used estimate the magnitude of missed savings opportunities (by comparing HPwES savings per home to MI Weatherization program savings) to optimize future program design and cross-program marketing.

Conclusion: Low PY1 participation volume does not reflect program participation potential. The PY1 volume (64 completed projects by July 1, 2022) was lower than target (150 homes) but this was primarily due to program start-up delays. The program launched in July 2021, but initial audits and weatherization projects did not begin until early 2022.

Recommendation: ETG should continue to target homes with the highest energy use and closely monitor interest, especially in 2023 when the Inflation Reduction Act efficiency tax credits are available. ETG should consider ways to help participants take advantage of personal federal income tax credit for measures not addressed due to the MI Weatherization budget cap. For example, MI Weatherization participants could subsequently participate in the HPwES program, incur some upfront cost but would be able to take advantage of the \$1,200 annual tax credit.

10.6 Barriers to Participation

The evaluator asked participants for their perspective on why someone might not want to participate in the program. Some of the noteworthy suggestions were:

- Some people may not be comfortable with an unknown contractor in their home.
- Skepticism the program is actually free, or concern this sounds like a scam.

- Owners of rental homes have little incentive to participate if tenet pays the utility bills.
- The size of the incentives available through the program were not always sufficient to cover the total cost of needed weatherization work.

10.7 Evaluability Recommendations

Include an estimate of building square footage for homes with Air Sealing. Building square footage was not included in the tracking data so the Evaluator used publicly available tax records to estimate building conditioned square footage. The average size of homes receiving some type of air sealing measure was 1,965 ft². Following the NJCEP, this results in average savings of 35.8 therms. Though the NJCEP was not used to estimate savings, the average reported savings (40.8 therms per home with air sealing) was comparable.

Include all necessary Duct Sealing and Repair information in the tracking data. The information needed to use the NJCEP protocols to calculate duct sealing savings was not available in the tracking data. The 2020 NJCEP (pg. 71) includes a savings methodology to estimate duct sealing which requires estimates of:

- Percentage of duct work found within the conditioned space.
- Duct leakage evaluation (leaky, average, tight).
- Duct insulation evaluation (existing R-value).

Include the baseline R-value estimates for Insulation in the tracking data: The tracking data includes treated area (in ft²) or linear footage, the R-value of insulation added, and an estimate of savings per square foot. The baseline R-values were not included in the tracking data, so the evaluator was unable to estimate savings using the NJCEP protocol. In PY1, homes had an average of 856 ft² of insulation added, saving 152 therms per home, 0.18 therms/ ft². This is comparable to the savings estimated using the TRM methodology for improving R-5 insulation to R-30. This value (0.18 therms/ ft²) is relatively high.

Consider Tune-Up and Boiler Reset Controls Measures in the TRM update. The 2020 NJ TRM does not include an approach to estimate savings for tune-ups but does include a measure for “boiler reset controls” which assumes 5 percent reduction in annual heating energy if outdoor temperature reset controls are implemented. The average tune-up savings was 118 therms per home which is likely at least 10 percent of annual heating therms use.

Include location of Ducts that were improved. The average reported savings for duct improvement (89 therms/home) is comparable to ducts located in an attic, with insulation added to improve the R-value from R-2 to R-8. Duct location was not recorded, but if

ducts are in conditioned or partially conditioned space (basements) the reported savings are undoubtedly too high because most supply air leakage and return air infiltration occurs within the home's thermal boundary.

Improve data and savings calculation consistency while using the QA/QC process to identify issues. The evaluator identified and selected a sample of projects for review and in-depth participant interview. For one project with very high therms savings (957 therms) in the tracking data, an in-depth interview was conducted with the participant who provided the scope of work they received from the auditor. The evaluator discussed each line item in the work order with the participant and determined that some of the data in the tracking database, including total incentive amount and therms savings, was incorrect. The evaluator reviewed measure-level details for other projects and found that the first group of completed projects (15 of 64) may have similar issues. The evaluator did not attempt to work with the implementation team to better understand such discrepancies for several reasons:

- This was one of the first MI Weatherization projects. Subsequent projects' total savings were significantly lower and did not appear to have obvious discrepancies.
- Billing analysis is planned and will be used to determine evaluated savings in future evaluations.

QA/QC site visits by PSD have commenced and these will provide more accurate verification details.

10.8 Research Questions for PY2

Some of the PY1 evaluation research topics were not addressed because evaluators chose to conduct a limited sample of in-depth interviews rather than a statistical sample of participants. Additional data collection and research in PY2 is required to estimate savings attributed to the program (NTG) and gain a more comprehensive understanding of the program participants and impacts.

For the PY2 evaluation, the Evaluators should conduct auditor interviews, contractor interviews, and contractor ride-alongs. If participation exceeds ~300 homes¹⁰⁰, Evaluators should conduct participant surveys targeted to meet statistical confidence and precision guidelines. The evaluation team will develop a detailed PY2 evaluation plan that will address new evaluation topics and the following PY1 evaluation research questions that have not been addressed, or have only been investigated for a small number of participants:

- How do customers learn about the program?

¹⁰⁰ Assuming a 15 percent response rate, approximately 300 participants would be needed to establish NTG and other key parameters with 10% precision at the 90% confidence level.

- What is the cross-program participation of all moderate-income weatherization program participants?
- What role did participation in other efficiency programs (e.g., QHEC, efficient products, legacy state-run program) play in their decision to participate?
- Is lead- and partner-utility coordination working as expected?
- Are there ways to improve the design or implementation process?
 - E.g., can ETG use Home Energy Report (HER) information to target customers with the greatest savings potential?
- What challenges do health and safety measures present to contractors?
- What are the participant characteristics (e.g. demographics, location, home-type) and are they different from eligible residential customers not participating?
- Are there any specific measures for which the current incentive caps prohibit uptake? If so, what are they and how much would incentives need to be increased to enable implementation?

10.9 Surveys

Moderate Income Weatherization Program Participant Survey

Survey Objectives and Topic Areas

Research Objective	Research Questions	Section
Understand effectiveness of marketing and outreach	<ul style="list-style-type: none"> How did customers learn about the program? What are customers' communication preferences? What are motivating factors for participating? 	Section B
Assess measure installation and experience with installation	<ul style="list-style-type: none"> Verify measure was installed and if not, assess reasons What issues did customers encounter with the energy-efficient equipment? 	Section C
Assess experience with measure(s) installed through program	<ul style="list-style-type: none"> What issues did customers encounter with the energy-efficient equipment? 	Section C
Assess customer experience with Sub-Program delivery, including satisfaction with the sub-program, its individual components, and trade allies	<ul style="list-style-type: none"> How satisfied are participants with the Sub-Program? What elements of the Sub-Program worked well to enhance customer satisfaction? How likely would customers be to recommend SJG and the Sub-Program to others? 	Section D
Identify areas of desired Sub-Program improvement	<ul style="list-style-type: none"> Which features of the Sub-Programs may cause customer dissatisfaction, or could be improved? 	Section D
Identify drivers of customer satisfaction/dissatisfaction	<ul style="list-style-type: none"> What elements of the Sub-Program drove customer satisfaction or dissatisfaction? 	Section D and regression analysis ¹
Demographics		Section E

¹Note: To ensure the full suite of drivers of customer satisfaction and dissatisfaction are analyzed, Cadmus will conduct a regression analysis using both satisfaction questions and others throughout the survey that are related to satisfaction/program experience.

Sample variables:

- FirstName
- LastName
- CustomerEmail
- ProjectID
- BATHQuant (number received)
- KITCHQuant (number received)
- SHQuant (number received)
- SHADPTQuant (number received)
- StripQuant (number received)
- LEDQuant (number received)
- TSTATQuant (number received)

- AIR_SEALING (TRUE or FALSE)
- HVAC_REPLACE (TRUE or FALSE)
- HVAC_TUNE (TRUE or FALSE)
- DUCT_SEAL (TRUE or FALSE)
- WH_REPLACE (TRUE or FALSE)
- INSULATION (TRUE or FALSE)
- PIPE_INSULATION (TRUE or FALSE)

This is a draft document that we will update for online surveys in PY2. We are using the questions in this document to guide the in-depth interview discussion. One objective of the interviews is to update these questions for 2023 on-line surveys.

Email Invitation

Initial Invitation

To: [EMAIL]

From: SJG Customer Feedback

Subject: Please provide your feedback on the Home Weatherization program

Dear [FIRSTNAME],

SJG is conducting a survey about your experience with the Home Weatherization Program with the contractors, who conducted a home energy audit and provided you with recommended energy saving strategies tailored for your home.

We know your time is valuable, so by completing the survey, you will receive a \$10 electronic gift card.

Would you take a few moments to complete the brief survey? Your responses will be kept confidential, and you'll only need about 10 minutes to answer the questions. **Follow this link to the Survey:**

[SURVEY LINK]

Or copy and paste this URL into your web browser:

[SURVEY LINK]

If you have any questions or require technical support, please contact Athena Dodd at Cadmus, the research firm conducting this survey on our behalf. You can reach Athena at 303-389-2539 or Athena.Dodd@cadmusgroup.com.

Thank you in advance for sharing your feedback. Follow the link to opt out of future emails:

[\\$!://OptOutLink?d=Click here to unsubscribe](#)

Reminder Email Invitation

To: [EMAIL]

From: SJG Customer Feedback

Subject: We want your input! Don't forget to participate in this SJG survey

Dear [FIRSTNAME],

We recently invited you to participate in a survey about your experience with SJG's Home Weatherization Program. Your input and insights are very important to us, as we intend to use the information we collect to improve our program offerings.

Do you have a few minutes to answer the survey questions? Note that your responses will be kept confidential.

As a reminder, by completing the survey, you will receive a \$10 electronic gift card.

Follow this link to the Survey:

[SURVEY LINK]

Or copy and paste this URL into your web browser:

[SURVEY LINK]

If you have any questions or require technical support, please contact Athena Dodd at Cadmus, the research firm conducting this survey on our behalf. You can reach Athena at 303-389-2539 or Athena.Dodd@cadmusgroup.com.

We hope to hear from you!

Follow the link to opt out of future emails:

[Click here to unsubscribe](#)

A. Online Welcome Screen and Screening Question



Welcome! This survey will take about 10 minutes to complete. Your responses will remain confidential and will only be used for research purposes. This survey will address your recent experience with SJG's Home Weatherization Program. Click on the 'Next' button at the bottom of each page to navigate through the survey.

As a thank you for your time, you will receive a \$10 electronic giftcard.

A1. SJG's records show you received a virtual or in-home energy efficiency assessment and the installation of energy-efficient products from a contractor as part of SJG's Home Weatherization Program. Is that correct?

1. Yes **[ASK A2]**
2. No **[TERMINATE]**

A2. Do you or any of your immediate family members work for SJG?

1. Yes **[TERMINATE]**
2. No

B. Awareness

First, we'd like to hear about how you learned about the program.

B1. How did you hear about the Home Weatherization Program? **[RANDOMIZE 1–9]**

1. Utility representative
2. Email from SJG
3. SJG website
4. Read about it online (**not** on SJG website)
5. From a family, friend, neighbor, or co-worker
6. Through a bill assistance program
7. Brochure or flyer in the mail
8. Through a community organization
9. Contractor or vendor
10. Other **[SPECIFY: _____]**
98. Don't remember

B2. In the future, what is the best way to inform you about other energy efficiency programs and rebates offered by SJG? **[RANDOMIZE 1–8]**

1. Emails
2. Family, friend or word-of-mouth
3. SJG website
4. SJG newsletter
5. Bill insert
6. Online advertisement
7. Social media (Facebook, Instagram, etc.)
8. Contractor or vendor
9. Other **[SPECIFY: _____]**
98. Don't know

B3. Which of the following factors were most important in your decision to participate in the Home Weatherization program? Select the top two. **[RANDOMIZE 1-10]**

1. I wanted to reduce my energy consumption
2. I wanted to reduce my monthly energy bill
3. My house was uncomfortable
4. I knew of an existing problem in my home (for example, uninsulated attic area)
5. I know someone who has had Home Weatherization work done
6. I was concerned about the safety of my home (such as air quality)
7. I wanted to take advantage of the rebates that are offered
8. I previously participated in a SJG energy efficiency program
9. I wanted to learn about what my house needed to be more energy efficient
10. I wanted to reduce my impact on the environment
11. Other **[SPECIFY: _____]**
98. Don't know **[EXCLUSIVE]**

B4. Did you make all of the energy-efficiency improvements that were recommended in the audit?

1. Yes
2. No **[ASK B5]**
98. Don't remember

B5. What did you do, that was different? **[OPEN ENDED; Probe: installed something different, didn't make improvements and don't plan to/do plan to]**

1. I installed less than/fewer measures than recommended; please specify: **[OPEN ENDED] [ASK B6]**
2. **[Verbatim]**
98. Don't know

B6. Why did you decide to install the energy-efficiency improvements that you did and not everything that was recommended in the audit? **[MULTI-SELECT; RANDOMIZE ALL BUT OTHER AND DON'T KNOW]**

1. Some of the recommendations were too disruptive for my home
2. I didn't think all of the work was needed
3. I wanted to only do part of the work at a time and plan to complete more later
4. I didn't like the equipment options the contractor recommended
5. The work was invasive or inconvenient
6. The program did not cover the cost, and I didn't want to pay for additional measures
7. Other **[SPECIFY: _____]**
98. Don't know **[EXCLUSIVE]**

B7. Was there any repair or weatherization improvement that, in your opinion, should have been included? **[OPEN ENDED]**

C. Measure Verification

This section will be used to verify installation of equipment through the program.

LEDs

[ASK IF LEDQuant>0]

- C1. Our records indicate that you had **[LEDQuant]** LED lightbulb(s) installed through this program, either by the Home Weatherization contractor or installed on your own. Is this correct?
1. Yes **[SKIP TO C3]**
 2. No, the number is incorrect
- C2. Please enter the number of LEDs that fit in the following scenarios. [Enter number 1 – 50, numerical response only; show total row at bottom]
1. Number of LEDs installed by the Home Weatherization contractor: _____
 2. Number of LEDs the contractor left behind and that **I installed on my own**: _____
 3. Number of LEDs the contractor left behind and **I did not install**: _____ **[SKIP to C5]**
- C3. **[ASK IF C1=1 or C2.1 > 0 or C2.2 > 0]** How many of those LEDs have been removed since your assessment?
1. [Enter number 0 – 50, numerical response only]
 2. Don't know
- C4. **[ASK IF C3 > 0 OR C2.3 > 0]** Why did you remove the LEDs? Select all that apply. **[MULTIPLE RESPONSE]**
1. Light quality doesn't meet my needs
 2. I already have LEDs everywhere I want them
 3. The LED that was installed is no longer working
 4. Some other reason **[SPECIFY: _____]**

Bathroom Aerators

[ASK IF BATHQuant > 0]

- C5. Our records indicate that you had **[BATHQuant]** bathroom faucet aerator(s) installed through this program, either by the Home Weatherization contractor or installed on your own. Is this correct?
1. Yes **[SKIP TO C7]**
 2. No
- C6. How many bathroom faucet aerators were installed?
1. **[Enter number 0– 4, numerical response only]**
 98. Don't remember
- C7. **[ASK IF C5=1 or C6>0]** How many bathroom aerators have been removed since your assessment?

1. **[Enter number 0– 4, numerical response only]**

98. Don't know

C8. **[ASK IF C7>0]** Why did you remove the bathroom aerators? (Select all that apply)

[MULTIPLE RESPONSES ALLOWED]

1. The water pressure was too weak
2. The water pressure was too strong
3. Leaky faucet
4. Rust and stains/damaged
5. Did not like the design of the faucet aerator
6. Bathroom faucet aerator stopped working
7. Other **[SPECIFY: _____]**

Kitchen Aerators

[ASK IF KITCHQuant>0]

C9. Our records indicate that you had **[KITCHQuant]** kitchen faucet aerator(s) installed through this program, either by the Home Weatherization contractor or installed on your own. Is this correct?

1. Yes **[SKIP TO C11]**
2. No, the number is incorrect

C10. How many kitchen aerators were installed?

1. **[Enter number 0– 4, numerical response only]**

98. Don't remember

C11. **[ASK IF C9=1 OR C10>0]** How many kitchen aerators have been removed since your assessment?

1. **[Enter number 0 – 4, numerical response only]**

98. Don't know

C12. **[ASK IF C11>0]** Why did you remove the kitchen aerator(s)? **[MULTIPLE RESPONSE]**

1. The water pressure was too weak
2. The water pressure was too strong
3. Leaky faucet
4. Rust and stains/damaged
5. Did not like the design of the faucet aerator
6. Bathroom faucet aerator stopped working
7. Other **[SPECIFY: _____]**

Low-flow showerheads

[ASK IF SHQuant>0]

- C13. Our records indicate that you had **[SHQuant]** efficient-flow showerhead(s) installed through this program, either by the Home Weatherization contractor or installed on your own. Is this correct?
1. Yes **[SKIP TO C15]**
 2. No, the number is incorrect
- C14. How many efficient-flow showerheads were installed?
1. **[Enter number 0 – 4, numerical response only]**
 98. Don't remember
- C15. **[ASK IF C13=1 or C14>0]** Was one of the showerheads installed in the shower that your household uses the most frequently?
1. Yes
 2. No
- C16. **[ASK IF C14=1 or C15=1]** How many efficient-flow showerheads have been removed since the assessment?
1. **[Enter number 0 – 4, numerical response only]**
 98. Don't know
- C17. **[ASK IF C16>0]** Why did you remove the efficient-flow showerhead(s)?
[MULTIPLE RESPONSE]
1. They stopped working
 2. Did not like water pressure
 3. Did not like the design of the showerhead
 4. Other **[SPECIFY: _____]**

ShowerStart® showerhead adapters

[ASK IF SHADPTQuant>0]

- C18. Our records indicate that you had **[SHADPTQuant]** ShowerStart® showerhead adapter(s) installed through this program, either by the Home Weatherization contractor or installed on your own. Is this correct?
1. Yes **[SKIP TO C20]**
 2. No, the number is incorrect
- C19. How many showerhead adapter(s) were installed?
1. **[Enter number 1 – 4, numerical response only]**
 98. Don't remember
- C20. **[ASK IF C19=1 or C20=1]** Was one of the showerhead adapter(s) installed in the shower that your household uses the most frequently?
1. Yes
 2. No

C21. **[ASK IF C19=1 or C20=1]** How many showerhead adapter(s) have been removed since the assessment?

1. **[Enter number 0 – 4, numerical response only]**

98. Don't know

C22. **[ASK IF C22>0]** Why did you remove the showerhead adapter(s)? **[MULTIPLE RESPONSE]**

1. They stopped working

2. Did not like water pressure

3. Did not like the design of the showerhead adapter

4. Other **[SPECIFY: _____]**

Smart Thermostat

[ASK IF TSTATQuant>0]

C23. Our records indicate you had a **[TSTATQuant]** programmable smart thermostat(s) installed in your home through this program. Is this correct?

1. Yes, it was installed by a Home Weatherization contractor

2. Yes, I installed it with instruction from the Home Weatherization contractor

3. No, the number is incorrect

C24. **[ASK IF C23=3]** How many smart thermostat(s) were installed?

1. **[Enter number 1 – 4, numerical response only]**

98. Don't remember

C25. **[IF C24=1 OR 2]** Which of the following activities did the Home Weatherization contractor do for you? (Select all that apply)

1. Programmed it for me **[SKIP TO C28]**

2. Left behind instructions on how to program it

3. Showed me how to program it

4. Other **[SPECIFY: _____]**

C26. **[ASK IF C25=2 OR 3]** On a scale of 1 to 10 where 1 is *very dissatisfied* and 10 is *very satisfied*, how satisfied were you with the programming instructions?

Very Dissatisfied										Very Satisfied									
1	2	3	4	5	6	7	8	9	10										

C27. **[ASK IF C26<7]** Why do you say that?

1. **[TEXT BOX]**

C28. Is the new thermostat still installed and programmed? The programming could include changing temperature when you are away from home or for different times of the day.

1. Yes, it is installed and programmed
2. It is still installed, but not programmed
3. Installed, programmed and now program is overridden or deprogrammed
4. Removed new thermostat
98. Don't know

C29. **[ASK IF C28=3 OR 4]** Why did you remove the new thermostat? (Select all that apply) **[MULTIPLE RESPONSE]**

1. It stopped working
2. Did not like it in general
3. Did not like the interface
4. Did not like how it looked
5. Not cooling or heating as desired
6. Did not understand how to set/program it
7. Other **[SPECIFY: _____]**

Smart Power Strips

[ASK IF StripQuant>0]

C30. Our records indicate that you had **[StripQuant]** smart power strip(s) installed through this program, either by the Home Weatherization contractor or installed on your own. Is this correct?

1. Yes **[SKIP TO C32]**
2. No, the number is incorrect

C31. How many smart power strips were installed?

1. **[Enter number 1 – 4, numerical response only]**
98. Don't remember

C32. How many smart power strips have been removed since your assessment?

1. [Enter number 0 – 4, numerical response only]

98. Don't know

C33. [ASK IF C32>0] Why did you remove the smart power strip(s)? Select all that apply. **[MULTIPLE RESPONSES ALLOWED]**

1. They stopped working
2. They were difficult to use
3. I didn't like how they looked
4. Moved to another location
5. Other **[SPECIFY: _____]**

C34. [ASK IF C30=1 OR C31>0] Did the Home Weatherization contractor explain how to use your smart power strip?

1. Yes
 2. No
98. Don't recall

C35. [ASK IF C30=1 OR C31>0] Is the power strip set up and functionally turning off equipment?

1. Yes
 2. No
98. Don't know

C36. [ASK IF C35=1] What equipment is connected and turning off?

1. Open ended response
98. Don't know

Weatherization, HVAC, and H&S Measures

C37. Our records indicate that you had the following items installed/completed through the program. Is that correct?

Measure Category [ONLY SHOW MEASURES RECEIVED BY CUSTOMER]	Description/Example	Yes, this was installed/updated through the program	No, this was not installed/updated through the program
Air Sealing [IF AIR_SEALING=TRUE]	Installation of caulk, spray foam, or weather stripping		
Heating/Cooling System Replacement [IF HVAC_REPLACE =TRUE]	Install new HVAC equipment, such as a furnace		
Heating/Cooling System Tune-Up [IF HVAC_TUNE=TRUE]	Repairs/tune-up for your HVAC system (i.e., furnace, boiler, etc.)		

CADMUS

Duct Improvement [IF DUCT_SEAL=TRUE]	Duct sealing or duct insulation		
Water Heater [IF WH_REPLACE=TRUE]	Install new water heater		
Insulation upgrades [IF INSULATION=TRUE]	Add insulation to:		
	Ceilings		
	walls		
	Floors		
	Basement/crawlspace		
	Attic		
	other		
Pipe insulation [IF PIPE_INSULATION=TRUE]	Adding insulation to pipes carrying hot water		
Health & Safety	[H&S MEASURE DESCRIPTION(S)]		

C38. Did the assessment identify any health and safety issues or repairs that needed to be addressed, in addition to the recommended energy-saving improvements?

1. What issues were identified? (Probe: moisture, mold, durability, structural, other)
2. Did you address the issues identified? Why or why not?

C39. Were any of these measures particularly burdensome for you? (probe: work was invasive or inconvenient to my tenants, had to leave the house for extended time, had to rearrange/move personal items, etc)

C40. Would you say the program thoroughly addressed all energy-saving improvements in your home, or is there more that could have been done?

C41. Can you think of any reasons someone might not want to participate in a program like this?

D. Satisfaction

D1. What did you like most about participating in the Home Weatherization program?

1. **[OPEN END RESPONSE]**

D2. What did you like least about participating in the Home Weatherization program?

1. **[OPEN END RESPONSE]**

D3. On a scale of 1 to 10 where 1 is *very dissatisfied* and 10 is *very satisfied*, how satisfied are you with each of the following regarding the authorized SJG Home Weatherization contractor **who completed the assessment**? **[Dropdown of a 1 to 10 scale where 1 is “Very Dissatisfied” and 10 is “Very Satisfied”, plus a “N/A” option]:**

1. Finding a Home Weatherization contractor to complete the assessment
2. The professionalism of the Home Weatherization contractor who completed the assessment
3. The Home Weatherization contractor who completed the assessment overall

D4. On a scale of 1 to 10 where 1 is *very dissatisfied* and 10 is *very satisfied*, how satisfied are you with each of the following regarding the authorized SJG Home Weatherization contractor **who completed the home upgrades** (i.e., smart thermostat, air sealing and insulation, HVAC system tune-ups)? **[Dropdown of a 1 to 10 scale where 1 is “Very Dissatisfied” and 10 is “Very Satisfied”, plus a “N/A” option]:**

1. The professionalism of the contractor who completed the home upgrades
2. The Home Weatherization contractor who completed the home upgrades overall

D5. On a scale of 1 to 10 where 1 is *very dissatisfied* and 10 is *very satisfied*, how satisfied are you with each of the following program aspects? **[Dropdown of a 1 to 10 scale where 1 is “Very Dissatisfied” and 10 is “Very Satisfied”, plus a “N/A” option]:**

1. Scheduling the audit

2. The amount of time between calling to schedule and when the audit took place
3. The time it took to complete the audit
4. The quality of the energy-efficient items installed during the audit
5. The amount of time between the audit and the installation of home upgrades
6. The time it took to complete the installation of home upgrades
7. The professionalism of the contractor who completed the audit
8. The quality of the work performed during the installation of home upgrades

D6. Please rate how much effort you personally put forth to participate in the Home Weatherization program. **[CUSTOMER EFFORT]**

A Lot of Effort					Very Little Effort				
1	2	3	4	5	6	7	8	9	10

D7. How satisfied were you overall with the Home Weatherization program?

Very Dissatisfied					Very Satisfied				
1	2	3	4	5	6	7	8	9	10

D8. **[ASK IF D6<7]** Can you briefly describe why you gave the program that rating?

1. **[TEXT BOX]**

D9. How did your participation in the Home Weatherization program make you feel about SJG?

1. Much more positive
2. Somewhat more positive
3. Neutral
4. Somewhat more negative
5. Much more negative
98. Don't know

D10. Please identify any challenges you experienced while participating in the program.

[MULTIPLE RESPONSES ALLOWED] [RANDOMIZE ALL BUT OTHER AND DON'T KNOW]

1. Difficulty scheduling an audit time
2. Difficulty understanding eligibility requirements for the program
3. Difficulty providing documentation or other information to confirm you qualify for the program (also probe if possible: Did you find the process respectful? What documents were you required to provide? Were any of them a problem?)
4. Difficulty scheduling the installation
5. Difficulty communicating with certified energy efficiency professionals
6. Lack of technical knowledge about energy-efficiency equipment
7. Issues with new equipment received through the program
8. Other **[SPECIFY: _____]**
98. Don't know **[EXCLUSIVE]**

D11. [ASK IF MULTIPLE RESPONSES GIVEN TO D10] What was the primary challenge you experienced while participating in the program? **[CARRY FORWARD RESPONSES FROM D10]**

1. **[RESPONSES FROM D10]**
98. Don't know

D12. What, if anything, could SJG do to improve the program?

1. **[OPEN ENDED: _____]**
2. No suggestions

D13. Based on your experience with the **Home Weatherization program**, how likely would you be to recommend it to a friend or colleague?

Not at All Likely											Extremely Likely	Not sure
0	1	2	3	4	5	6	7	8	9	10	99	

D14. Based on your experience with the **authorized SJG Home Weatherization contractor**, how likely would you be to recommend the contractor to a friend or colleague?

Not at All Likely											Extremely Likely	Not sure
0	1	2	3	4	5	6	7	8	9	10	99	

D15. Assuming you could choose your utility company, how likely is it that you would recommend SJG to a friend or colleague?

Not at All Likely											Extremely Likely		Not sure
0	1	2	3	4	5	6	7	8	9	10	99		

E. Demographics

[See statewide demographics document]

F. Closing

F1. On occasion, managers of SJG programs may want to contact a customer to learn more about their experience. Please click on the box below if you prefer NOT to be contacted by a program manager about your responses to this survey.

1. Do NOT contact me about my responses to this survey

F2. To receive the \$10 gift card, please verify your name and address. SJG will not use any information for marketing purposes, and they will not update any of your billing or mailing preferences with this information.

1. First and Last Name: **[OPEN END RESPONSE]**
2. Street Address: **[OPEN END RESPONSE]**
3. City: **[OPEN END RESPONSE]**
4. State: **[OPEN END RESPONSE]**
5. Zip code: **[OPEN END RESPONSE]**
6. Email: **[OPEN END RESPONSE]**

Visit the [SJG](#) website for additional information on ways to save energy and improve your home's energy efficiency.

On behalf of SJG, thank you for your time and feedback!

11 Appendix E: HERs Program Evaluation Report

11.1 Introduction

The Home Energy Report (HER) subprogram builds on several years of experience in driving residential customer behavior change through the delivery of data and information about home energy consumption through personalized reports. This program is a proven method to reduce energy consumption and save customers money. HERs provide energy information through different lenses to help customers better understand energy use patterns, including:

- Monthly energy consumption for the home
- Comparison of energy use to similar homes
- Savings opportunities for customers
- Ways to engage in energy efficiency programs
- Energy savings tips
- How to engage with utilities

HERs are provided to customers at no cost through multiple channels including direct mail and email. This information is provided to customers to gain better insights into their own energy use as well as inform them how they compare to their peers, which can be a significant driver of behavior change in customers. Uplight, the implementation contractor, inherited a randomized control trial (RCT) with opt-out design methodology from a prior implementation contractor. Uplight continued with the RCT design and provides HERs to the same treatment and control cohorts. An RCT design allocates participants at random to either the treatment or control group.

HERs lead to greater customer satisfaction and better engagement with the energy efficiency programs and the utility company. Part of this satisfaction comes from the targeted information that can be provided to customers including personalized energy efficiency recommendations and information on how to participate in ETG's energy efficiency programs.

11.1.1 Program Design

To facilitate understanding of the HERs program design, ADM (the Evaluator) developed a draft logic model (see Figure 11-1). This draft was synthesized from the Evaluator's experience with similar programs, conversations with program and implementation staff, and a review of program documentation. The Evaluator sought to create a model that could be viewed as a "living document" that could assist program staff, implementation staff, and evaluators in understanding the program's underlying operations.

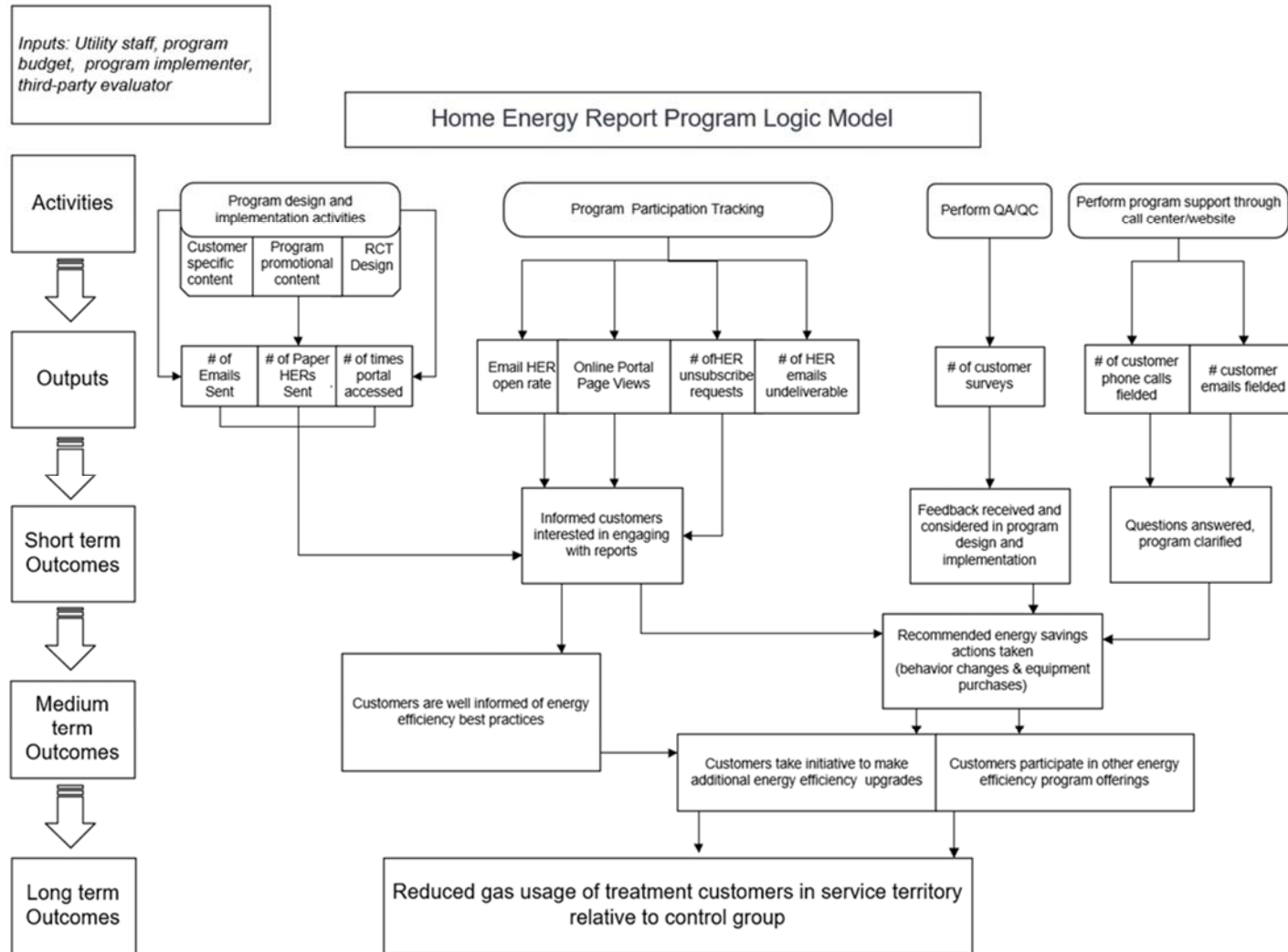


Figure 11-1: Behavioral Program Logic Model

Table 11-1: HER Program Estimated Participation and Savings

Utility	Metric	PY1	PY2	PY3
Elizabethtown Gas	Estimated Participants	150,000	155,000	160,000
Elizabethtown Gas	Projected Annual Savings (therms)	907,885	583,168	560,152
Elizabethtown Gas	Projected Lifetime Savings (therms)	1,944,452	1,248,994	1,199,699

Table 11-1 provides estimated HER program participant and savings from SJIU plans and filings for PY1 through PY3.

The HER Program began providing HERs in 2017 to a portion of residential customers. Table 11-2 summarizes the cohorts implemented in the HER program within the ETG service area.

Table 11-2: Summary of ETG HER Cohorts

Cohort	RCT Date	Treatment Group Size			Control Group Size		
		Original Treatment Customers	Number at Start PY1	Number at EOY PY1	Original Control Customers	Number at Start PY1	Number at EOY PY1
Legacy Wave 1	Dec 2017	133,418	124,787	124,352	21,393	20,017	133,418
Legacy Wave 2	Aug 2019	11,833	10,728	10,746	11,926	10,850	11,833
Total			145,251	135,515	135,099	33,319	30,867

The Evaluator estimated savings for HER Program using non-participant residences in ETG’s service territory selected from the Randomized Control Trial (RCT) and analyzed each of the cohorts treated during PY1. Table 11-3 describes the evaluation period for each wave and reporting period.

Table 11-3: Summary of Cohort Organization

Cohort	RCT Date	Pre-Period	Post-Period
Legacy Wave 1	Dec 2017	12/1/2016-11/30/2017	PY1: 7/1/2021-6/30/2022
Legacy Wave 2	Aug 2019	8/1/2018-7/31/2019	PY1: 7/1/2021-6/30/2022

11.1.2 Summary of Data Provided

The implementer Uplight provided the following data to support the analysis:

- Pre- and post-treatment monthly gas billing data for participants and non-participants. The data started in July 2016 and ended May 2022.
- HERs customer information, including date of first sent paper and email HERs report by Uplight, email contact information, and opt-out date.
- HERS report delivery dates and content for each customer.
- List of tips and suggestions for reducing gas usage contained in HERs reports.

11.1.3 Evaluation Objectives

The Evaluator identified the following impact research objectives for evaluating ETG's HER program:

- Estimate annual and per customer gross gas savings (therms) to gain insight into program performance.
- Validity testing of treatment and control cohorts.
- Calculate lift from other ETG energy efficiency program participation.
- Determine the potential for tainting of the control from participation in other HERs programs run by electric utilities.
- Report low- and moderate-income program participation.
- Calculate a realization rate for the program and determine the primary drivers of the realization rate.

The Evaluator identified the following process research objectives for evaluating ETG's HER program:

- Review implementation of prior program recommendations by the HER program team (ETG and Uplight).
- How does the program design and performance compare to other, similar programs as well as to industry best practices?
- How well did the program staff and implementation staff work together? Are there data tracking and communication efficiencies that can be gained?
- What are the end user experiences throughout the program?
- Are there ways to improve the design for subsequent treatment waves or enhance the implementation process (e.g., modifications to the HERs delivery method, modification to the HERs content)?
- Are the customers satisfied with the HERs they receive through the program? What are the causes of dissatisfaction?

- What are the demographics of the customers enrolled in the program (e.g., based on homeownership, income level, education level, geographic area, ethnicity) compared to those in the control group?
- Were there any significant changes or new obstacles (for each program year)?
- Were there any outside or external barriers that influenced the program, such as the COVID-19 pandemic?
- How did behaviors and efficient practices differ between the treatment and control groups? Were treatment customers inspired to participate in other program offerings or install energy efficient measures? If not, why – are there specific barriers? Are there ways in which the HERs or other program offerings could be improved to encourage customers to take additional steps towards being more energy efficient?
- Looking forward, what are key barriers and drivers to success with the current cohort(s) and/or with new cohorts?

11.2 Methodology

This section describes the evaluation approach of the HER program. The Evaluator analyzed each of the cohorts treated during PY1.

11.2.1 Glossary of Terminology

The following section contains a glossary of terminology used throughout the report.

As a first step to detailing the evaluation methodologies, the Evaluator has provided a glossary of terms to follow:

- Ex-ante Savings – Calculated savings used for program and portfolio planning purposes.
- Ex-post Savings – Savings estimates reported by an evaluator after the energy impact evaluation has been completed.
- Gross Savings – The change in energy consumption directly resulting from program-related actions taken by participants in an efficiency program, regardless of why they participated.

11.2.2 Sampling Plan

Table 11-4 identifies sample sizes and confidence/precision estimates by program activity for each program year (PY).

Table 11-4: Sampling Plan

Activity	Sample Size (PY1)	Confidence /Precision (PY1)	Sample Size (PY2)	Confidence /Precision (PY2)	Sample Size (PY3)	Confidence /Precision (PY3)
Impact Analysis	census	N/A	--	N/A	census	N/A
Participant Survey (Elizabethtown Gas)	70 control / 70 treatment customers	90/10	--	--	70 control / 70 treatment customers	90/10
Program Staff Interviews	3-5 per utility	N/A	--	--	3-5 per utility	N/A

Table 11-5 identifies key survey topics for customer surveys for participant and control customers.

Table 11-5: Customer Survey Topics

Survey	Key Survey Topics
Participant Customer	Program familiarity and comprehension, program feedback, impact of program on behaviors, awareness of what drives energy usage, customer demographics, impacts from COVID-19.
Control Customer	Awareness of what drives energy usage, sources of information on reducing energy usage, customer demographics, impacts from COVID-19.

11.2.3 Impact Evaluation Approach

This section describes the Impact evaluation approach of the HER program. The Evaluator followed an industry standard impact evaluation approach that conforms with the accepted level of rigor for all HERs program evaluations. The Evaluator used participant and control group billing data in the pre-period (before the household starts receiving HERs) and in the post-period (after household starts receiving HERs) to estimate program impacts for each wave as part of the impact evaluation for the HER Program, as detailed in the Uniform Methods Project (UMP) behavioral chapter by the National Renewable Energy Laboratory¹⁰¹. In addition, the Evaluator estimated joint savings from other downstream and upstream energy efficiency programs offered to ETG’s residential customers.

¹⁰¹ <https://www.nrel.gov/docs/fy18osti/70472.pdf>

The work effort was divided into six distinct steps:

1. Data preparation and cleaning, including true-up and calendarization.
2. Validity testing of remaining treatment and control groups during the baseline period.
3. Create matched ad-hoc control group via propensity score matching for waves where validity was compromised (not needed).
4. Estimate monthly and annual billed consumption differences between treatment and control groups via regression modeling.
5. Estimating and removing joint savings from other programs.
6. Estimate program attrition.
7. Reporting low- to moderate income program participation.

The Evaluator explored several linear regression models for the impact evaluation of the HER program. Each approach involves panel linear regression models to estimate energy savings for the treatment group. The explored methods required monthly billing data for the program participants and a comparable counterfactual group.

The following types of Linear Fixed Effects Regression (LFER) models were explored during the evaluation of this program: Lagged Dependent Variable (LDV) with weather controls, Difference-in-Difference (D-in-D) with weather controls, and Post-Program Regression (PPR) models. The Evaluator selected the PPR model with weather controls as it provided the best fit for the data (highest adjusted R-squared). The PPR model is a panel regression model that calculates the differences between treatment and control consumption in the post-program period. However, it includes average seasonal usage controls from the pre-program period to control for any small systematic differences in pre-treatment usage trends between the participant and control customers.

The Evaluator presents savings estimates in three formats for each program year:

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

Data Preparation

The evaluation team used participant and non-participant billing data in the pre-period (before intervention of HERs) and participant and non-participant billing data in the post-period (after intervention of HERs) in a fixed-effects panel regression model to predict energy usage savings, as detailed in the Uniform Methods Project (UMP) behavioral chapter.¹⁰²

¹⁰² <https://www.energy.gov/sites/prod/files/2015/02/f19/UMPCChapter17-residential-behavior.pdf>

The following steps were taken to prepare data:

1. Identified homes in the billing data that were assigned to the treatment or control group in the original RCT design.
2. Excluded homes without sufficient billing history.
3. Excluded homes without sufficient post-period billing data.
4. Excluded homes with consumption data indicating it is an outlier.
5. Excluded months that are present after a customer’s move out date.
6. Restricted to billing data for the 12 months prior to the wave enrollment start date and the given program year.
7. Verified that remaining RCT control households are still a valid comparison for the remaining treatment households.

The Evaluator examined data for outliers using multiple accepted identification techniques. These include standard deviation, Bonferroni Outlier Test, and Grubbs Test for Outliers (G-test). The Evaluator aimed to remove error readings rather than remove high and low users, as these subgroups contribute real behaviors to the average savings estimate.

True-Up

The Evaluator corrected for estimated reads and adjusted actual reads by using a “true-up” process. For each metered read and all estimated reads immediately preceding it, the Evaluator totaled the billed usage and number of days spanning those bills. The total billed usage for that cumulative period was divided by the total number of days in each individual bill to generate a corrected usage value. Because the number of estimated reads per actual read is inconsistent, the number of estimated reads prior to the first actual read in the provided dataset was not assumed. Therefore, the first metered read and all estimated reads preceding were excluded from the dataset. Similarly, estimated reads that do not have a corresponding actual read (generally towards the tail end of provided billing data) were excluded from analysis. The following equation provides the means for calculating the adjusted usage for billing data after the first metered read and all prior estimated reads have been excluded:

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

Equation 39

Where:

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

- n = A metered bill providing an adjustment factor for preceding estimated bills.
- m = The billing month of interest
- Billed usage* = The total billed usage in a month (monthly bills) or consumed in a month (AMI interval data).
- Billing days* = The total number of days in a monthly bill’s billing period or AMI interval month.

Calendarization

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

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

Equation 40

Where:

- i = First bill containing the month of interest
- n = Last bill containing the month of interest
- m = The month of interest
- Monthly usage* = The calendarized monthly usage for a given month
- Month days* = The number of days belonging to the month of interest in a billing period.
- Billing days* = The number of days in a billing period

In addition to calculating the monthly usage, the number of billed days per month is also calculated by summing together the number of billed days in a corresponding month. The following equation provides the algorithm for calculating the number of billed days in a given month.

$$Billed\ days_m = \sum_i^n Month\ days_i$$

Equation 41

After calendarization was completed, an average daily usage value was then calculated by dividing the monthly usage by the number of billed days in a month. The data set is then filtered to exclude months that have less than one billed day or exceed the total number of days in that calendar month for that year—months that meet these criteria have overlapping bills and are unreliable for analysis. Partial-month data for the most recent available billing period was also removed from the data set.

Validity Testing

The Evaluator conducted equivalence testing of pre-treatment data for each cohort to ensure that the control and treatment groups are not statistically different at the $p < 0.10$ level (90 percent confidence level). The Evaluator performed a Welch's Two-Sample T-test on the total consumption for the 12 months prior to the enrollment (RCT) start date of each cohort.

Regression Models

The Evaluator utilized the post-program regression (PPR) model to calculate savings for the HER program. The model relies on modeling the interaction between time and the treatment effect to generate a regression coefficient that represents the average daily usage savings post-treatment.

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

In addition, the Evaluator utilized Heating Degree Days (HDD) in the regression model to account for any weather-related effects not captured by the monthly dummies or each customer's average pre-period seasonal usage. HDD is derived from the difference between a base temperature of 65 degrees Fahrenheit, the outside temperature above which a building is assumed to need no heating, and the actual outside air temperature.

The 65 degrees Fahrenheit temperature threshold used in the analysis is a commonly used base temperature that represents an approximation for typical residential building HVAC systems. Regional temperature data was obtained from the National Oceanic and Atmospheric Administration for weather stations local to treatment and control group customers in ETG’s service territory.

The PPR model is specified in Equation 42 below:

$$Usage_{imy} = \beta_0 + \sum_{m=1}^{12} \sum_{y=1}^n I_{my} * \beta_{mys} * (AvgPre_i + AvePreSummer_i + AvePreWinter_i) + \sum_{m=1}^{12} \sum_{y=1}^n I_{my} * \tau_{my} * treatment_{imy} + \beta_1 * HDD_{im} + \epsilon_{imy}$$

Equation 42

Where:

- $Usage_{imy}$ = Customer *i*’s average daily energy usage in bill month *m* in year *y*
- β_0 = Intercept of the regression equation
- I_{my} = An indicator variable equal to one for each monthly bill month *m*, year *y*, and zero otherwise
- β_{mys} = The coefficient on the bill month *m*, year *y* indicator variable interacted with season *s*
- β_1 = The coefficient on Heating Degree Days
- $AvgPre_i$ = Average daily usage for customer *i* in the pre-treatment period
- $AvePreSummer_i$ = Average daily usage for customer *i* in the pre-treatment period during June through September
- $AvePreWinter_i$ = Average daily usage for customer *i* in the pre-treatment period during December through March
- $treatment_{imy}$ = The treatment indicator variable. Equal to one when the treatment is in effect for the treatment group. Zero otherwise. Always zero for the control group.
- HDD_{im} = Heating Degree Days for customer *i* in month *m*
- τ_{my} = The estimated treatment effect in Usage per day per customer; the main parameter of interest
- ϵ_{imy} = The error term

The Evaluator also utilized the lagged dependent variable (LDV) model and the fixed-effect model to estimate program savings. Each of the models have different methods of controlling for individual differences and provide reliable estimates of program savings.

The LDV model is like the PPR described above with the exception that instead of regressing the three pre-usage values, the monthly usage from the pre-usage period one year prior to the treatment period for the corresponding month is used as the predictor. For example, the predictor for the month of July in the treatment period is the month of July in the 12-month period before treatment began.

In addition, the Evaluator utilized HDD in the regression models to account for any weather-related effects not captured by the monthly dummies or each customer’s average pre-period seasonal usage.

The LDV model is specified by the equation below:

$$Usage_{imy} = \beta_0 + \sum_{m=1}^{12} \sum_{y=1}^n I_{my} * \beta_{my} + Pre - Period Usage_{i,m,y-n} * \beta_{m,y-n} + \sum_{m=1}^{12} \sum_{y=1}^n I_{my} * \tau_{my} * treatment_{imy} + \beta_1 * HDD_{im} + \epsilon_{imy}$$

Equation 43

Where:

- $Usage_{imy}$ = Customer *i*'s average daily energy usage in bill month *m* in year *y*
- β_0 = Intercept of the regression equation
- I_{my} = An indicator variable equal to one for each monthly bill month *m*, year *y*, and zero otherwise
- β_{my} = The coefficient on the bill month *m*, year *y* indicator variable
- β_1 = The coefficient on Heating Degree Days
- $Pre - Period Usage_{i,m,y-n}$ = The billed usage for customer *i* in bill month *m* in the year prior to the assignment to treatment condition. The term *n* represents the number of years home *i* has been in the program. This term represents pre-period usage and would indirectly control for variability in customer characteristics such as home size and heating fuel.
- $\beta_{m,y-n}$ = The coefficient on the home-specific pre-assignment usage term

- $treatment_{imy}$ = The treatment indicator variable. Equal to one when the treatment is in effect for the treatment group. Zero otherwise. Always zero for the control group
- HDD_{im} = Heating Degree Days for customer i in month m
- τ_{my} = The estimated treatment effect in Usage per day per customer; the main parameter of interest
- ε_{imy} = The error term

The D-in-D regression model is specified in Equation 44 below:

$$Usage_{imy} = \beta_i + \sum_{m=1}^{12} \sum_{y=1}^n I_{my} * \beta_{my} + \tau_{my} * \sum_{m=1}^{12} \sum_{y=1}^n I_{my} * treatment_{imy} * Post_{my} + \beta_1 * HDD_{im} + \sum_{i=1}^n Customer_i * \theta_i + \varepsilon_{imy}$$

Equation 44

Where:

- $Usage_{imy}$ = Customer i 's average daily energy usage in bill month m in year y
- β_i = The intercept term for customer i , or the “fixed effect” term. Equal to the mean daily energy use for each customer
- I_{my} = An indicator variable that equals one during month m , year y , and zero otherwise. This variable models each month’s deviation from average energy usage.
- β_{my} = The coefficient on the bill month m , year y indicator variable
- β_1 = The coefficient on Heating Degree Days
- $treatment_{imy}$ = The treatment indicator variable. Equal to one when the treatment is in effect for the treatment group. Zero otherwise. Always zero for the control group.
- $Post_{my}$ = The post-period indicator variable. Equal to one in the post-period and zero otherwise.
- HDD_{im} = Heating Degree Days for customer i in month m
- τ_{my} = The estimated treatment effect in Usage per day per customer; the main parameter of interest.
- θ_i = The estimated fixed effects for customer i

$Customer_i$ = An indicator variable equal to one for customer i and zero otherwise.

ε_{imy} = The error term

As can be seen above, the D-in-D regression model controls for individual differences by including a fixed term that is equal to the customer's average daily energy use that has been averaged across the pre- and post-treatment period. In addition, the Evaluator utilized HDD in the regression model to account for any weather-related effects not captured by the monthly dummies.

Dual Participation Analysis

Participants in both the treatment and control groups may participate in other subprograms. The "HER" measure received by participants in the treatment group may cause these participants to seek out other programs and measures offered in the energy efficiency (EE) portfolio to a greater extent than the control group. To the extent that the treatment group participates in other EE programs at a rate above and beyond that of the control group, those savings will be reflected in the gross energy savings calculated using the method above. However, savings for these items will also have been attributed to their respective programs and subprograms. The Evaluator corrected for dual participation that occurred after treatment began to the extent that the treatment group participated at a higher rate than the control group.

Double counted savings is the difference in other-program-savings for the recipient and control groups, and this difference is subtracted from a behavioral program estimate to avoid double counting. If a program has more recipients than non-recipients in the analysis, then taking the straight sum of savings from other-program-savings would dramatically inflate the double counting effect. As there are different numbers of participants in each group, it is more appropriate to evaluate double counting based on the difference in per-participant savings.

For downstream measures, we took the following steps to account for dual participation:

- 1) The measures for the treatment group and control group were assigned to an appropriate month based on the reported date of installation for measures installed after the treatment start date only.
- 2) Verified savings for all measures installed for the month were summed together and divided by 365.25 and then divided by the number of participants in each group to create a daily average savings value for each group for measures installed in each month.
- 3) For each month, the daily average savings value for all prior months were then added to the current month of interest for both the treatment and control group.

- 4) For each month, subtracting the daily average savings value from the control group from the treatment group results in an incremental daily savings that is attributable to dual participation of the treatment group to a greater extent than the control group up to and including that month of interest.
- 5) This adjustment factor is then subtracted from the daily savings value attributed to the treatment effect of that corresponding month extrapolated from the linear model.

The Evaluator accounted for uplift from the upstream program, Online Marketplace, using the same method utilized for the downstream programs. This was possible due to the availability of customer account information in the Online Marketplace tracking data.

Report Low to Moderate Income Program Participation

The Evaluator utilized customer demographic information from the process evaluation participant surveys to summarize customers characterized as low- or moderate-income. The definitions for low- and moderate-income come from New Jersey and are chosen to align with NJ's EE LMI Program income eligibility requirements. Low-income customers are classified as having incomes below 250 percent of the Federal Poverty Level (FPL), while moderate-income customers will be classified as having incomes between 250 percent and 400 percent of the FPL.

Net Savings

The HER program uses a randomized control trial, comparing recipients to non-recipients. As a result, the savings estimates from the model are net savings estimates, and no further deduction of free ridership is taken. Therefore, Net-to-Gross (NTG) is set to 1 for each program year.

11.2.4 Process Evaluation Approach

Review Program Materials

As an initial step, the Evaluator reviewed program documents such as delivery schedules, sample reports and samples of any additional engagement materials. The purpose of reviewing these materials was to understand what information is communicated to participants and how it is communicated.

Program Staff Interviews

The Evaluator conducted program staff and implementor interviews. During the interviews, the Evaluator clarified the program activities, including what customer engagement tools the program uses in addition to the HERs, if any, to influence customer behavior. The Evaluator also probed the program manager's perspective on the opportunities for and barriers to a successful program. Additionally, the Evaluator

explored program operations in interviews with implementation staff. Questions were designed to prompt discussion of any changes that have occurred in program design, implementation, or delivery, including any changes in how participants are recruited, how HERs were developed, and how information on home energy usage is collected.

Participant Surveys

The Evaluator adapted survey instruments that we have developed previously in evaluating similar programs, which address several of the research questions for this evaluation.

Research questions included:

- Did treated customers notice and read the reports? How many and how thoroughly?
- What did the customers think of the information provided? How easy was it to understand? What, if anything, was not easy to understand or did not make sense?
- How much do treated customers understand about what drives energy usage and what are the best ways to reduce it?
- How much are treated customers aware of their current energy use?
- Was information on their home's energy use accurate and up to date? If they think it wasn't, what did they disagree with and why?
- How useful was the energy saving information provided? What would have made it more useful?
- How much do treated customers use other engagement tools (e.g., customer portals and incentives)?
- What actions have customers taken to save energy? What has kept them from taking other recommended actions? What barriers might have prevented them from taking recommended actions and what might remove those barriers?
- What would they change about how, or how often, the reports were delivered? Would they like them more or less frequently or delivered in a different manner (e.g., as an attachment to a text message)?

Control Customer Surveys

As with the participant survey, the Evaluator adapted survey instruments that we have developed previously in evaluating similar programs. The objective of the control group survey was to provide information that may help interpret impact evaluation findings and to detect meaningful differences between the participant and controls groups with moderately good statistical power.

11.3 Impact Evaluation Results

This section provides the results of each portion of the impact evaluation. The Evaluator calculated the percent savings per home by dividing the average annual energy savings estimated in the treatment group by the average annual energy consumption from the control group for each program year. That value is then adjusted for uplift from downstream and upstream measures. The program-level savings were calculated by multiplying the average annual household impact estimate by the weighted number of active program participants in the treatment group and after removing double counted savings, by program year.

Program savings are summarized in Table 11-6 and discussed in detail in the following sections.

Table 11-6: HER Gross Annual Savings

Projected Annual Savings (therms)	Ex-Ante Savings (therms)	Gross Annual Savings (therms)	RR therms
907,885	682,159	630,407	92%

11.3.1 Data Preparation and Cleaning

The Evaluator prepared and cleaned billing data provided by ETG prior to running regressions. The following table represents the unique number of customers per wave and treatment group throughout the billing cleaning stages.

Table 11-7: Treatment and Control Customers After Restrictions

Wave	Restriction Detail	Treatment Customers	Control Customers
Legacy Wave 1	Start	170,491	27,496
Legacy Wave 1	Keep first wave assignment	170,491	27,346
Legacy Wave 1	After removing bills that occur after inactive date	170,451	27,340
Legacy Wave 1	Remove outliers (>17 therms/day)	170,450	27,340
Legacy Wave 1	After removing bills that occur before pre-period	170,450	27,340
Legacy Wave 1	Restrict to pre-period and post-period in program year	170,368	27,324
Legacy Wave 1	Restrict to customers with at least 9 months pre and 6 months post ¹⁰³	124,461	19,987
Legacy Wave 2	Start	15,494	15,492
Legacy Wave 2	Keep first wave assignment	14,574	14,544
Legacy Wave 2	After removing bills that occur after inactive date	14,570	14,538
Legacy Wave 2	Remove outliers (>17 therms/day)	14,570	14,538
Legacy Wave 2	After removing bills that occur before pre-period	14,563	14,533
Legacy Wave 2	Restrict to pre-period and post-period in program year	14,559	14,531
Legacy Wave 2	Restrict to customers with at least 9 months pre and 6 months post ¹⁰³	9,101	9,166

The Evaluator performed a true-up of customer bills to adjust for estimated reads.

In addition, the Evaluator conducted calendarization adjustments for each monthly bill. The resulting dataset contained adjusted monthly bill reads with associated consumption and bill duration for each month the customer remained active.

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

1.1.1 Validity Testing Results

After billing preparation and cleaning, the remaining customers were tested for statistically significant differences in usage between the treatment and control groups for each of the 12 pre-period months in each wave. As shown in the tables below, all waves had valid control groups.

¹⁰³ The Evaluator performed sensitivity testing on the minimum number of post-period months required and found no significant differences in the savings estimate because the majority of customers have the maximum number of post-period billing months available.

Table 11-8 and Table 11-9 detail differences and statistical significance between each wave’s treatment and control groups for each of the 12 months in the pre-period.

Table 11-8: Legacy Wave 1 T-Test Results

Pre-Period Month	Treatment Group Average Daily Usage (therms/day)	Control Group Average Daily Usage (therms/day)	Average Daily Usage Difference (therms/day)	P-value	Statistically Significant Difference
Jan	5.59	5.58	0.00	0.861	-
Feb	5.13	5.12	0.01	0.515	-
Mar	4.52	4.51	0.01	0.567	-
Apr	2.48	2.48	0.00	0.781	-
May	1.27	1.26	0.00	0.486	-
Jun	0.82	0.82	0.00	0.457	-
Jul	0.65	0.65	0.00	0.831	-
Aug	0.67	0.67	0.00	0.842	-
Sep	0.73	0.73	0.00	0.544	-
Oct	1.31	1.31	0.00	0.993	-
Nov	2.17	2.17	0.00	0.996	-
Dec	5.24	5.23	0.00	0.861	-

Table 11-9: Legacy Wave 2 T-Test Results

Pre-Period Month	Treatment Group Average Daily Usage (therms/day)	Control Group Average Daily Usage (therms/day)	Average Daily Usage Difference (therms/day)	P-value	Statistically Significant Difference
Jan	5.93	5.97	-0.04	0.246	-
Feb	5.85	5.86	-0.01	0.814	-
Mar	4.43	4.43	0.00	0.923	-
Apr	2.18	2.18	0.00	0.850	-
May	1.20	1.20	-0.01	0.351	-
Jun	0.72	0.73	-0.01	0.255	-
Jul	0.63	0.64	-0.01	0.249	-
Aug	0.54	0.54	0.00	0.848	-
Sep	0.67	0.67	0.00	0.925	-
Oct	1.81	1.82	0.00	0.793	-
Nov	3.94	3.96	-0.02	0.429	-
Dec	4.95	4.97	-0.02	0.598	-

11.3.2 Dual Participation Analysis Results

Participants in both the treatment and control groups participate in other ETG energy efficiency programs. The double counted savings, defined in the methodology, whether positive or negative, are subtracted from the wave’s gross savings estimates from the regression analysis to get total verified savings. This section summarizes the results of the double counting analysis for downstream and upstream programs.

ETG delivered tracking data for the residential programs included in the double counting analysis, including the Home Performance with ENERGY STAR Program, Multi Family Direct Install Program, Energy Efficient Products Program,¹⁰⁴ Moderate Income Weatherization Program, and Quick Home Energy Check-Up Program.

The Evaluator identified and summarized the average treatment customer, average control customer, and average incremental savings attributed to the residential programs for each wave.

Table 11-10 displays the verified double counting savings to be subtracted from each group’s annual program savings for each program year.

Table 11-10: PY1 Downstream/Upstream Uplift Results

Wave	Average Treatment Household Daily Savings (therms/year)	Average Control Household Daily Savings (therms/year)	Average Uplift Household Daily Savings (therms/year)	Weighted Treatment Customers	Program Uplift Savings	Program Uplift % of Annual Savings
Legacy Wave 1	0.078	0.076	0.001	124,352	173	0.03%
Legacy Wave 2	0.058	0.045	0.013	10,746	141	0.21%
Total	0.076	0.074	0.002	135,099	314	0.05%

The results are separated by wave. PY1 displays a total of 314 therms in double counted savings. The uplift double counting values are subtracted from the regression model results for each wave.

1.1.1 Linear Regression Modeling Results

This section details the regression results of each of the evaluated waves. All waves were evaluated using their original RCT control groups.

¹⁰⁴ Including both Downstream HVAC and Appliance Rebates as well as the Online Marketplace. The tracking data for the Online Marketplace program contained customer account numbers. Therefore, uplift for the upstream program could be accounted for with the same methodology as downstream programs.

As discussed in the evaluation approach section, savings are directly determined through model parameters, the coefficient τ_{my} , which is defined again in Table 11-11.

Table 11-11: Regression Parameters

Variable	Parameter	Interpretation
Treatment	τ_{my}	Average daily savings per customer in the post-period

Per-home results and percent savings by year are presented for each of the analyzed waves. Joint savings attributable to ETG upstream and downstream programs were calculated and removed to avoid double counting.

The Evaluator found all waves to display positive savings that are statistically significant, and each model portrayed a sufficient fitness to the data.

Legacy Wave 1 Results

Table 11-12 displays the annual Therms savings per treatment customer for Legacy Wave 1, prior to any double counting adjustments. The savings are positive and statistically significant at the 95 percent level.

Table 11-12: Legacy Wave 1 Annual Savings per Household

Wave	Program Year	Estimate	5% CI	95% CI
Legacy Wave 1	PY1	4.52	3.04	6.01

Table 11-13 displays the primary regression coefficients for PY1 for the selected PPR model. The complete list of regression coefficients, including all covariate interactions, is provided in the appendix.

Table 11-13: Legacy Wave 1 PY1 Regression Results

Coefficient	Estimate	Std Error	P Value	5% CI	95% CI
(Intercept)	-7.88	0.09	0.00	-8.02	-7.73
Treatment	-0.01239	0.00	0.00	-0.02	-0.01
Feb	1.74	0.02	0.00	1.71	1.77
Mar	3.56	0.04	0.00	3.49	3.62
Apr	5.15	0.06	0.00	5.06	5.25
May	6.19	0.07	0.00	6.08	6.30
Jun	7.85	0.09	0.00	7.71	7.99
Jul	7.97	0.09	0.00	7.83	8.12
Aug	7.95	0.09	0.00	7.81	8.10
Sep	7.84	0.09	0.00	7.70	7.99
Oct	7.21	0.08	0.00	7.08	7.34
Nov	3.90	0.05	0.00	3.83	3.98
Dec	3.50	0.04	0.00	3.43	3.56
Pre-period Usage	0.04	0.02	0.02	0.01	0.06
Pre-period Summer Usage	0.08	0.01	0.00	0.07	0.09
Pre-period Winter Usage	1.01	0.01	0.00	1.00	1.02
HDD	0.24	0.00	0.00	0.24	0.24

The Evaluator ran 3 different regression models and selected the best fitting PPR model. The PPR model was a good fit, as seen by the Adjusted R-square in Table 11-14.

Table 11-14: Legacy Wave 1 Model Fit

Wave	Model	Adjusted R2	F Statistic	Number of Observations	Number of Weighted Treatment Customers
Legacy Wave 1	PPR	0.875	231,850	1,622,024	124,352

The ex-post gross gas savings of HER program for Legacy Wave 1 is summarized below. The number of customers used to calculate total ex-post gas savings is the number of weighted treatment customers in the post-period.

Table 11-15: Legacy Wave 1 Gross Annual Gas Savings, PY1

Annual Unadjusted Savings Per Home (therms/year)	5% CI Annual Unadjusted Savings Per Home (therms/year)	95% CI Annual Unadjusted Savings Per Home (therms/year)	Annual Double Counted Savings Per Home (therms/year)	Annual Adjusted Savings Per Home (therms/year)	Annual Control Group Usage Per Home (therms/year)	Annual Percent Savings Per Home
4.52	3.04	6.01	0.00	4.51	927	0.49%

Legacy Wave 1 displayed 0.49 percent annual household savings for PY1. Average annual household savings for treated customers for Legacy Wave 1 was 4.52 therms in PY1. Household savings estimates were extrapolated using the number of weighted treatment customers active in the post-period. The Evaluator found the Legacy Wave 1 to display 562,422 therms in savings for the PY1 evaluation period. In addition, the 95 percent confidence intervals are summarized for PY1.

Table 11-16: Legacy Wave 1 Total Gross Annual Gas Savings, PY1

Wave	Annual Adjusted Savings Per Home (therms)	Number of Weighted Treatment Customers	Program Savings (therms)	Program Savings (therms) 5% CI	Program Savings (therms) 95% CI
Legacy Wave 1	4.52	124,352	562,422	377,551	747,293

Legacy Wave 2 Results

Table 11-17 displays the annual gas savings per treatment customer for Legacy Wave 2, prior to any double counting adjustments. The savings are positive and statistically significant at the 95 percent level.

Table 11-17: Legacy Wave 2 Annual Savings per Household

Wave	Program Year	Estimate	5% CI	95% CI
Legacy Wave 2	PY1	6.34	3.53	9.15

Table 11-18 displays the primary regression coefficients for PY1 for the selected PPR model. The complete list of regression coefficients, including all covariate interactions, is provided in the appendix.

Table 11-18: Legacy Wave 2 PY1 Regression Results

Coefficient	Estimate	Std Error	P Value	5% CI	95% CI
(Intercept)	-8.22	0.22	0.00	-8.58	-7.86
Treatment	-0.01736	0.00	0.00	-0.02	-0.01
Feb	1.81	0.05	0.00	1.73	1.90
Mar	3.71	0.10	0.00	3.54	3.88
Apr	5.38	0.14	0.00	5.14	5.61
May	6.45	0.17	0.00	6.16	6.74
Jun	8.16	0.22	0.00	7.80	8.52
Jul	8.25	0.22	0.00	7.89	8.62
Aug	8.25	0.22	0.00	7.89	8.61
Sep	8.15	0.22	0.00	7.80	8.51
Oct	7.54	0.20	0.00	7.21	7.87
Nov	4.07	0.12	0.00	3.88	4.26
Dec	3.65	0.10	0.00	3.49	3.82
Pre-period Usage	0.13	0.03	0.00	0.09	0.18
Pre-period Summer Usage	0.07	0.02	0.00	0.03	0.10
Pre-period Winter Usage	0.88	0.01	0.00	0.86	0.90
HDD	0.25	0.01	0.00	0.24	0.26

The Evaluator ran 3 different regression models and selected the best fitting PPR model. The PPR model was a good fit, as seen by the Adjusted R-square in Table 11-19.

Table 11-19: Legacy Wave 2 Model Fit

Wave	Model	Adjusted R2	F Statistic	Number of Observations	Number of Weighted Treatment Customers
Legacy Wave 2	PPR	0.875	231,850	1,622,024	124,352

The ex-post gross gas savings of HER program for Legacy Wave 2 is summarized below. The number of customers used to calculate total ex-post gas savings is the number of weighted treatment customers in the post-period.

Table 11-20: Legacy Wave 2 Gross Annual Gas Savings, PY1

Annual Unadjusted Savings Per Home (therms/year)	5% CI Annual Unadjusted Savings Per Home (therms/year)	95% CI Annual Unadjusted Savings Per Home (therms/year)	Annual Double Counted Savings Per Home (therms/year)	Annual Adjusted Savings Per Home (therms/year)	Annual Control Group Usage Per Home (therms/year)	Annual Percent Savings Per Home
6.34	3.53	9.15	0.01	6.33	993	0.64%

Legacy Wave 2 displayed 0.64 percent annual household savings for PY1. Average annual household savings for treated customers for Legacy Wave 2 was 6.33 therms in PY1. Household savings estimates were extrapolated using the number of weighted treatment customers active in the post-period. The Evaluator found the Legacy Wave 2 to display 67,985 therms in savings for the PY1 evaluation period. In addition, the 95 percent confidence intervals are summarized for PY1.

Table 11-21: Legacy Wave 2 Total Gross Annual Gas Savings, PY1

Wave	Annual Adjusted Savings Per Home (therms)	Number of Weighted Treatment Customers	Program Savings (therms)	Program Savings (therms) 5% CI	Program Savings (therms) 95% CI
Legacy Wave 2	6.33	10,746	67,985	37,781	98,188

Other Regression Model Results

Table 11-22 provides additional regression model estimates from the other two models run by the Evaluator: LDV and D-in-D. As shown, model fit (Adjusted R²) is lower than the selected PPR model for each wave. Annual percent savings per home are comparable across all three models ranging from 0.47 percent to 0.52 percent for Legacy Wave 1, and 0.62 percent to 0.80 percent for Legacy Wave 2.

Table 11-22: Other Regression Model Estimates

Wave	Model	Annual Unadjusted Savings Per Home (therms/year)	5% CI Annual Unadjusted Savings Per Home (therms/year)	95% CI Annual Unadjusted Savings Per Home (therms/year)	Adjusted R2	Number of Observations	Annual Percent Savings Per Home
Legacy Wave 1	D-in-D	4.80	2.21	7.40	0.792	3,350,110	0.52%
Legacy Wave 1	LDV	4.40	2.78	6.02	0.852	1,617,125	0.47%
Legacy Wave 2	D-in-D	6.12	1.17	11.07	0.804	418,114	0.62%
Legacy Wave 2	LDV	7.91	4.94	10.89	0.858	198,983	0.80%

Aggregated Waves Results

The Evaluator found positive, statistically significant savings for all waves evaluated. The Evaluator adjusted regression results with double counted savings in both downstream and upstream programs to arrive at the final program savings estimate. The following tables summarize each wave’s annual household energy savings impact with 95 percent confidence intervals.

Table 11-23: PY1 Program Savings Summary

Wave	Number of Weighted Treatment Customers	Annual Household Savings (Therms)	Annual Household 5% CI (therms)	Annual Household 95% CI (therms)	Program Savings (therms)	Program Savings 5% CI (therms)	Program Savings 95% CI (therms)
Legacy Wave 1	124,352	4.52	3.04	6.01	562,422	377,551	747,293
Legacy Wave 2	10,746	6.33	3.52	9.14	67,985	37,781	98,188
Total	135,099	4.67	3.07	6.26	630,407	415,332	845,482

11.3.3 Attrition Analysis Results

Table 11-24 summarizes the moveout rates for each wave in PY1. The moveout rates for each wave range from 6 percent and 9 percent.¹⁰⁵ In addition, the annual attrition rate in PY1 is roughly 7 percent across waves for the both the treatment and control groups.

Table 11-24: PY1 Moveout Rates by Wave

Wave	Treatment Customers Start PY	Control Customers Start PY	Treatment Customers End PY	Control Customers End PY	Treatment Moveouts	Control Moveouts	Treatment Moveout Percent	Control Moveout Percent
Legacy Wave 1	133,418	21,393	124,787	20,017	8,631	1,376	6%	6%
Legacy Wave 2	11,833	11,926	10,728	10,850	1,105	1,076	9%	9%
Total	145,251	33,319	135,515	30,867	9,736	2,452	7%	7%

The Evaluator estimated the cumulative level of both treatment and control moveouts over the program life by wave. In addition, the following table displays the total moveout rate aggregating all waves. Attrition since inception for each wave, in aggregation, equals approximately 25 percent.

Table 11-25: Moveout Rates Since Inception by Wave

Wave	RCT Start Date	Treatment Group Size			Control Group Size		
		Original Treatment Customers	Treatment Customers End PY	Treatment Moveout Percent Since Inception	Original Control Customers	Control Customers End PY	Control Moveout Percent Since Inception
Legacy Wave 1	Dec 2017	167,655	124,787	26%	26911	20,017	26%
Legacy Wave 2	Aug 2019	14,501	10,728	26%	14468	10,850	25%
Total		182,156	135,515	26%	41,379	30,867	25%

1.1.1 HERs Report Delivery Type Summary

Table 11-26 summarizes HERs report delivery type for treatment customers in PY1 by wave. Customers with an inactive date were excluded at the outset since they no longer receive reports and are part of natural attrition. Ninety-six percent of customers received

¹⁰⁵ For most customers, the billing data ended a few weeks before the end of the program year. ADM estimated the attrition rate for the last month in the program year (May 2022) by taking the average attrition rate for all prior months during the program and applying it to the number of customers in the penultimate month.

paper HERs reports. In addition, 66 percent of customers received email reports, while 66 percent of customers received both email and paper reports, indicating that most customers receiving email reports also received paper reports. Lastly, 10 percent of customers for Wave 2 did not receive any reports, which may indicate a data issue either in recording report type or in obtaining customer contact information.

Table 11-26: HERs Report Delivery Type Summary

Wave	Percent of Treatment Receiving Paper Reports	Percent Treatment Receiving Email Reports	Percent Treatment Customers Receiving Email and Paper Reports	Percent of Treatment Customers Receiving Neither Report
Legacy Wave 1	97%	66%	65%	3%
Legacy Wave 2	90%	76%	76%	10%
Total	96%	66%	66%	4%

11.4 Process Evaluation Results

11.4.1 Program Staff Facilitated Discussions

The Evaluator conducted discussions with ETG and Uplight staff to investigate the design and implementation of ETG’s Behavioral program. The summary information presented here outlines key takeaways and was synthesized from discussions held with Uplight and ETG staff. These discussions were held in July and August 2022 and included one discussion with Uplight’s client solutions director and solutions manager and another with ETG’s energy efficiency manager and energy efficiency analyst, and SJI’s EM&V manager.

ETG and Uplight staff observed that the Behavioral program would not meet its savings goals for PY1. Uplight’s solution manager said that the program would increase the number of treatment customers from 150,000 to 175,000 in PY2 because program savings had not been met in PY1. ETG’s energy efficiency manager said the main strength of the program is the volume of customers that can participate. Uplight’s solution manager noted that they were contractually obligated to average 160,000 treatment customers so by increased enrollment, they have “pushed it up about as high we could”.

The Behavioral program has a design that is consistent with industry standards. The Uplight client solutions director observed that the overall design of the ETG HERs offering is “fairly similar” to the Behavioral program they offer to other utility customers. The solutions manager said that the opt-out rate was consistent with other utilities’ Behavioral programs, though the rate was higher for ETG when compared to SJG.

Customer fatigue or over-exposure to HERs was cited as a barrier to success. The ETG energy efficiency manager observed that customers have received HERs for years, from both electric and gas utilities, and suggested there may be a need for implementation companies to explore innovative program designs to better engage with customers.

The Behavioral program provides cross-promotion for residential programs. HERs highlight available programs and increase awareness of offerings available for ETG customers. For example, the solution manager said that the reports can be customized each month and modified to promote specific offerings, such as the Online Marketplace or online assessment. Uplight’s solutions manager also cited the HERs’ “modular” design as a strength. He noted that the reports could incorporate utility-specific program promotion into different sections and order them to focus attention on certain offerings. The solutions manager said that report “modularity” or being able to prioritize the order of report content was added in July 2022.

The Behavioral program’s summary reports show HERs click through rates and the assessment tool usage followed similar patterns. There was relatively stable usage throughout the year, and usage spiking in winter months (see Figure 11-2). The unique click through rate is defined by Uplight as the number of unique customers who clicked on a link in an email HERs, divided by the number of unique emails opened by customers.

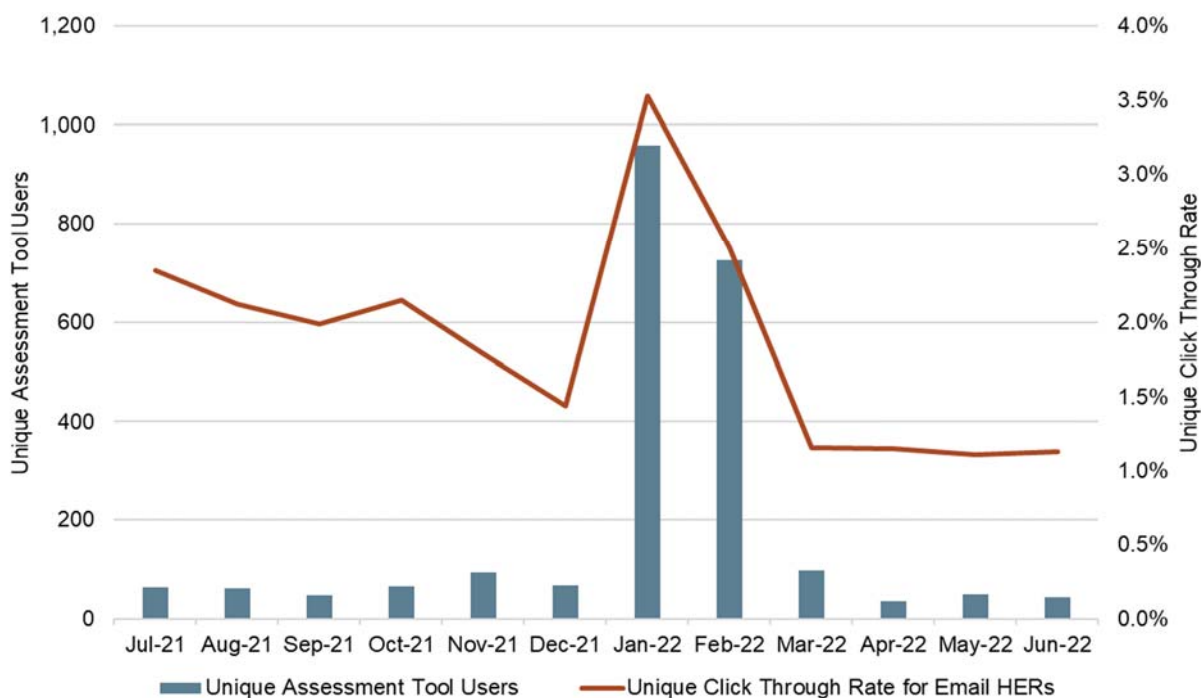


Figure 11-2: Unique Assessment Tool Users and Click Through Rate for Email HERs

1.1.1 HER Participant and Control Group Survey Results

The Evaluator surveyed ETG customers who received HERs and a sample of customers designated as controls. Those customers who received HERs are referred to as *participants*, while those designated as part of the control group are referred to as *non-participants*. The survey was administered in July and August 2022. The Evaluator sent 5,175 customers that received HERs an email invitation. Seventy-three participants and 72 non-participants completed the survey. Ten participants were screened-out from the survey. Seven participants said they did not recall receiving reports, two said they had not read any of the reports, and one did not recall if they had received their reports in email or paper format. Table 11-27 displays response rate information. The survey invitation either offered no incentive or a \$5 gift certificate. (The survey did not initially offer an incentive; the Evaluator added a \$5 incentive to improve the response rate and meet survey quota requirements by the reporting deadline.)

Table 11-27: Summary of Email Survey Response

Metric	Participants	Non-participants	Total
Initial Invite	5,175	5,221	10,396
Incentive offered	1,299	1,326	2,625
No incentive offered	3,876	3,895	7,771
Bounces	245	551	796
Complete	73	72	145
Incentive offered	40	49	89
No incentive offered	33	23	56
Response Rate	1%	1%	1%
Incentive offered	3%	4%	3%
No incentive offered	1%	1%	1%

The survey collected information about the program participants’ experiences with the HERs and satisfaction with ETG. The survey also inquired about the participants’ and non-participants’ use of ETG’s online energy portal and about energy-saving actions customers have taken (e.g., behavioral changes, or installing energy efficient appliances and equipment). The Evaluator compared responses from customers who received HERs and non-participants. Statistically significant differences are noted.¹⁰⁶

¹⁰⁶ ADM compared results with two proportion z-tests. Reported differences that are statistically significant at $p < 0.05$ using a two-tailed test are marked by a single asterisk.

Most participants reported receiving paper reports and reading all or most of them. Eighty-one percent of participants said they received paper reports, while 43 percent said they received email reports. Table 11-28 displays how often participants reported reading the HERs in the last 12 months.

Table 11-28: How often did you read the HERs in the last 12 months?¹⁰⁷

Portion Read	Percent (n = 74)
All the Reports	55%
Most of the Reports	24%
About half of the Reports	5%
A few of the reports	12%
None of the Reports	3%

Typically, one person per household reads the HERs, though engaged households may have multiple readers. Twenty-four percent of survey respondents reported that someone else in their household had read the HERs. However, 94 percent of the participants who said someone else was reading reports said they themselves had read all or most of the reports. Thus, respondents’ accounts of how many HERs they had read were a good indication of the extent to which they were being read by others in the household.

The perceived relevance and a lack of time are the primary reasons customers do not read more of the reports. Those who indicated that they had not read all of the reports were asked why they chose not to read the HERs. Table 11-29 displays the reasons participants cited for not reading more of the HERs.

¹⁰⁷ Two respondents indicated they had not read any of the reports and were screened out from completing the rest of the survey.

Table 11-29: Reasons Participants Have Not Read More Reports

Answer	Percent (n = 31)
Prompted Responses – Selected All That Apply	
Do not have the time	29%
The suggested tips were not applicable to my home	29%
I did not find the information on the report to be valuable	16%
Not interested	13%
I did not find the information in the report to be accurate	13%
I don't know (Exclusive)	10%
Unprompted Responses – Open-end or “Other” Recommendations	
I accidentally deleted before reading	3%
I rent and therefore do not have control over implementation of the suggestions.	3%

Most survey respondents found the HER information on their home’s energy use easy to understand. Table 11-30 displays how participants rated the ease of understanding HERs information. The rated ease of understanding was positively related to reading more of the HERs. Among survey respondents who indicated they read all the reports, 90 percent reported the information was easy to understand compared to 10 percent who indicated they read only a couple reports.

Table 11-30: Rated Ease of Understanding HER Information

Answer	Percent (n = 72)
1 - Very difficult	0%
2	8%
3	11%
4	31%
5 - Very easy	49%
I don't know	1%

Survey respondents largely found the information on their home’s energy use to be accurate. Table 11-31 displays participants rated accuracy of the HERs. The 10 percent of respondents who said the HER information was inaccurate (rated as a 1 or 2 on a 5-point scale) provided some explanation for their rating (n=7). These respondents shared various feedback regarding their report accuracy. Four respondents indicated the

reports were not accurate as they were not being compared to similar homes (e.g., home size, type). Two noted their interest in the home comparison methodology. One did not clarify their rating of the accuracy of their reports.

Table 11-31: Rated Accuracy of HER Information

Answer	Percent (n = 72)
1 - Not at all accurate	4%
2	6%
3	17%
4	44%
5 - Very accurate	24%
I don't know	6%

Most respondents were satisfied with the reports and their various components.

Figure 11-3 displays HERs participant satisfaction with the various components and the reports overall. Eighteen percent of respondents indicated dissatisfaction with one or more aspects of their report. The survey offered these respondents an opportunity to provide recommendations on how to improve the information on the HERs and to comment on reasons for dissatisfaction with their reports. Five customers did not elaborate on their dissatisfaction or provide recommendations to improve the reports. Below are the suggestions provided by survey respondents:

- **Accuracy or level of detail:** Four respondents suggested that the reports should be more accurate or include additional information.
- **Other:** Four respondents provided other comments. These included sending the reports monthly, providing a bulleted list with summary information, ensuring the online portal saves and integrates inputted information, and discontinuing paper reports sent in the mail.

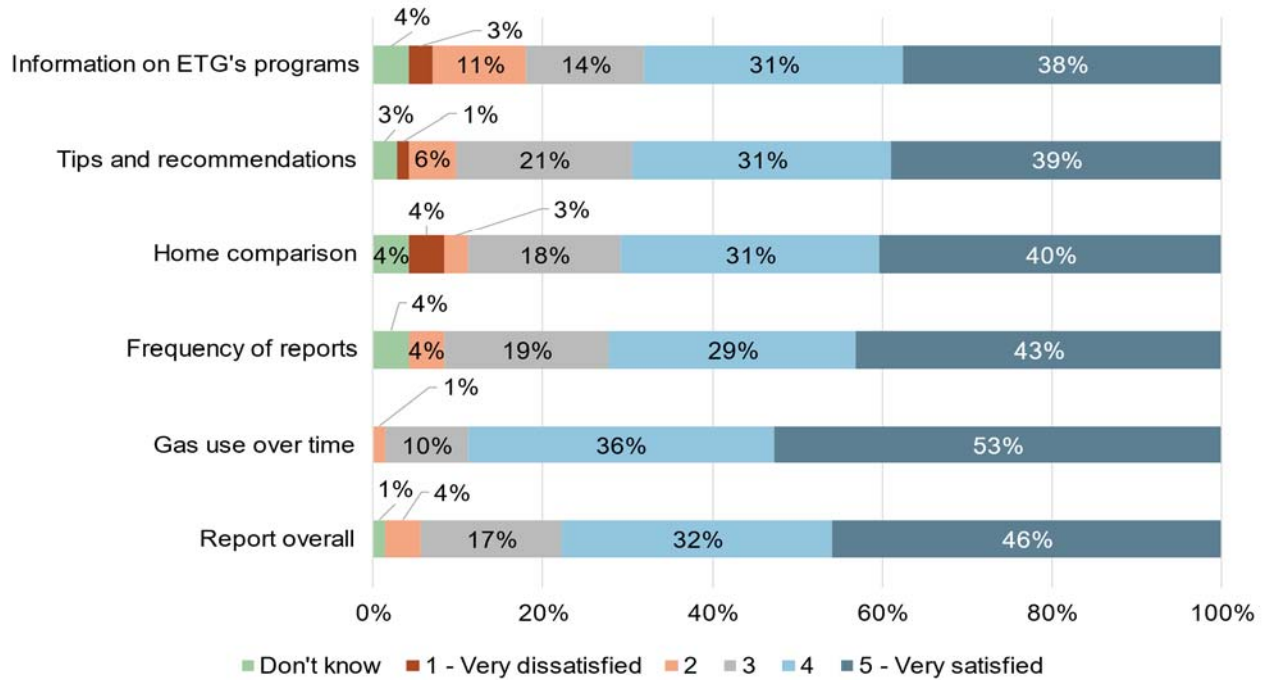


Figure 11-3: Satisfaction with HERs (n=72)

HERs participants rated the usage history and tip/recommendation sections as most valuable. Though more than half of participants rated each of the four sections as valuable, the tips/recommendations and usage history sections were generally perceived as more valuable (see Figure 11-4.)¹⁰⁸

¹⁰⁸ Rated the value of the sections a 4 or 5 on a scale from 1 (not at all valuable) to 5 (very valuable).

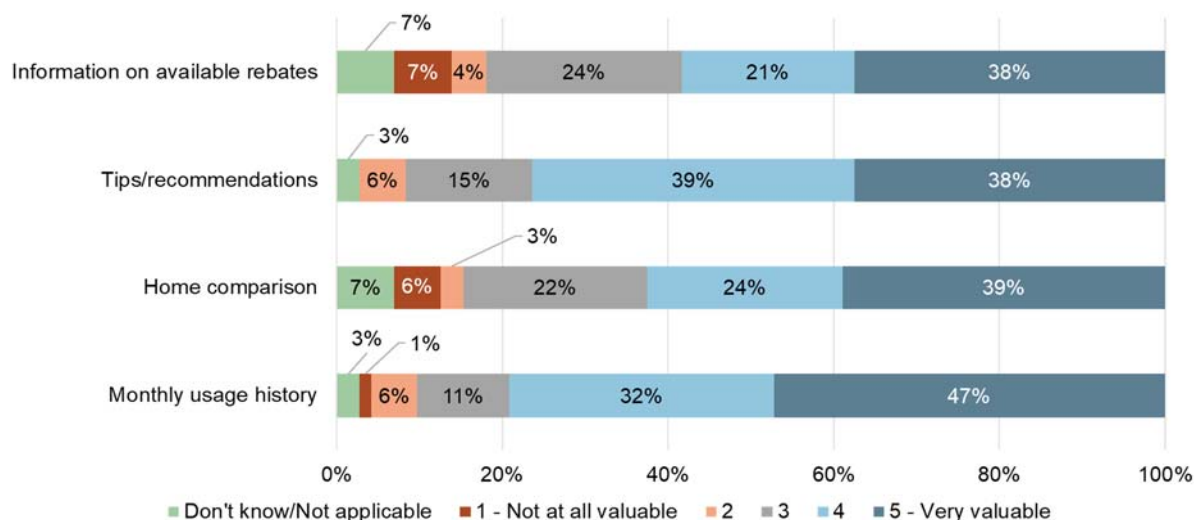


Figure 11-4: Perceived Value of HERs Sections (n=72)

HERs participants generally have not visited the online portal, primarily because they are unaware of it. One-third of participants recalled logging onto ETG’s online portal. Most of the customers that indicated logging onto the online portal indicated they agreed the website was easy to navigate and provided interesting, helpful, easy to understand information. Table 11-32 displays reasons customers noted for not having logged onto the portal.

Table 11-32: Primary Reason why Customers had not logged onto Portal

Reason	Percentage of Respondents (n = 48)
Prompted Responses – Selected All That Apply	
Was not aware of the portal	44%
Did not have the time to use the portal	21%
Did not think the portal would provide useful information	15%
Did not know how to access the portal	13%
I don't know (Exclusive)	19%
Unprompted Responses – Open-end or “Other” Recommendations	
Not interested in my energy use	2%
Experienced technical difficulties trying to access the portal	2%
Do not like having to access the portal to gain info on my home energy usage.	2%

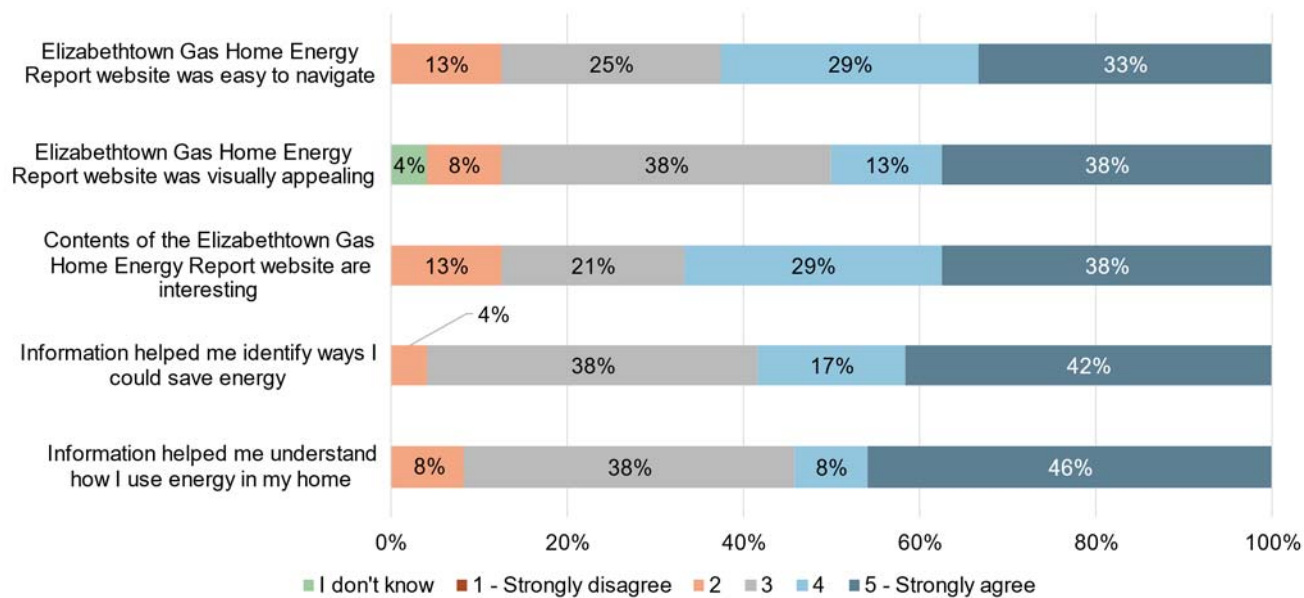


Figure 11-5: HER Participant Level of Agreement with Statements About Online Portal Experience (n=24)

Participants and non-participants had similar home characteristics (see Table 11-33 and Table 11-34). Participants and non-participants were asked about their home characteristics, including home ownership, home type, and year of construction. Most of the respondents owned a single-family home, with gas home and water heating. About three-quarters lived with one or two other people in their home.

Table 11-33: ETG HERs Survey Respondent Home Characteristics

Response	All Respondents (n = 145)	Participants (n = 72)	Non-participants (n = 73)
Home Ownership			
Rent	15%	15%	15%
Own	84%	83%	85%
Other (not specified)	0%	1%	0%
Home Type			
Single-family detached	64%	64%	64%
Duplex	6%	8%	4%
Triple decker	2%	1%	3%
Apartment/condo in a 2-4 unit building	6%	6%	7%
Apartment/condo in a 5+ unit building	8%	7%	8%
Townhouse or row house	13%	14%	12%
Don't know	1%	0%	1%
Year Home Was Built			

Response	All Respondents (n = 145)	Participants (n = 72)	Non-participants (n = 73)
Before 1960	39%	36%	42%
1960 to 1979	22%	26%	18%
1980 to 1999	19%	22%	16%
2000 to 2009	7%	4%	10%
2010 or later	7%	7%	7%
Don't know	6%	4%	7%
Number of members in household			
1	17%	19%	15%
2	40%	42%	38%
3	17%	13%	22%
4	18%	18%	18%
5	2%	1%	3%
6 or more	3%	6%	1%
Prefer not to say	2%	1%	3%
Home size			
Less than 1,000 square feet	6%	7%	5%
1,000-1,999 square feet	45%	43%	47%
2,000-2,999 square feet	23%	25%	22%
3,000-3,999 square feet	8%	8%	7%
4,000 or more square feet	2%	3%	1%
Don't know	0%	14%	18%

Table 11-34: ETG HERs Survey Respondent Home Characteristics, Continued

Response	All Respondents (n = 145)	Participants (n = 72)	Non-participants (n = 73)
Home heating type			
Electricity		7%	10% 4%
Natural gas		90%	89% 90%
Oil		1%	0% 3%
Don't know		2%	1% 3%
Water heating type			
Electricity		8%	11% 5%
Natural gas		87%	83% 90%
Oil		0%	84% 0%
Other (not specified)		1%	1% 0%
Don't know		4%	4% 4%

A larger portion of non-participants indicated that one or more members of their household was without a job or worked from home in the past 12 months. ADM asked respondents to indicate the number of household members that worked from home, worked outside the home, attended school from home, or went to school in person for one or more days per week, Monday through Friday, in the past 12 months. The findings were similar for non-participants and participants, though a larger portion of non-participants indicated having a member of their household work from home in the past 12 months. Also, a larger portion of non-participants indicated that one or more member of their household was without a job at some point during the past 12 months (see Figure 11-6).

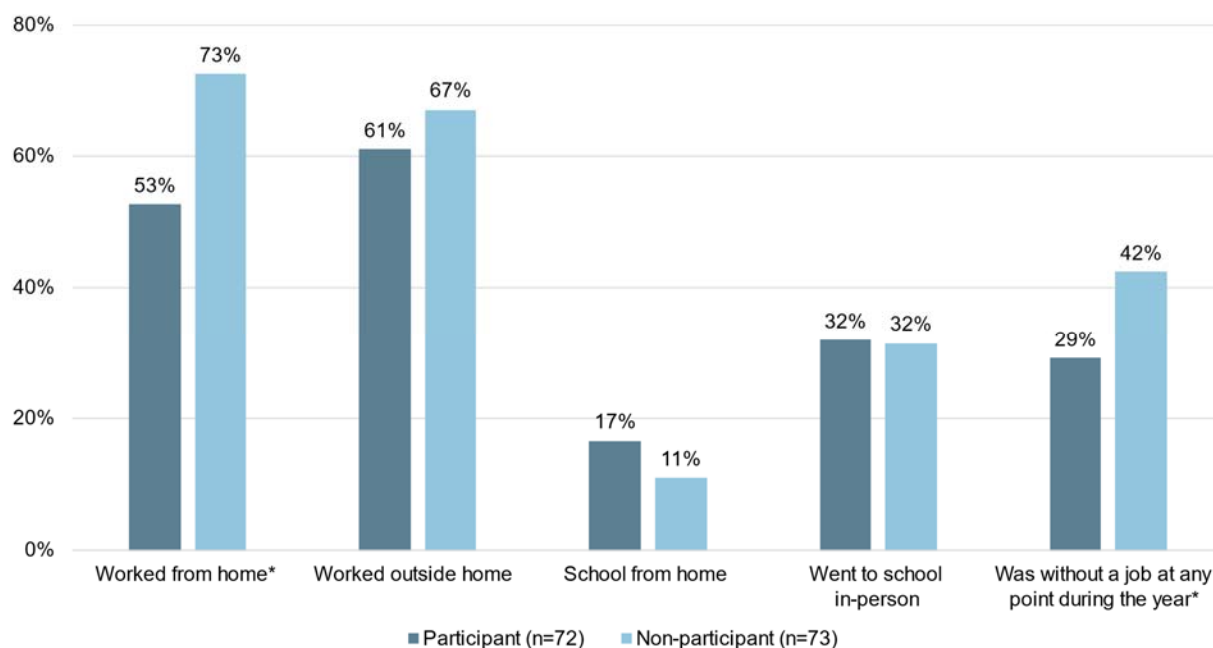


Figure 11-6: Home Occupancy Characteristics

Demographic characteristics were similar for the participants and non-participants. Participants and non-participants were asked about their age, income, primary language spoken in their home, income, and race/ethnicity (see Table 11-35).

Table 11-35: ETG HERs Survey Respondent Demographics

Response	All Respondents (n = 145)	Participants (n = 72)	Non-participants (n = 73)
Age			
Under 35 years old	4%	1%	7%
35-55 years old	32%	32%	32%
Over 55 years old	60%	63%	58%
Prefer not to answer	4%	4%	4%
Primary Language			
English	92%	90%	93%
Spanish	3%	6%	1%
Chinese	1%	1%	0%
Hindi	1%	1%	1%
Portuguese	1%	0%	1%
Prefer not to answer	2%	1%	3%
Race/Ethnicity			
Black or African American	6%	4%	8%
Hispanic or Latino/Latina	10%	13%	8%
American Indian and Alaska Native	0%	0%	0%
Asian	10%	11%	10%
White	68%	68%	67%
Prefer not to answer	10%	11%	10%
Income			
Under 250% FPL	19%	24%	14%
Between 250-400% FPL	14%	17%	11%
Over 400% FPL	41%	36%	47%
Don't know	2%	1%	3%
Prefer not to answer	24%	22%	26%

Respondents tended to be older, speak English as their primary language, and identified as white. About 41 percent indicated their household income was more than 400 percent of the federal poverty level and 19 percent said their household income was less than 250 percent of the FPL. In comparison, using Census Bureau data the Evaluator estimates that about 27 percent of households served by ETG have incomes under 250 percent of FPL.

Table 11-36: ETG HERs Survey Respondent Demographics

Response	All Respondents (n = 145)	Participants (n = 72)	Non-participants (n = 73)
Age			
Under 35 years old	4%	1%	7%
35-55 years old	32%	32%	32%
Over 55 years old	60%	63%	58%
Prefer not to answer	4%	4%	4%
Primary Language			
English	92%	90%	93%
Spanish	3%	6%	1%
Chinese	1%	1%	0%
Hindi	1%	1%	1%
Portuguese	1%	0%	1%
Prefer not to answer	2%	1%	3%
Race/Ethnicity			
Black or African American	6%	4%	8%
Hispanic or Latino/Latina	10%	13%	8%
American Indian and Alaska Native	0%	0%	0%
Asian	10%	11%	10%
White	68%	68%	67%
Prefer not to answer	10%	11%	10%
Income			
Under 250% FPL	19%	24%	14%
Between 250-400% FPL	14%	17%	11%
Over 400% FPL	41%	36%	47%
Don't know	2%	1%	3%
Prefer not to answer	24%	22%	26%

Survey respondents generally endorsed positive beliefs and attitudes about energy efficiency, with similar attitudes among participants and non-participants. The portion of nonparticipants and participants that endorsed beliefs was similar and the evaluator did not find statistically significant differences for seven of nine attitude questions.

There was one question that had a statistically significant difference, with the participant group having a higher proportion of respondents agreeing that they were not very concerned about the amount of energy used in their home.

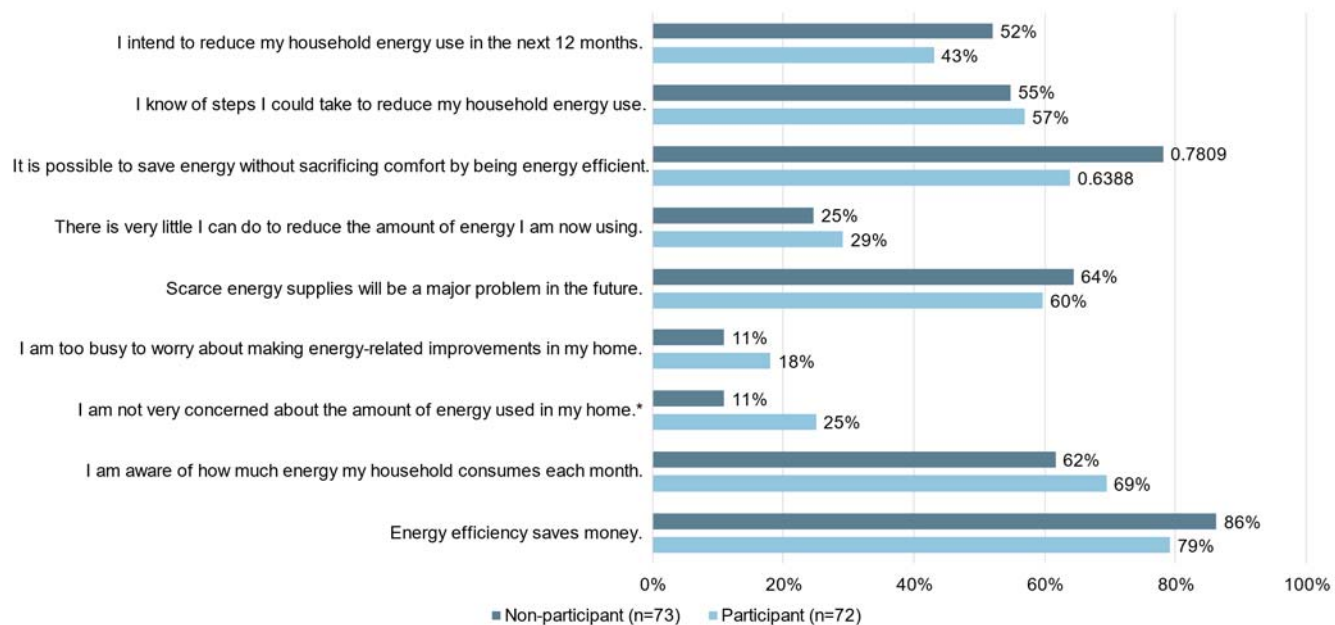


Figure 11-7: Agreement on Energy Efficiency Belief and Attitude Statements¹⁰⁹

The portion of non-participants and participants that indicated buying one or more energy efficiency items in the past 12 months was similar. Sixty percent of HERs recipients reported they had installed one or more energy saving products in the past 12 months; this was similar to non-participant respondents. The portion of non-participants that indicated making six or more energy saving purchases in the past 12 months was higher than the portion of the participant group. Further, non-participants reported installing energy efficient doors, and ENERGY STAR® clothes washers at a higher rate than participants. Fifty-nine percent of HERs participants that read most or all reports reported purchasing energy efficient products compared to 38 percent of HERs participants that said they read them half the time or less often, however this difference was not statistically significant.

¹⁰⁹ Figure displays agreement as defined with a rating of 7 or higher on scale from 0 (strongly disagree) to 10 (strongly agree). ADM compared the proportions with two proportion z-tests. Reported differences are significant with an alpha of 0.05 using a two-tailed p value.

Table 11-37: Comparison of Participants and Non-participants on Energy-Saving Purchases

	Participants (n = 72)	Non-participants (n = 73)
Bought one or more energy efficiency items	60%	56%
Number of Items Bought – All Respondents		
None	40%	44%
1 to 5	58%	45%
6 or more*	1%	11%

Table 11-38: Installation of Energy Efficient Items/Products in Past 12 Months by Participants and Non-participants

Measure	Participants (n = 72)	Non-participants (n = 73)
Smart thermostat (e.g., Nest, Lyric, Ecobee, Sensi)	22%	16%
Energy efficient windows	14%	16%
ENERGY STAR® gas water heater	14%	14%
ENERGY STAR® dishwasher	13%	19%
ENERGY STAR® clothes washer*	13%	21%
ENERGY STAR® clothes dryer	10%	23%
Low flow showerheads	8%	19%
Water heater pipe insulation	7%	11%
Low flow faucet aerators	7%	4%
Attic, floor, or wall insulation	6%	10%
ENERGY STAR® furnace	4%	11%
ENERGY STAR® boiler	4%	1%
Energy efficient doors*	3%	12%
ENERGY STAR® heat pump water heater	0%	3%
ENERGY STAR® heat pump	0%	3%

Participants and non-participants indicated taking one-time energy saving actions at similar rates. The Evaluator asked respondents if they had completed any of eight one-time energy saving actions that have been suggested to ETG HER recipients. Fifteen percent of respondents (both participants and non-participants) said they had not taken any of the recommended one-time actions. The Evaluator compared the number of one-

time actions taken by customers who had read most or all the reports versus those that read half of the reports or fewer but found no statistically significant differences.

Barriers to additional energy saving actions and purchases may include a lack of knowledge about the steps to take and awareness about household energy use.

Responses to the level of agreement questions regarding energy attitudes and behaviors indicated that these factors were barriers. Though more than half of respondents agreed that they know of steps they can take to save energy and were aware of how much energy they use, more than 20 percent did not (see Figure 11-8). Survey findings also indicate being too busy to make energy-related improvements and not being concerned about energy use may also be barriers, though to a lesser extent.

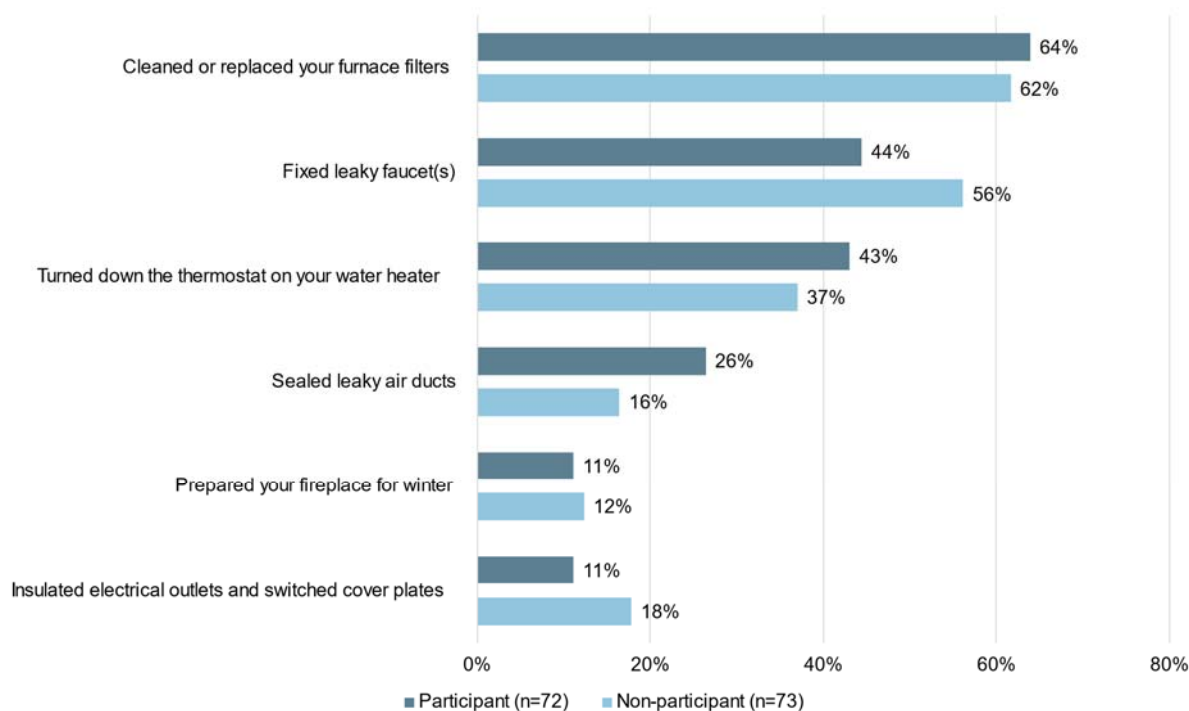


Figure 11-8: One-time energy saving actions taken in past 12 months

Most customers have created an online account on the Elizabethtown Gas website.

Overall, 68 percent of customers said they had created an account on the ETG website. Engagement with the website was similar across the HERs participants and non-participants (65 percent participant, 71 percent non-participant). Reasons customers had not created an online account varied, though nearly half of these customers cited a general lack of interest (26 percent) or the perception that it would not provide valuable or interesting information (22 percent). The customers who indicated technical difficulties noted challenges setting their account up and having website connection issues.

Table 11-39: Reasons Customers Had Not Created Online Account

Reason	Participants (n = 46)
I didn't know about it	26%
I have concerns about internet privacy	22%
I don't think it would provide valuable or interesting information	22%
I don't know how to	9%
Technical difficulties	4%
Reason not specified (write-in)	2%
General lack of interest (write-in)	26%

Participants and non-participants reported taking routine energy saving actions at similar rates. The Evaluator asked HERs participants about up to four routine energy saving actions that they had been recommended through the reports and asked non-participants about 10 routine energy saving actions that were included in HERs tracking data. The portion of respondents who indicated they took these actions most or all of the time was similar, comparing the participants and non-participants.

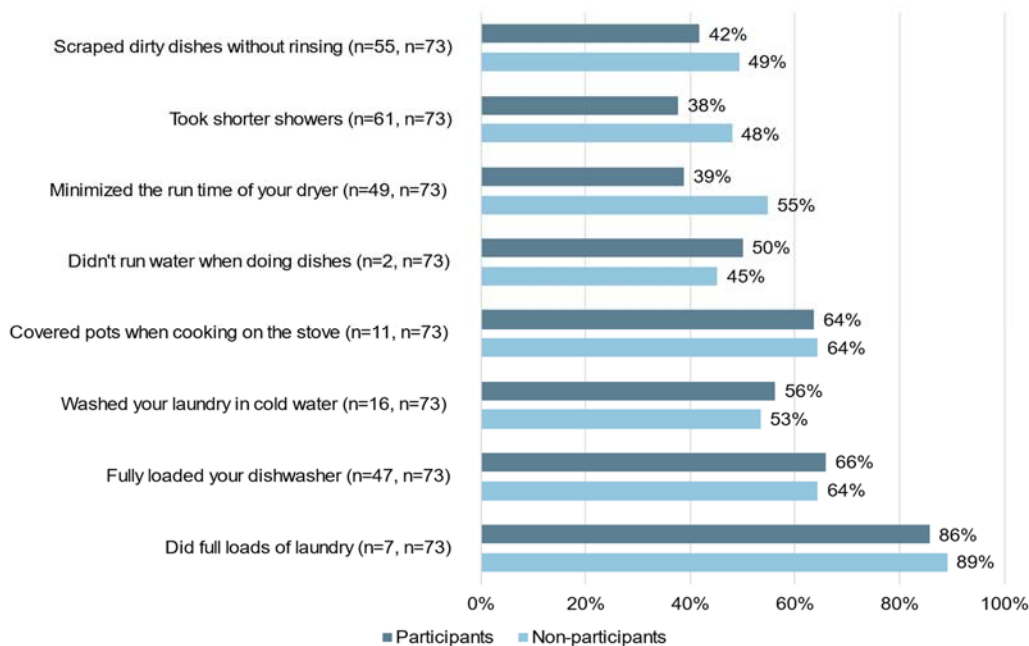


Figure 11-9: Routine energy saving actions taken in past 12 months¹¹⁰

HERs participants indicated that the reports were important in their decision to take steps to save energy and buy energy efficient products. The Evaluator asked participants to rate the importance of the HERs on their decision to take new steps to save energy and purchase energy efficient appliance(s) and/or equipment. Sixty-nine percent of participants that read most or all reports said the reports were important in their purchase (n=58) compared to 38 percent of those who read a few or about half of the reports (n=8). The Evaluator did not note a relationship between the reported number of reports read and importance participants assigned to the HERs on energy saving actions taken.

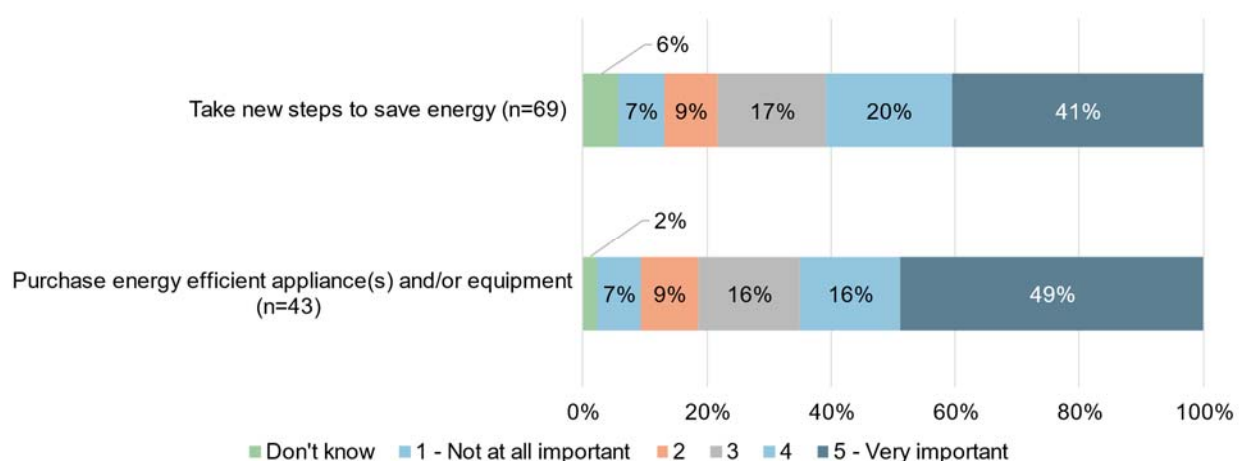


Figure 11-10: Importance of HERs on Participant Energy Saving Actions and Purchases

11.5 Conclusions and Recommendations

Conclusion: HER Program verified annual savings of 630,407 Therms for PY1 are positive and statistically significant for both Legacy waves.

- All the evaluated waves had valid control groups for each program year which suggests that the creation of the original RCT waves by the implementer was done in accordance with industry standards.
- All evaluated waves displayed average annual gas savings between 0.5 percent and 0.6 percent of annual billed use in PY1. Typical behavioral programs display average annual gas savings between 0.25 percent and 2 percent.

¹¹⁰ Figure displays portion of respondents who indicated taking these actions all or most of the time. Respondents were asked “How often in the last 12 months had you thought about or done the following?” and given six options (never considered, considered, done sometimes, done most of the time, done all the time and not applicable to my home).

- Downstream and upstream double counted savings were 314 Therms for PY1. The double counted savings were removed from the estimated savings from the regression results. The double counted savings represent 0.05 percent of program savings before double counting, therefore, the impact on final program savings is relatively small.
- The total attrition for the program since inception is 26 percent for the treatment group and 25 percent for the control group. In addition, the annual attrition rate in PY1 is roughly 7 percent across waves for both the treatment and control groups.

Recommendation: **Save and store historical billing data for all customers in each wave to ensure future analyses** will have one year of billing data prior to the RCT start date for each customer, as well as complete billing data after the intervention.

Conclusion: **Ten percent of customers in Wave 2 did not receive any HERs reports**, which may indicate a data issue either in recording HERs report type or in obtaining customer contact information.

Recommendation: **Investigate why 10 percent of treatment customers in Wave 2 are recorded as not receiving either paper or email HERs reports.** If customer contact information can be obtained for some of these customers, program savings will likely increase.

Conclusion: **Most participant survey respondents reported receiving paper reports and reading all or most of them.** Eighty-one percent of participants said they received paper reports, while 43 percent said they received email reports. Seventy-nine percent of participants said they read most or all the reports.

Recommendation: **Continue to promote the online portal to increase customer awareness and engagement.** HERs participants that had engaged with the portal generally found it interesting, helpful, and easy to navigate. However, two-thirds of participants did not recall logging onto the online portal, indicating an opportunity to increase engagement.

Conclusion: **A measure life greater than 1 year was assumed for PY1, care must be taken by ETG to not double count savings in consecutive years.**

Recommendation: **Assume a 1 year measure life for ongoing HERs programs or change the cohorts each year to claim a longer measure life for savings.**

11.6 Barriers

The perceived relevance and a lack of time are the primary reasons customers do not read more of the reports. Participants often cited lack of time, tips not being applicable, and information not being valuable as reasons they did not read more of the reports.

Barriers to additional energy saving actions and purchases may include a lack of knowledge about the steps to take and awareness about household energy use.

Responses to the level of agreement questions regarding energy attitudes and behaviors indicated that these factors were barriers, as well as being too busy to make energy-related improvements and not being concerned about energy though to a lesser extent.

HERs participants generally have not visited the online portal, primarily because they are unaware of it. One-third of participants recalled logging onto ETG's online portal.

11.7 Evaluability Recommendations

The data for this program supported an enhanced, industry standard billing regression M&V approach in PY1. The Evaluators found the control and treatment tracking data, utility billing data, program documentation, and customer contact information to be complete and was provided quickly by the program implementation contractor.

11.8 Research Questions for PY2

The Evaluator noted additional data collection in PY2 would be required to continue to develop understanding of program design and barriers to program success. Specifically, the Evaluator noted opportunities to answer the following research questions more fully:

- What are control group customers' sources of information about how to reduce energy?
- What do the control group customers think of the information provided in those sources? How easy was it to understand? How useful was it?
- How much are control group customers aware of their current energy use?
- What actions have control group customers taken to save energy? What has kept them from taking other recommended actions? What might induce them to take additional recommended actions?
- Are treatment customers experiencing HERs fatigue after several years of reports?
- Are the HERs advertisements for the other programs noticed and working?

11.9 Survey

Client: SJIU
 Program: Home Energy Reports Program
 Group: Participants and Control
 Mode: Email

RESEARCH OBJECTIVES

Evaluation Question	Survey Question
What are the end user experiences throughout the program?	Q1- Q23
Are the customers satisfied with the HERs they receive through the program? What are any causes of dissatisfaction?	Q22
What actions have treated customers taken to save energy?	Q8-Q17
How did behaviors and efficient practices differ between the treatment and control groups?	Q8-Q17, Q27-Q36
Were treatment customers inspired to participate in other program offerings? If not, why – are there specific barriers?	Q15-Q17
What barriers might have prevented them from taking recommended actions and what might remove those barriers?	Q4-Q23
Are there ways in which the HERs or other program offerings could be improved to encourage customers to take additional steps towards being more energy efficient?	Q23, Q42
Did treated customers notice and read the reports? How many and how thoroughly?	Q1-Q6
What did the treated customers think of the information provided? How easy was it to understand? What, if anything, was not easy to understand or did not make sense?	Q18- Q23
How much are treated customers aware of their current energy use?	Q40
Was information on their home’s energy use accurate and up to date? If they think it wasn’t, what did they disagree with and why?	Q19-Q20
How useful was the energy saving information provided? What would have made it more useful?	Q21-Q23
How much do treated customers use other engagement tools (e.g., customer portals and incentives)?	Q40
What would they change about how, or how often, the reports were delivered?	Q22-Q23
What are the demographics and home characteristics of treatment and control group customers?	Q42-Q53

PREDEFINED VARIABLES

Prepopulated variables are shown in all caps enclosed in brackets, e.g., [PREDEFINED VARIABLE]

Variable	Definition
GROUP	1 = Treatment 0 = Control
ROUTINE1/2/3/4/5	Routine energy saving recommendation sent to customer

PARTICIPANT EMAIL SURVEY MESSAGE

Subject: Help Improve [UTILITY]'s Energy Efficiency Programs

Reply To: adm-surveys@admenergy.com

From Name: [UTILITY]

[UTILITY] is interested in your feedback about the Home Energy Reports it sends you through email or the mail. Your reports contain information about your home energy use and tips for saving energy. Your responses will be kept anonymous and confidential.

Click here to provide feedback: [SURVEY LINK]

We would greatly appreciate your taking a few minutes to provide your feedback. If you have questions or require technical assistance, please respond to this email or contact us at adm-surveys@admenergy.com.

If you wish to no longer receive emails about this survey, please click on the "Unsubscribe" link below. Thank you in advance for your time!

Kind Regards,

ADM Associates / Contractor to [UTILITY]

CONTROL EMAIL SURVEY MESSAGE

Subject: Help Improve [UTILITY]'s Energy Efficiency Programs

Reply To: adm-surveys@admenergy.com

From Name: [UTILITY]

[UTILITY] is interested in your feedback to help them improve their services. We would greatly appreciate your taking a few minutes to provide your feedback. Your responses will be kept anonymous and confidential.

Start Survey: [SURVEY LINK]

If you have questions or require technical assistance, please respond to this email or contact us at adm-surveys@admenergy.com.

If you wish to no longer receive emails about this survey, please click on the "Unsubscribe" link below. Thank you in advance for your time!

Kind Regards,

ADM Associates / Contractor to [UTILITY]

SCREENING

[DISPLAY BLOCK IF GROUP = 1]

1. Do you recall receiving Home Energy Reports like the one below from [UTILITY]? They include information about your home energy use and tips on how you can save energy. You would have received them either by email or mail.

[INSERT EXAMPLE HOME ENERGY REPORT]



1. Yes
 2. No [THANK AND TERMINATE SURVEY]
2. How did you receive your Home Energy Reports? [MULTI-SELECT]
 1. Paper copies in the mail
 2. Email
 3. I did not receive any Home Energy Report [TERMINATE SURVEY]
 98. I don't know [TERMINATE SURVEY]
 3. About how many Home Energy Reports do you recall receiving in the last 12 months? Your best guess is fine. [NUMERIC VALUE]
[OPEN-ENDED]

4. How often did you read the Home Energy Reports in the last 12 months?
1. I read all the reports
 2. I read most of the reports
 3. I read about half of the reports
 4. I read a few of the reports
 5. I haven't read any of the reports
 98. I don't know

[DISPLAY Q5 IF Q4 = 2, 3, 4, OR 5]

5. Why didn't you read more of the Home Energy Reports? **[MULTI-SELECT] [RANDOMIZE 1-5]**
1. Do not have the time
 2. Not interested
 3. The suggested tips were not applicable to my home
 4. I did not find the information on the report to be valuable
 5. I did not find the information in the report to be accurate
 6. I didn't understand them
 7. I can't read English
 96. Other (Please specify) **[OPEN-ENDED]**
 98. I don't know
6. Has anyone else in your household read the reports?
1. Yes
 2. No
 97. Not applicable
 98. I don't know

[DISPLAY Q7 AND TERMINATE IF Q6=1 AND Q4=5]

7. Could you please provide contact information for the person who reads the reports?
1. Name: **[OPEN-ENDED]**
 2. Email address: **[OPEN-ENDED]**
 97. Prefer not to say
 98. I don't know

ENERGY EFFICIENCY BEHAVIORS- PARTICIPANTS

[DISPLAY BLOCK IF GROUP = 1]

8. How often in the last 12 months had you thought about or done the following? **[INSERT OPTIONS DEFINED AS 1=NEVER CONSIDERED, 2=CONSIDERED, 3=DONE SOMETIMES, 4=DONE MOST OF THE TIME, 5=DONE ALL THE TIME, 97 = THIS IS NOT APPLICABLE TO MY HOME] [RANDOMIZE RESPONSES]**

1. [ROUTINE1]
2. [ROUTINE2]
3. [ROUTINE3]
4. [ROUTINE4]
5. [ROUTINE5]

9. Did you take any of the following actions to save energy in the past 12 months? (Please select all that apply) **[MULTI-SELECT] [RANDOMIZE RESPONSES]**

1. Turned down the thermostat on your water heater
2. Fixed leaky faucet(s)
3. Sealed leaky air ducts
4. Insulated electrical outlets and switched cover plates
5. Prepared your fireplace for winter
6. Cleaned or replaced your furnace filters
7. None of the above **[EXCLUSIVE]**

10. Did you install any of these energy saving products in the past 12 months? (Please select all that apply) **[MULTI-SELECT] [RANDOMIZE RESPONSES]**

1. Smart thermostat (e.g., Nest, Lyric, Ecobee, Sensi)
2. Energy efficient windows
3. Energy efficient doors
4. Attic, floor or wall insulation
5. Water heater pipe insulation
6. Low flow faucet aerators
7. Low flow showerheads
8. ENERGY STAR® dishwasher
9. ENERGY STAR® clothes dryer
10. ENERGY STAR® clothes washer
11. ENERGY STAR® heat pump water heater
12. ENERGY STAR® gas water heater
13. ENERGY STAR® furnace
14. ENERGY STAR® heat pump
15. ENERGY STAR® boiler
16. None of the above **[EXCLUSIVE]**

[DISPLAY Q11 IF Q10=13]

11. What type of fuel does your new furnace use?

1. Natural gas
2. Electricity
3. Propane

- 4. Oil
- 98. I don't know

[DISPLAY Q12 IF Q18=11. 12. 13, 14. 15]

12. What did the appliance that you replaced with the [Q18 RESPONSE] use for fuel?
- 1. Natural gas
 - 2. Electricity
 - 3. Propane
 - 4. Oil
 - 98. I don't know

[DISPLAY Q13 FOR EACH Q10 RESPONSE EXCEPT 4 AND 5]

13. How many [Q10 RESPONSE] did you purchase in the last 12 months?

[OPEN-ENDED]

[DISPLAY Q14 IF FOR EACH Q10 RESPONSE EXCEPT 4 AND 5]

14. Of those [Q10 RESPONSE] you purchased, how many are currently installed?

[OPEN-ENDED]

[DISPLAY Q15 IF Q10 = 1, 6, 7, 9, 10, 11, 12]

15. Did you get a [UTILITY] rebate or discount for the [ANSWER Q10]?
- 1. Yes
 - 2. No
 - 98. I don't know

[DISPLAY Q16 IF Q15 = 2]

16. Why didn't you apply for the rebate?
- 1. I didn't know a rebate was available
 - 2. I had trouble with the application process
 - 96. Other (Please specify)
 - 98. I don't know

[DISPLAY Q17 IF Q10<>16 OR ANY Q8 = 3, 4, OR 5 OR Q9<>7]

17. How important was the information on your Home Energy Reports when you decided to... **[INSERT 1-5 SCALE AS DEFINED 1=NOT AT ALL IMPORTANT TO 5=VERY IMPORTANT, WITH 98 = I DON'T KNOW]**
- 1. **[DISPLAY IF ANY Q10 = 3, 4, OR 5 OR Q9<>7]** Take new steps to save energy

2. **[DISPLAY IF Q10 <> 13]** Purchase energy efficient appliance(s) and/or equipment.

HOME ENERGY REPORTS

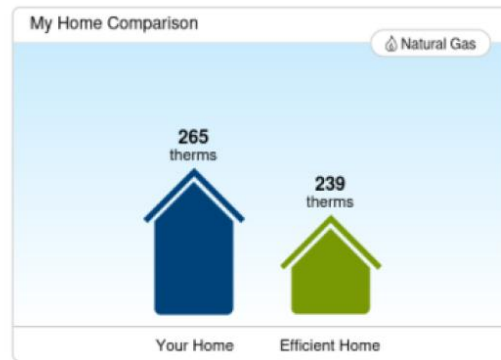
[DISPLAY BLOCK IF GROUP = 1]

18. Using the scale below, please rate how easy or difficult it is to understand the information in your Home Energy Report. **[INSERT 1-5 SCALE, WHERE 1 = VERY DIFFICULT AND 5 = VERY EASY, WITH 98=I DON'T KNOW]**
19. How accurate do you believe the information in your Home Energy Report is about your home energy usage? **[INSERT 1-5 SCALE AS DEFINED 1=NOT AT ALL ACCURATE AND 5=VERY ACCURATE, WITH 98 = I DON'T KNOW]**

[DISPLAY Q20 IF Q19 < 3]

20. What do you think is inaccurate in your Home Energy Report?
[OPEN-ENDED]
21. How valuable are the following types of information included in your Home Energy Report? **[RANDOMIZE ORDER, INSERT 1-5 SCALE AS DEFINED IS 1=NOT AT ALL VALUABLE TO 5=VERY VALUABLE, WITH 97 = NOT APPLICABLE AND 98 = I DON'T KNOW]**

How am I doing this month?

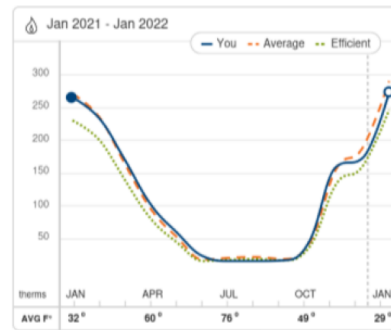


*Who am I being compared to?

🏠 Group Size	🏠 Square Footage	🏠 Year Built
1,537 Homes	1,190-1,790	1929-1939

1. Home comparison

Your natural gas use over time



2. Natural gas use over time



Get Appliance Rebates up to \$300

Save energy and money in your home when you upgrade to ENERGY STAR® certified clothes washers and gas dryers. You may be eligible to receive a rebate for up to \$100 on the purchase of a clothes washer, and up to \$200 on the purchase of an eligible gas dryer when you apply through the Appliance Rebate Program exclusively for active ETG residential customers.

[Learn More](#)

3. Information on available rebates

How can I save more?



Every little bit helps

Scrape, don't rinse your dirty dishes

When loading your dishwasher, try to avoid using water to rinse off leftover food. Even though most people pre-rinse their dishes, this is largely unnecessary because modern dishwashers are very good at their job. So just use a utensil to scrape off the large pieces of food and let the dishwasher do the rest!

4. Tips/recommendations

22. Please rate your satisfaction with the following: [, **INSERT 1-5 SCALE AS DEFINED 1=VERY DISSATISFIED AND 5=VERY SATISFIED, WITH 98 = I DON'T KNOW**]

1. Home comparison
2. Gas use over time
3. Information on [UTILITY]'s programs
4. Tips and recommendations
5. Frequency of reports
6. Report overall

[DISPLAY Q23 IF ANY ROW IN Q22 <3]

23. How could we improve the Home Energy Report?
[OPEN-ENDED]

24. [UTILITY] offers its customers access to an online portal where you can see your home's energy usage along with insights and tips. In the past 12 months, have you accessed this online portal?

1. Yes, I visited the portal within the last 30 days
2. Yes, I visited the portal more than 30 days ago
3. No, I do not recall visiting the portal

[DISPLAY Q25 IF Q24= 3]

25. Why haven't you visited the online portal? (Please select all that apply)
[MULTISELECT]

1. Was not aware of the portal
2. Not interested in my energy use
3. Did not know how to access the portal
4. Did not think the portal would provide useful information
5. Did not have the time to use the portal
6. Experienced technical difficulties trying to access the portal
96. Other (Please describe)
98. I don't know **[EXCLUSIVE]**

[DISPLAY Q26 IF Q24 = 1 OR 2]

26. Using the scale below, how much do you agree or disagree with the following statements about the portal? **[SCALE: 1 = 1 (Strongly disagree), 2 = 2, 3 =3, 4 = 4, 5 = 5 (Strongly agree), 98 = Don't know]**

1. The [UTILITY] Home Energy Report website was easy to navigate
2. The information helped me understand how I use energy in my home
3. The information helped me identify ways that I could save energy
4. The contents of the [UTILITY] Home Energy Report website are interesting
5. The [UTILITY] Home Energy Report website was visually appealing

ENERGY EFFICIENCY BEHAVIORS- CONTROL GROUP

[DISPLAY BLOCK IF GROUP = 0]

27. How often in the last 12 months had you thought about or done the following? **[INSERT OPTIONS DEFINED AS 1=NEVER CONSIDERED, 2=CONSIDERED, 3=DONE SOMETIMES, 4=DONE MOST OF THE TIME, 5=DONE ALL THE TIME, 97 = THIS IS NOT APPLICABLE TO MY HOME]**

1. Used the correct burner size when cooking
2. Did full loads of laundry
3. Fully loaded your dishwasher
4. Maintained your heating and cooling systems
5. Washed your laundry in cold water
6. Covered pots when cooking on the stove
7. Didn't run water when doing dishes
8. Minimized the run time of your dryer
9. Took shorter showers
10. Scraped dirty dishes without rinsing

28. Did you take any of the following actions to save energy in the past 12 months? (Please select all that apply) **[MULTI-SELECT]**

1. Turn down the thermostat on your water heater
2. Fix leaky faucet(s)
3. Seal leaky air ducts
4. Insulate electrical outlets and switch cover plates
5. Prepare your fireplace for winter
6. Clean or replace your furnace filters
7. None of the above **[EXCLUSIVE]**

29. Did you install these or any other energy saving products in the past 12 months? (Please select all that apply) **[MULTI-SELECT]**

1. Smart thermostat (e.g., Nest, Lyric, Ecobee, Sensi)
2. Energy efficient windows
3. Energy efficient doors
4. Attic, floor or wall insulation
5. Water heater pipe insulation
6. Low flow faucet aerators
7. Low flow showerheads
8. ENERGY STAR® dishwasher
9. ENERGY STAR® clothes dryer
10. ENERGY STAR® clothes washer
11. ENERGY STAR® heat pump water heater
12. ENERGY STAR® gas water heater
13. ENERGY STAR® furnace
14. ENERGY STAR® heat pump
15. ENERGY STAR® boiler
16. None of the above **[EXCLUSIVE]**

[DISPLAY Q30 IF Q29=13]

30. What type of fuel does your new furnace use?

1. Natural gas
2. Electricity
3. Propane
4. Oil
98. I don't know

[DISPLAY Q31 IF Q29=11. 12. 13, 14. 15]

31. What did the appliance that you replaced with the [Q18 RESPONSE] use for fuel?

1. Natural gas
2. Electricity
3. Propane
4. Oil
98. I don't know

[DISPLAY Q32 FOR EACH Q28 RESPONSE]

32. How many [Q28 RESPONSE] did you purchase in the last 12 months?

[OPEN-ENDED]

[DISPLAY Q33 IF FOR EACH Q28 RESPONSE]

33. Of those [Q28 RESPONSE] you purchased, how many are currently installed?

[OPEN-ENDED]

[DISPLAY Q34 IF Q28 = 1, 6, 7, 9, 10, 11, 12]

34. Did you get a [UTILITY] rebate or discount for the [Q28 RESPONSE]?

1. Yes
2. No
98. I don't know

[DISPLAY Q35 IF Q34 = 2]

35. Why didn't you apply for the rebate?

1. I didn't know a rebate was available
2. I had trouble with the application process
96. Other (Please specify)
98. I don't know

[DISPLAY Q36 IF Q27 = 1 OR Q28 <> 20]

36. How important was any information provided by [UTILITY] when you decided to... **[INSERT 1-5 SCALE, 1 = NOT AT ALL IMPORTANT AND 5**

= VERY IMPORTANT, WITH 98 = I DON'T KNOW AND 99 = NOT APPLICABLE]

1. [DISPLAY IF Q27 = 1] Take new steps to save energy
2. [DISPLAY IF Q28 <> 7 AND Q29<>10] Purchase energy efficient appliance(s) and/or equipment.

ENERGY ATTITUDES & BEHAVIORS - BOTH GROUPS

37. Have you created an online account on the [UTILITY] website?

1. Yes
2. No
98. I don't know

[DISPLAY Q38 IF Q37=2 OR 98]

38. Why haven't you created an online account on the [UTILITY] website?
Please select all that apply.

1. I didn't know about it
2. I don't know how to
3. I have concerns about internet privacy
4. I don't think it would provide valuable or interesting information
5. Technical difficulties
96. Other **[OPEN-ENDED]**

[DISPLAY Q39 IF Q38=5]

39. What kind of technical difficulties did you have?
[OPEN-ENDED]

40. How much do you agree or disagree with the following statements?
[INSERT 0-10 SCALE 0 = STRONGLY DISAGREE, 10 = STRONGLY AGREE, WITH 98 = I DON'T KNOW] [RANDOMIZE 1-7]

1. Energy efficiency saves money.
2. I am aware of how much energy my household consumes each month.
3. I am not very concerned about the amount of energy used in my home.
4. I am too busy to worry about making energy-related improvements in my home.
5. Scarce energy supplies will be a major problem in the future.
6. There is very little I can do to reduce the amount of energy I am now using.
7. It is possible to save energy without sacrificing comfort by being energy efficient.
8. I know of steps I could take to reduce my household energy use
9. I intend to reduce my household energy use in the next 12 months

HOME OCCUPANCY

41. For each of the following please enter the number of people in your household who did each of the following in the past 12 months.

	# of people
Worked from home (at least one full day a week, M-F)	
Worked outside home (at least one full day a week, M-F)	
School from home (at least one full day a week, M-F)	
Went to school in person (at least one full day a week, M-F)	
Was without a job at any point during the year	

DEMOGRAPHICS

42. Do you rent or own your home?

1. Rent
2. Own
96. Other (Please specify) **[OPEN-ENDED]**

43. Which of the following best describes your home?
1. Single-family
 3. Duplex
 4. Triple decker (e.g., three story house with each floor being a separate unit)
 5. Apartment/condo in a 2-4 unit building
 6. Apartment/condo in a 5+ unit building
 7. Townhouse or row house (adjacent walls to another house)
 8. Mobile home or trailer
 96. Other (Please specify) **[OPEN-ENDED]**
 98. I don't know
44. When was your home built?
1. Before 1960
 2. 1960-1979
 3. 1980-1999
 4. 2000-2009
 5. 2010 or later
 98. I don't know
45. About how many square feet is your home? If you are unsure, an estimate is OK.
1. Less than 1,000 square feet
 2. 1,000-1,999 square feet
 3. 2,000-2,999 square feet
 4. 3,000-3,999 square feet
 5. 4,000-4,999 square feet
 6. 5,000 or greater square feet
 98. I don't know
46. What is the main fuel used for heating your home?
1. Electricity
 2. Natural Gas
 3. Propane
 4. Oil
 96. Other (Please Specify) **[OPEN-ENDED]**
 98. I don't know

47. What fuel does your main water heater use?

1. Electricity
2. Natural Gas
3. Propane
4. Oil
97. Other (Please Specify) **[OPEN-ENDED]**
98. I don't know

48. What is your age?

1. Under 35 years old
2. 35- 55 years old
3. Over 55 years old
99. I prefer not to answer

49. What is the primary language spoken in your home?

1. English
2. Spanish
3. Chinese
4. German
5. Native American language
6. Vietnamese
7. Russian
8. Tagalog
9. Hmong
10. Korean
11. African language
12. French
13. Japanese
96. Other (Please specify) **[OPEN ENDED]**
99. I prefer not to answer

50. Which of the following best describes the race or ethnic background you identify with? Please select all that apply (Please Select All that Apply)

1. Black or African American
2. Hispanic or Latino/Latina
3. American Indian and Alaska Native
4. Asian
5. Middle Eastern or North African
6. Native Hawaiian and Other Pacific Islander
7. White
96. Not Listed (Please specify):
99. Prefer not to answer
96. Not Listed (Please specify)
99. I prefer not to answer

51. Including yourself, how many people are living in your household? **[DROP DOWN BOX – 1-14 or more, 99. Prefer not to answer]**

52. Is your annual household income over or under [CUTOFF]?

IF Q52 = 1 CUTOFF = \$33,976
IF Q52 = 2 CUTOFF = \$45,776
IF Q52 = 3 CUTOFF = \$57,576
IF Q52 = 4 CUTOFF = \$69,376
IF Q52 = 5 CUTOFF = \$81,176
IF Q52 = 6 CUTOFF = \$92,976
IF Q52 = 7 CUTOFF = \$104,776
IF Q52 = 8 CUTOFF = \$116,576
IF Q52 = 9 CUTOFF = \$128,376
IF Q52 = 10 CUTOFF = \$140,176
IF Q52 = 11 CUTOFF = \$151,976
IF Q52 = 12 CUTOFF = \$163,776
IF Q52 = 13 CUTOFF = \$175,576
IF Q52 = 14 CUTOFF = \$187,376

1. Over
2. Under
3. I don't know
99. I prefer not to answer

[DISPLAY Q53 IF Q52 = 1]

53. Is your annual household income over or under [CUTOFF]?

IF Q52= 1 CUTOFF = \$54,360
IF Q52 = 2 CUTOFF = \$73,240
IF Q52 = 3 CUTOFF = \$92,120
IF Q52 = 4 CUTOFF = \$111,000
IF Q52 = 5 CUTOFF = \$129,880
IF Q52 = 6 CUTOFF = \$148,760
IF Q52 = 7 CUTOFF = \$167,640
IF Q52 = 8 CUTOFF = \$186,520
IF Q52 = 9 CUTOFF = \$205,400
IF Q52 = 10 CUTOFF = \$224,280
IF Q52 = 11 CUTOFF = \$243,160
IF Q52 = 12 CUTOFF = \$262,040
IF Q52 = 13 CUTOFF = \$280,920
IF Q52 = 14 CUTOFF = \$299,800

1. Over
2. Under
3. I don't know
99. I prefer not to answer

THANK YOU

Thank you for participating in this survey. Have a great day!

TERMINATE SURVEY TEXT

Thanks for letting us know! This survey is for [UTILITY] customers who recall having participated in the Home Energy Reports Program.

12 Appendix F: Commercial Prescriptive and Custom Program Evaluation Report

12.1 Introduction

Elizabethtown Gas (ETG) launched the Energy Solutions for Business Prescriptive and Custom program (Program) to encourage and support the installation of high-efficiency natural gas (and electric) equipment by ETG C&I customers by providing prescriptive and custom incentives tailored to each customer. The program provided rebates to facility operators and owners with contractors playing a key role in informing their customers about the program and supporting the customer's participation by submitting the application and required documentation.

Program staff includes ETG employees, the primary implementation contractor AEG, and various subcontractors.

Nine projects were completed in program year one (PY1). Of those, two were prescriptive and 7 were custom projects. The program resulted in program level **ex-ante annual savings of 31,659.92 therms and 194,480.40 lifetime therms**¹¹¹.

Because the number of projects completed in PY1 was low during this ramp-up year, ADM's (the Evaluator) evaluation of the program was limited to a single impact evaluation sample and a process evaluation that included in-depth interviews with program and implementation staff.

12.1.1 Program Description

The Program has two channels, prescriptive and custom, which together cover most energy savings upgrades and retrofits that ETG commercial customers may need. Prescriptive rebates were designed to promote the marketing of energy efficiency measures by electrical and mechanical contractors and distributors to their customers. The prescriptive program included energy-efficient lighting, food service equipment, heating and cooling equipment, appliances, and other various efficiency measures. The program reduced cost barriers by offering low to no interest financing on qualifying equipment and offering upfront rebates. For PY1 the only delivery channel utilized for incentive distribution was downstream. This channel can be described as:

- **Downstream channel:** incentives were paid to the utility customer (sometimes an incentive can be signed over to the contractor). Typically, the focus was the

¹¹¹ There were several differences between the participant definitions between the M&V program tracking data reports and ETG management data reports. This resulted in some small differences between the ETG reported ex-ante values and the M&V reported values.

utility customer, although contractors/installers were often involved in installing the equipment or measure(s).

The custom portion of the program provided performance-based or calculated rebates for electric and/or natural gas efficiency measures for commercial and industrial customers. Large energy-efficient equipment or retrofitting specialized process system improvements can require a large capital investment by the customer, the program's performance-based or calculated rebates were intended to reduce the customer's capital investment burden and improve return on investment. Custom efficiency projects were more complex than prescriptive measures and were generally less common. These custom measures arise from specialized applications that included manufacturing, light/heavy industrial, and other steam powered processes.

All custom and prescriptive projects go through the same review process, regardless of size, scope, or type. AEG handles the review of projects, ensures they meet eligibility requirements (e.g., running a benefit-cost test accounting for gas and electric usage), perform post-installation site visits, and then release rebates.

12.2 Methodology

Program savings were calculated using algorithms in the New Jersey Board of Public Utilities Protocols to Measure Resource Savings FY2020, the 2021 NJ TRM Addendum, and the "Coordinated Measure List" developed by the NJ EM&V sub-team. The Evaluator planned on using stratified sampling for the Program, which is performed to account for skewed distributions of savings and to reduce the sample sizes required to satisfy the desired precision requirements. But in PY1, the number of completed projects was low so the sample included every submitted project. In future years, we expect to have more custom and prescriptive projects and will apply stratified sampling methods.

The measure categories included in the evaluation of the prescriptive and custom subprogram were prescriptive condensing integrated (combo) boiler and water heaters, and custom steam trap repairs. The sections below detail the impact analysis methodologies for these measure categories¹¹² and the process evaluation approach for the Program.

12.2.1 Prescriptive Measures

Deemed savings values from the New Jersey protocols (as determined in the statewide Coordinated Measure List) were used to analyze savings for the prescriptive measure condensing integrated boiler and water heaters (<300MBh, 90 percent AFUE). The NJ

¹¹² The NJ SWE requested that savings for certain measures be calculated in a second way using methods that may be included in future NJ TRM updates per their direction. These other savings estimates will be reported as required by the NJ SWE.

2020 Savings Protocols (pg. 26) were used to analyze savings for this measure in the two sampled projects.

12.2.2 Custom Measures

The custom projects for PY1 all consisted of Steam Trap Repair/Replacements. Desk reviews of the project's savings were based on the NY TRM Algorithms and MA evaluation - "Steam Trap Evaluation Phase 2," March 8, 2017. This reference was from the statewide Coordinated Measure List.

12.2.3 Sampling

ADM prepared a stratified sample plan to verify and calculate program savings for PY1. Because of the number of projects completed in PY1 the Evaluator reviewed a census of projects in the tracking data to verify that appropriate savings were calculated.

For its PY2 evaluation, the Evaluator will create two samples: one to collect data through phone interviews and surveying for process, net to gross, and impact evaluations; and a second stratified sample to verify and estimate gross savings. The sample design will allow program savings to be estimated at the 90 percent confidence level with relative precision of +/- 10 percent, and the 85 percent confidence level with relative precision of +/- 15 percent for all measures¹¹³ that represent more than 5 percent of the program savings.

12.2.4 Data Collection

The Evaluator performed basic rigor desk reviews of sampled projects; the chosen method depended on the availability of the contact, measure, customer preference, and progress towards achieving the required sample size. After the sample of projects were selected, and the program administrator provided documentation pertaining to the projects, the first step in the measurement and verification effort was to review this documentation.

For each project, the available documentation (e.g., audit reports, savings calculations, etc.) for each measure were reviewed (desk review), with particular attention given to the calculation procedures and documentation for savings estimates (e.g., support documentation, consistency with the TRM, etc.). Documentation that was reviewed in the PY1 sample included program forms, databases, reports, billing data, weather data, and any other potentially useful data. Each application was reviewed to determine whether the following types of information have been provided:

- Documentation for the baseline and proposed efficient equipment, including:
 - Descriptions

¹¹³ Including at least two non-lighting measures.

- Schematics
- Performance data
- Additional supporting information as applicable
- Information about the savings calculation methodology, including:
 - Type of methodology used
 - Assumptions made
 - Correctness of calculations

If there was uncertainty regarding a project or incomplete project documentation, the Evaluator contacted program staff to seek further information to ensure the completeness of the project data.

12.2.5 Net Savings Approach

Net savings refer to savings that are attributed to the program efforts after accounting for:

- Free ridership, the portion of gross energy impacts that would have occurred even in the absence of the program.
- Spillover, additional program-induced energy savings for which the program didn't provide any specific financial incentives, both participant and non-participant.

The Evaluator will incorporate an approved battery of free ridership and spillover questions in its customer interviews/surveys. The responses to these questions will be used in a statewide study to estimate net-to-gross ratios as directed by the NJ statewide evaluator (SWE). For the first triennium, the stipulated NTG is set 1.

12.2.6 Process Evaluation Approach

The process evaluation was designed to explore the program's design, barriers to participation, implementation, and outcomes. In PY1, process evaluation activities were limited to program and implementation staff interviews and document review. The Evaluator plans to conduct service provider interviews and customer surveys in PY2. Process evaluation research questions included:

- Was there sufficient coordination with the New Jersey Clean Energy Program (NJCEP), to ensure customers were able to easily navigate available energy efficiency programs and incentives?
- The Program covers a wide variety of commercial efficiency upgrades, does the program effectively market all the available options to customers? Are there ways to improve the design or implementation process to provide more efficiency options for each customer?

- What were the barriers to participation in the Program: cost of equipment, customer awareness, incentive levels, landlord arrangements, and availability of efficient measures?
- Is there cross participation between these subprograms and other programs offered by the company or by NJCEP? Beyond program participation, has program marketing increased awareness of ETG's array of efficiency program offerings?
- Beyond the first program year: Were there any significant changes or new obstacles to program delivery for either of the subprograms? Were there any outside or external barriers that influenced the program's success? Are the marketing efforts effective and useful or are customers finding out about the program in other ways?
- Has the shift from state to utility administration of programs affected participation? If yes, how?
- How is the program working to meet its regional and measure diversity goals? Are new measures being explored?
- What types of buildings/facilities participated in the program? Could certain facility types be targeted more effectively?
- Were participants satisfied with their experience?
- What was the selection criteria for the service providers to participate in this program?
- Is training offered for participating training providers? Is the training sufficient? How is the training provider's performance assessed?
- The up-front rebates and low to no-interest financing are highlights of the prescriptive portion of the program, were these effective in recruiting customers? Would adjustments to the up-front rebates increase participation?
- This program is set up to deliver measures through many different channels, which channels were the most successful? What changes could be made to increase participation through the less successful channels?
- Custom projects require pre-approval through an application process, was this process easy to navigate for the customer, contractor, and utility? Are there any changes to this process that could improve it?

12.3 Impact Evaluation Results

The program tracking data was complete, savings were calculated correctly, and uploads appeared to be timely. Program documentation included all requested applications, models, engineering calculations, assessment reports, and savings calculations. The

Evaluator found that the information provided an accurate picture of the program projects and all information necessary to perform a minimally rigorous evaluation.

Program impact results reported in Table 12-1 and Table 12-2.

Table 12-1:PY1 Measures and Ex-Ante Therms Savings

Measure Name	Quantity	Annual Therms	Total Annual Therms	Measure Life	Lifetime Therms
Prescriptive Combination Boiler	2	161.46	322.92	20	6,458.40
Custom Steam Traps	7	--	31,337.00	6	188,022.00
Total	9	--	31,659.92	6.1	194,480.40

Table 12-2:M&V Sampled Sites Therms by Measure including Realization Rates

Measure	Ex-Ante Therms	Ex-Post Therms	RR Therms
Prescriptive Combination Boiler	322.92	322.92	100%
Custom Steam Traps	31,337.00	30,015.00	96%
Total	31,659.92	30,337.92	96%

The overall savings for the prescriptive sub-program was **322.92 therms** resulting in a **100 percent realization rate**. The methods and inputs for the prescriptive projects were the same in the ex-ante and ex-post savings assessments.

The overall savings for the custom sub-program was **30,015 therms** resulting in a **96 percent realization rate**. The difference in expected and realized savings were due to two identified factors:

- The low realization rate can mostly be attributed to the boiler efficiencies assumed in calculations. The initial ex-ante assessment assumed 80 percent thermal efficiency for all the boilers, but the ex-post assessment used site-specific boiler efficiencies which ranged from 80 percent to 86 percent. As boiler efficiency increases, the savings for each steam trap repair or replacement decreases, deflating the realized savings.
- One Project had a change to the operating pressure which also affected savings. The ex-ante assumed 5 psig but this exceeds the pressure documented at the boiler. The ex-post used 4 psig in savings calculations which lowered the realized savings.

12.3.1 Evaluability

The Evaluator reviewed the Prescriptive and Custom program tracking data and requested documentation for nine sampled sites. The program tracking data was complete, and uploads appeared to be timely. The savings methods were performed

correctly, although the Evaluator revised baseline assumptions for some custom projects. Program documentation included all requested applications, models, engineering calculations, assessment reports, and savings calculations. The Evaluator found that the information provided an accurate picture of the prescriptive and custom projects and all the necessary information to perform a minimum rigor evaluation.

12.4 Process Evaluation Results

12.4.1 Program Staff Facilitated Discussions

The Evaluator facilitated two discussions in July and August 2022 to investigate the design and implementation of Elizabethtown Gas's (ETG's) commercial energy efficiency programs. The first discussion was held with South Jersey Industries' EM&V manager, ETG's energy efficiency manager, and an ETG energy efficiency analyst in July of 2022. The second was held in August 2022 with AEG's program manager and lead engineer. The Evaluator's conversation with South Jersey Industries' EM&V manager, South Jersey Gas' energy efficiency manager and the SJG commercial energy efficiency analyst in July of 2022 was also used to inform understanding of program operations and implementation.

The topics of discussion included staff roles, communication processes, marketing and outreach, data management, barriers to implementation, and progress towards goals.

Interview findings indicate differing perspectives regarding the appropriateness of incentive level for the Prescriptive and Custom program. ETG contacts observed that the program incentives were sufficient, while the AEG contacts said that the incentive levels were a barrier to implementation success. ETG's energy efficiency manager reflected that energy savings are the program's main strength as the amount of savings per dollar spent is better than had been modeled. The AEG contacts noted that trade allies had shared comments with them regarding the incentive levels but acknowledged that the program can pay up to 50 percent of project costs and that "did not seem low." However, AEG's lead engineer stated that the incentive levels were \$1.60 per therms for Custom projects and AEG's program manager said that other utilities outside of New Jersey with similar programs may offer from \$3-6 per therms, so the incentive level was "a little bit on the lower end" and "obviously that has an impact."

An easy application process is perceived as a program strength. AEG's program manager observed that, compared to other utilities, the ETG application process is "relatively easy", and requires less information. He noted that other utilities may require a RIM test for every project, whereas this is not a requirement for SJI's program.

There are opportunities to streamline the program website and improve navigability. The lead engineer observed that there had been one project application through the online service provider portal to date. The Evaluator visited the ETG website

and found opportunities to improve the ease of navigation and user design for customers and trade allies. For example, hyperlinks on the “Energy Solutions for Business and Multi-Family: Prescriptive and Custom” webpage that are stated to link to the Prescriptive portal first lead users to pages with incentive lists and program descriptions; users must scroll down to find an “Apply Now” button, which leads to another landing page with more information. Featuring hyperlinks to instructions, required documents, incentive levels, pdf application, and the online portal more prominently and clearly could improve users’ experience and ease navigability.

There has been extensive collaboration between the state’s electric and natural gas utilities. SJG’s energy efficiency manager noted that there had been limited market confusion because New Jersey’s utilities had done a significant amount of background work. He observed that it is a challenge to eliminate all market confusion in a state with seven different utilities but suggested the high-level of collaboration and market coordination had reduced the potential for it. ETG’s energy efficiency manager said that the utilities had set up several working groups that had been helpful with the transition. He observed that because all the utilities must meet the same requirements, it has driven them to work together to split the burden. The manager indicated that ETG’s parent company, South Jersey Industries (SJI), had worked closely with the only other gas-only utility in the state (New Jersey Natural Gas) to align and collaborate as much as possible.

There is an opportunity to further develop ETG’s relationships with Prescriptive and Custom trade allies. The Prescriptive and Custom program requires customers to independently engage with contractors; ETG contacts noted that there is less active management of Trade Ally relationships on the commercial compared to the residential side of ETG’s energy efficiency programs. AEG’s lead engineer suggested that the program’s custom component may face a barrier with enrollment and participation because there are a limited number of firms available to develop calculations and assist customers with projects. The AEG program manager noted that contractors may not be interested in participating in the Prescriptive and Custom program as the incentives are not as robust as the Direct Install program. AEG staff noted that there had been one sparsely attended Trade Ally training early in PY1. They indicated interest in additional outreach to trade allies and suggested they were working to provide additional resources and training to engage with trade allies for the Prescriptive and Custom program in PY2.

Supply chain issues were noted as having affected the Prescriptive and Custom program in PY1. ETG’s energy efficiency manager noted that there had been long lead times for high efficiency HVAC equipment in PY1 with wait times of “six to eight months” to receive orders for some commercial projects.

Staff interviews indicated that the main barrier to implementation of the Prescriptive and Custom program is marketing and customer engagement. The AEG contacts indicated the Custom and Prescriptive programs would not meet their

savings targets in the first year but would fulfill year one savings targets early in year two. AEG staff noted that ETG's lack of legacy programs was a barrier to the program's implementation as customers and contractors are not as familiar with it.

AEG staff noted that savings goals from PY1 and PY2 would be combined, and these goals met in PY2. ETG staff suggested the programs were building awareness and developing marketing and engagement strategies to build interest in the upcoming program year. The AEG program manager observed that AEG's call staff had contacted 200 mid-sized SJI customers from April to June 2022 and there had been "no activity whatsoever out of out of that campaign." AEG staff attributed the lack of success marketing to its incentive levels and the need to engage larger customers through more targeted outreach. ETG's energy efficiency manager suggested that ensuring customers are aware of financing options was another related barrier to customer engagement.

AEG also noted that ETG's territory overlaps with PSE&G. At the time of the Evaluator's call, there had not been any shared projects, indicating that customers that have participated in PSE&G's Prescriptive and Custom energy efficiency programs in PY1 had not received rebates for gas saving measures.

There are efforts to improve customer engagement with the Prescriptive and Custom program. Discussions with staff indicate marketing efforts have not been successful for the Prescriptive and Custom program. ETG staff mentioned that they were currently developing and implementing a sales team approach that will target high usage customers and use established relationships to promote its energy efficiency programs.

It is premature to assess the effectiveness of third-party QA/QC procedures due to limited participation and the recent start-date of the third-party inspector contract. Multiple parties are involved in project quality control activities. AEG and ETG have internal procedures in place and additionally a third-party inspector was hired in July 2022. Regarding internal procedures, AEG's lead engineer noted that all Prescriptive and Custom projects that receive over \$50,000 in incentives are inspected by AEG staff and there is a requirement to inspect 2.5 percent of all other projects. AEG and ETG contacts noted that internal procedures are being effectively implemented, though there has been limited participation to require substantial QA/QC. Additionally, in the future ETG staff may "shadow" vendors for Prescriptive and Custom projects to familiarize themselves with the program and to look for areas of improvement.

Performance Systems Development (PSD) was hired to conduct third-party inspections and check for missed opportunities, and health and safety issues, and verify that documented work has been completed. They are required to perform inspections for 10 percent of Prescriptive projects; after their inspections, PSD compiles a report and uploads the QA/QC information to Vision.

The transition from NJCEP to utility-run commercial programs was not perceived as a challenge for the Prescriptive and Custom program. ETG's energy efficiency manager noted that from a customers' perspective "not much had changed" other than interacting with another entity. He said he was unaware of commercial customers having any challenges navigating the change. The ETG energy efficiency manager said that the utilities had set up several working groups that had been very helpful with the transition. He observed that because all the utilities must meet the same requirements, it has driven them to work together to split the burden. The manager indicated that ETG's parent company, South Jersey Industries, has worked closely with the only other gas-only utility in the state (New Jersey Natural Gas) to align and collaborate as much as possible.

12.5 Conclusions and Recommendations

Conclusion: There was a lack of communication about shared projects with electric utilities whose territory overlaps with ETG. At the time of the Evaluator's call there had not been any contact about shared projects.

Recommendation: Develop communication with implementation groups for electric utilities with overlapping territory to pass over potential projects that may fall heavily on the gas or electric savings side. Shared electric and gas projects are a hallmark of successful commercial energy efficiency programs across the country and with the unique structure of shared savings for overlapping customers in NJ, there is an opportunity here to develop strong gas and electric programs that benefit NJ rate payers.

Conclusion: The types of projects seen so far have been a prescriptive combination boilers and steam trap repairs which is a small representation of the overall variety of potential projects. In future years, we expect to see an increase in other project types being completed as awareness of the program increases.

Recommendation: For Custom projects we recommend ex ante analyses use the actual equipment efficiencies when available, instead of deferring to assumed or deemed efficiencies.

12.6 Barriers to Participation

Staff interviews indicated that the main barrier to implementation of the Prescriptive and Custom program is marketing and customer engagement. The AEG contacts indicated the Custom and Prescriptive programs would not meet their savings targets in the first year but would fulfill year one savings targets early in year two. AEG staff noted that ETG's lack of legacy programs was a barrier to the program's implementation as customers and contractors are not as familiar with it. ETG staff suggested the programs were building awareness and developing marketing and engagement strategies to build interest in the upcoming program year.

Interview findings indicate differing perspectives regarding the appropriateness of incentive level for the Prescriptive and Custom program. ETG contacts observed that the program incentives were sufficient, while the AEG contacts said that the incentive levels were a barrier to implementation success.

There is an opportunity to further develop ETG's relationships with Prescriptive and Custom trade allies. The Prescriptive and Custom program requires customers to independently engage with contractors; ETG contacts noted that there is less active management of Trade Ally relationships on the commercial compared to the residential side of ETG's energy efficiency programs. The AEG program manager noted that contractors may not be interested in participating in the Prescriptive and Custom program as the incentives are not as robust as the Direct Install program.

There are opportunities to streamline the program website and improve navigability. The lead engineer observed that there had been one project application through the online service provider portal to date. ADM visited the ETG website and found opportunities to improve the ease of navigation and user design for customers and trade allies.

12.7 Evaluability Recommendations

We recommend ex-ante analyses use the actual equipment efficiencies when available, instead of deferring to assumed or deemed efficiencies. For both sampled prescriptive projects, the ex-ante and ex-post analysis methods were the same resulting in the same savings. However, the custom steam trap projects had assumed an 80 percent thermal efficiency while the efficiency ranged from 80-86 percent resulting in realization rates of about 95 percent for most projects.

Consider collecting steam loss factors for future inclusion in the NJ TRM updates. For this program year, we applied the steam loss factors (Floss) reported by the contractor. We recommend that the program begin collecting documentation for steam trap leakage designations (plugged/leaking/blowing by) as part of the implementation process.

12.8 Research Questions for PY2

The Evaluator noted additional data collection in PY2 would be required to continue to develop understanding of program design and barriers to program success. Specifically, the Evaluator did not conduct customer surveys or contractor interviews in PY1.

Contractor interviews or surveys will seek to provide answers to the following research questions:

- When customers are not at all interested in purchasing efficient equipment (versus standard equipment), what are the reasons? Based on your customer interactions, what do you think could help increase interest in efficient measures from these customers?
- What are the obstacles to getting partially interested customers involved with the program? Are there ways that those obstacles could be mitigated?
- Is there sufficient program marketing and outreach?
- Are customers satisfied with their experience? What are the causes of dissatisfaction?
- Were service providers satisfied with the program design and participation processes?
- Looking forward, what are key impediments and drivers to program success?
- Are there any specific measures for which the current incentive levels do not motivate customers to buy high efficiency equipment instead of standard efficiency equipment? If so, what are they and how much would incentives need to be increased to get good uptake?
- Are there any specific measures for which a lower program incentive level would still motivate customers to buy high efficiency equipment instead of standard efficiency equipment? If so, what are they and how much could incentive levels be reduced?
- Are you participating in the same program run by different utilities? How is that experience?

The Evaluator's customer survey in PY2 will aim to answer or add additional background information for the following research questions for the commercial programs:

- Were participants satisfied with their experience?
- This program is set up to deliver measures through many different channels, which channels were the most successful? What changes could be made to increase participation through the less successful channels?
- Custom projects require pre-approval through an application process, was this process easy to navigate for the customer, contractor, and utility? Are there any changes to this process that could improve it?

Are the incentive levels appropriately set? Should incentives be increased to promote participation? Could incentives levels be decreased without significantly impacting participation?

13 Appendix G: Direct Install Program Evaluation Report

13.1 Introduction

Elizabethtown Gas (ETG) launched a Direct Install (DI) program during the program year to incentivize small businesses, non-profit and faith-based organizations, municipalities, and schools to initiate retrofit energy efficiency projects. The program provides the customer with 1) a free energy audit of their site that results in a retrofit project plan to improve the site's energy efficiency, 2) assistance from the program implementer to engage a qualified contractor and to apply for rebates for qualifying measures installed during the retrofit project.

Program staff includes ETG employees, the primary implementation contractor AEG, and an implementation subcontractor CMC.

Seventeen audits were completed in PY1. Of the 17 audits completed 4 projects were erroneously given free DI measures¹¹⁴ in the beginning of the program. They were counted as participants to include the savings of the free measures.

The first year of the program resulted in program level ex-ante annual savings of **260.89 therms and 2,629.48 therms of lifetime savings**.

Because the number of completed projects were limited during this ramp-up year, the bulk of ADM's (the Evaluator) evaluation of the program focused on a process evaluation.

13.1.1 Program Description

Program participation generally starts with a customer learning about the program from their utility, the utility's contractor for Commercial programs (AEG), or the subcontractor for the Direct Install program (CMC). The customer then submits the required documentation to ETG. Next, the customer schedules an audit with CMC. The audit covers both natural gas and electric building systems, with a strong focus on natural gas savings. Customers receive a project proposal from CMC after the audit. If the customer decides to follow through with the proposal, CMC connects them with a subcontractor for installation work. After installation work is complete, CMC works with the customer to ensure proper paperwork is submitted to AEG for rebate processing. The program is

¹¹⁴ During the initial program rollout, CMC, the subcontractor implementing the C&I Direct Install program erroneously included the installation of free direct install measures during the initial energy audit, which was not part of the program design. This only affected a very limited number of customers. Since ETG defined participation in the C&I Direct Install program by the installation of energy savings measures, these customers (and the associated savings) were included in annual totals even if the customers did not pursue additional measures after the initial audit during the program year.

available to natural gas customers with an average peak electrical demand of 200 kW or less over the previous 12 months.

The program includes two tiers of eligibility:

Tier 1:

Non-residential customers with up to 100 kW average peak demand

or

Non-residential customers with up to 200 kW average peak demand who also meet one of the following criteria:

- Are located within an Urban Enterprise Zone
- Are located within an Opportunity Zone
- Are owned or operated by a local government
- Are a K-12 public schools.

Tier 2:

Non-residential customers with up to 200 kW average peak demand.

13.2 Methodology

Program savings were calculated using algorithms in the New Jersey Board of Public Utilities *Protocols to Measure Resource Savings* FY2020, the 2021 NJ TRM Addendum, and “Coordinated Measure List” developed by the NJ Utilities.

Several measures installed through the program are included in the Commercial and Industrial Energy Efficient Construction section of the Coordinated Measure List. For some measures, ADM (the Evaluator) used values from applicable baseline tables for direct install measures that more accurately reflected the project’s baseline conditions.

13.2.1 Program Measures

Table 13-1 lists all potential measures for the DI Program along with the source for savings calculations for each measure. An important focus of the PY2 impact evaluation will be to identify high impact measures that may require more in-depth study in PY3.

Table 13-1: Program Measures and Protocol Sources

Measure	Source
Anti-Fog Film	Rauss, D. et. al., Southern California Edison. Cool Retrofit Solutions in Refrigerated Display Cases. 2008 ACEEE Summer Study. Benchmarked with Engineering Calculations using NEEP Mid-Atlantic TRM v10
Anti-Sweat Heater Controls	NJ FY2020 (Pg. 126)
Automatic Door Closer	PA TRM (Pg. 171)
Boiler and Furnace Tune-Up	Gas: Illinois (IL) TRM V9, Pg. 190 C&I
Boiler Economizer Controls	IL TRM V9 TRM pg. 317 & 320
Boiler Replacement	NJ FY2020 Pg. 175
Boiler Reset Controls	NJ FY2020 Pg. 178
Central Air Conditioning	NJ FY2020 Protocols Pg. 172
Central Heat Pumps	NJ FY2020 Protocols Pg. 172
Combination Boilers	NJ FY2020 Pg. 175
Domestic Hot Water Pipe Insulation	NJ FY2020 Pg. 186
Door Gasket	MidAtlantic TRM V10 TRM (Pg. 350)
Ductless Mini-Split Heat Pump	NJ FY2020 (Pg. 99)
Evaporator Fan ECMs for Walk-ins	NJ FY2020 Protocol (Pg. 96)
Evaporator Fan Motor Control	NJ FY2020 (Pg. 123)
Furnace Replacement	NJ FY2020 Pg. 176
Heat Pump Water Heater	MA/MD V10 TRM Pg. 352 HPWH
Infrared Heater	NJ FY2020 Pg. 176
Instantaneous Water Heater	NJ FY2020 Pg. 174
Lighting Controls	NJ FY2020 Pg. 189
Low Flow Faucet Aerators	NJ FY2021 Pg. 32
Low Flow Showerheads	NJ FY2021 Pg. 32
NEMA Premium Motors	NJ FY2020 (Pg. 172)
Night Covers	NJ FY2020 (Pg. 122)
Non-Refrigerated Vending Machine Control	NJ FY2020 Pg. 174
Packaged Terminal AC	NJ FY2020 (Pg. 99)
Packaged Terminal HP	NJ FY2020 (Pg. 99)
Pre-Rinse Spray Valves	NJ FY2020 Pg. 184
Prescriptive Lighting - Exterior	NJ FY2020 Pg. 189
Prescriptive Lighting - Interior	NJ FY2020 Pg. 189
Programmable Thermostat	NJ FY2020 (Pg. 176)

Measure	Source
Refrigerated Case Doors	NJ FY2020 (Pg. 120)
Refrigerated Case Lighting	NJ FY2020 (Pg. 87)
Refrigerated Vending Machine Control	NJ FY2020 (Pg. 174)
Smart Thermostat	MD/MA V10 TRM (Pg. 315) Use NJ EFLHs from (Pg. 101 & 102)
Storage Water Heater <= 75 kBtu/h	NJ FY2021 Pg. 98 + IL TRM V9 Section 4.3.1
Storage Water Heater > 75 kBtu/h	NJ FY2021 Pg. 98 + IL TRM V9 Section 4.3.1
Strip Curtains	PA TRM (Pg. 166)
Variable Frequency Drives	NJ FY2020 (Pg. 172)

13.2.2 Sampling

The Evaluator prepared a stratified sample plan to verify and calculate program savings for PY1. Because only one project was completed within the program design parameters, the Evaluator reviewed a census of records in the tracking data for that project to verify that appropriate deemed savings values were used to calculate gross savings reviewed.

For its PY2 evaluation, the Evaluator will create two samples: one for collecting data through phone interviews and surveying for process, net to gross, and impact evaluations; and a second sample to verify and estimate gross savings. The sample design will allow program savings to be estimated at the 90 percent confidence level with relative precision of +/- 10 percent, and the 85 percent confidence level with relative precision of +/- 15 percent for all measures¹¹⁵ that represent more than 5 percent of the program savings. The M&V samples will be used in conjunction with the TRMs and Protocols listed in Table 13-1 to verify gross savings for the program.

13.2.3 Net Savings Approach

Net savings refer to savings that are attributed to the program efforts after accounting for:

- Free ridership, the portion of gross energy impacts that would have occurred even in the absence of the program.
- Spillover, additional program-induced energy savings, generated by both participants and non-participants, for which the program didn't provide any specific financial incentive.

The NJ Board of Public Utilities stipulated that NTG is set to 1.0 for the first triennium of the program. After the initial triennium, data used to calculate NTG will be collected using an approved battery of free ridership and spillover questions in customer surveys.

¹¹⁵ Including at least two non-lighting measures.

13.2.4 Data Collection

The Evaluator reviewed the available documentation (e.g., audit reports, measure descriptions, project schematics, performance data, savings calculations, and any additional supporting materials) for each the four program projects completed during PY1, including the three projects that were not included in the program impact results. The Evaluator reviewed calculation procedures, documentation for savings estimates (e.g., support documentation, consistency with the TRM, etc.). The Evaluator verified information about the savings calculation methodology, including:

- Type of methodology used
- Assumptions made
- Calculation accuracy

If there was uncertainty regarding a project or incomplete project documentation, the Evaluator contacted program staff to seek further information to ensure the completeness of the project data.

13.2.5 Process Evaluation Approach

The process evaluation was designed to explore the program's design, barriers to participation, implementation, and outcomes. To investigate these areas, the Evaluator reviewed program documents, spoke with program and implementation staff. In PY1, process evaluation activities were limited to program and implementation staff interviews and document review. The Evaluator plans to conduct service provider interviews and customer surveys in PY2. Process evaluation research questions included:

- The program was designed to reach those small businesses that are typically left out of commercial gas efficiency programs, specifically small businesses, non-profits, municipalities, schools, and faith-based organizations. Was the program successful in reaching all these types of customers? If not, what were the barriers for specific types of customers?
- Was there sufficient coordination with the New Jersey Clean Energy Program (NJCEP), to ensure customers were able to easily navigate available energy efficiency programs and incentives? Was the utility led program successful at recruiting these underserved businesses into the program?
- The program covers 70-80 percent of the cost of energy saving measures, are these incentive amounts sufficient to entice program participation? Did the period of increased incentives at the start of PY2 cause any changes to program participation? Could they be lower and still support an effective program?
- Marketing of the program is key to the successful engagement of this underserved population of customers, were the planned marketing strategies followed? What

worked and are there additional marketing approaches that could be useful in the future?

- Why might a customer seek to participate in an audit but not full program implementation?
- Were there any outside or external barriers that influenced the program’s success?
- Were participants satisfied with their experience?
- What are the utility and implementation staff’s perspectives on the program? What are reactions to program design choices that have been implemented?
- Is training offered for participating service providers? Is the training sufficient?
- How well do staff and service providers work together? Can any rebate processing, data tracking, and/or communication efficiencies be gained?
- Did the program implementation reflect its design? Are there ways to improve the design or implementation process?

13.3 Impact Evaluation Results

The program tracking data was complete, savings were calculated correctly, and uploads appeared to be timely. Program documentation included all requested applications, models, engineering calculations, assessment reports, and savings calculations. The Evaluator found that the information provided an accurate picture of the program projects and all information necessary to perform a minimally rigorous evaluation. Program results are reported in Table 13-2 and Table 13-3.

Table 13-2: PY1 Measures and Ex-Ante Therms Savings

Measure Name	Quantity	Annual Therms	Total Annual Therms	Measure Life	Lifetime Therms
Assessment Fee	17	--	--	--	--
Low Flow Faucet Aerators	9	26.70	240.34	10	2,403.39
Domestic Hot Water Pipe Insulation	6	3.43	20.55	11	226.09
Total	32	30.13	260.89	10	2,629.48

Table 13-3: M&V Sampled Sites Therms by Measure including Realization Rates

Measure	Ex-Ante Therms	Ex-Post Therms	RR Therms
Pipe insulation	20.55	20.55	100%
Low flow aerator	240.34	240.34	100%
Total	260.89	260.89	100%

1.1.1 Evaluability

The Evaluator reviewed the Direct Install program tracking data and requested documentation for four sampled sites. The program tracking data was complete, savings were calculated correctly, and uploads appeared to be timely. There was a single difference in the tracking data reports for M&V and what the utility program managers received, the reports for M&V did not provide total savings, only measure counts and measure savings. This issue could result in small differences between the program total savings the Evaluator reports and what ETG reports due to rounding but will be watched closely going forward.

Program documentation included all requested applications, models, engineering calculations, assessment reports, and savings calculations. The Evaluator found that the information provided an accurate picture of the Direct Install projects and all the necessary information to perform an enhanced rigor evaluation.

13.4 Process Evaluation Results

The Evaluator facilitated two discussions in July and August 2022 to investigate the design and implementation of ETG's commercial energy efficiency programs including the DI Program. The first discussion was held with South Jersey Industries' EM&V manager, ETG's energy efficiency manager, and an ETG energy efficiency analyst in July of 2022. The second was held in August 2022 with AEG's program manager and lead engineer. The Evaluator also held a call with South Jersey Gas staff in July 2022; that discussion helped build understanding of ETG's programs, as the two companies share a parent company and collaborate and benefit from synergies that arise from consistent program design and implementation strategies and efforts. The topics of discussion included staff roles, communication processes, marketing and outreach, data management, barriers to implementation, and progress towards goals. The Evaluator provides the following conclusions drawn from those conversations.

1.1.2 Barriers to Participation

The current DI program design and state procurement law prevent municipalities from participating in the program. The state of New Jersey has a procurement law which requires municipalities to receive bids from three contractors before purchasing equipment. When the program was designed, utility staff thought that an exemption would be granted to allow municipalities to participate in the program, as was the case when the program was run by NJCEP. However, the state BPU and Division of Law have not yet decided on the exemption.

The requirement to submit electric utility bills may hinder or halt participation for some customers. AEG's program manager noted that the electric utility bill requirement had been a barrier to participation for ETG DI customers, as there was some reluctance

to provide their electric bill to ETG. ETG contacts posited that this step may spur internal conversations at customers' companies which in turn lead them not to participate.

Auditor training and initially limited marketing led to a slow start to the DI Program. The DI Program will meet its PY1 goals early in PY2. Utility staff noted that the DI Program was training its auditors for the first six months of the program year and noted that this may have caused a delay or slow start for DI projects. Auditors were fully trained by the beginning of May 2022. Staff indicated that the DI program will not meet its goals in year one, though they anticipate meeting year one targets early in year two.

13.5 Conclusions and Recommendations

Conclusion: Staff noted budgetary concerns because of significant past participation in the NJCEP DI program and customer interest developed during PY1. ETG's energy efficiency manager emphasized that the DI Program's main focus needs to be on the pipeline to see what is coming because project sizes vary and in some cases one project could allow the program to meet its targets.

Recommendation: The Evaluator should follow up with ETG and implementation staff in PY2 to report on the program effects of focusing on the project pipeline when approving DI projects.

Conclusion: It is premature to assess the effectiveness of third-party QA/QC procedures due to limited participation and the recent start-date of the third-party inspector contract. AEG and ETG contacts noted that internal procedures are in-place and being effectively implemented, though there has been limited participation to require substantial QA/QC. In July 2022, ETG hired Performance Systems Development (PSD) to conduct third-party inspections and check for missed opportunities, and health and safety issues, and verify that documented work has been completed. They are required to perform inspections for 10 percent of DI projects; after their inspections, PSD compiles a report and uploads the QA/QC information to Vision. CMC conducts pre-assessments of each participating facility as well as post-inspections.

Recommendation: The Evaluator should review the QA/QC reports for effectiveness and possible inclusion in the M&V verification process in PY2 and beyond. PSD should also provide ETG with solutions and recommendations to issues they find during the site visits.

Conclusion: The current DI program design and state procurement law prevent municipalities from participating in the program. The state of New Jersey has a procurement law which requires municipalities to receive bids from three contractors before purchasing equipment. When the program was designed, utility staff thought that an exemption would be granted to allow municipalities to participate in the program, as

was the case when the program was run by NJCEP. However, the state BPU and Division of Law have not yet decided on the exemption.

***Recommendation:* Continue to request for an exemption for municipalities to wave the bid requirements so that they can participate in the utility run programs.**

***Conclusion:* The requirement to submit electric utility bills may hinder or halt participation for some customers.** AEG's program manager noted that the electric utility bill requirement had been a barrier to participation for ETG DI customers, as there was some reluctance to provide their electric bill to ETG. ETG contacts posited that this step may spur internal conversations at customers' companies which in turn lead them not to participate.

***Recommendation:* Continue to ask for a change in the current DI program design, to allow natural gas companies to use a gas bill for program qualification rather than an electric one.**

13.6 Evaluability Recommendations

The Evaluators found that all necessary information is being collected to perform an enhanced rigor evaluation for this program in the future.

- The program tracking data was complete, savings were calculated correctly, and uploads appeared to be timely. There was a single difference in the tracking data reports for M&V and what the utility program managers received, the reports for M&V did not provide total savings, only measure counts and measure savings. This issue could result in small differences between the program total savings the Evaluator reports and what ETG reports due to rounding but will be watched closely going forward.
- Program documentation included all requested applications, models, engineering calculations, assessment reports, and savings calculations. The Evaluator found that the information provided an accurate picture of the Direct Install projects and all the necessary information to perform an enhanced rigor evaluation.

13.7 Research Questions for PY2

The Evaluator noted additional data collection in PY2 would be required to continue to develop understanding of program design and barriers to program success. Specifically, the Evaluator did not conduct customer surveys or contractor interviews in PY1.

Contractor interviews or surveys will seek to provide answers to the following research questions:

- When customers are not at all interested in purchasing efficient equipment (versus standard equipment), what are the reasons? Based on your customer interactions, what do you think could help increase interest in efficient measures from these customers?
- What are the obstacles to getting partially interested customers involved with the program? Are there ways that those obstacles could be mitigated?
- Is there sufficient program marketing and outreach?
- Are customers satisfied with their experience? What are the causes of dissatisfaction?
- Were service providers satisfied with the program design and participation processes?
- Looking forward, what are key impediments and drivers to program success?
- Are there any specific measures for which the current incentive levels do not motivate customers to buy high efficiency equipment instead of standard efficiency equipment? If so, what are they and how much would incentives need to be increased to get good uptake?
- Are there any specific measures for which a lower program incentive level would still motivate customers to buy high efficiency equipment instead of standard efficiency equipment? If so, what are they and how much could incentive levels be reduced?
- Are you participating in the same program run by different utilities? How is that experience?

The Evaluator's customer interviews in PY2 will aim to answer or add additional background information for the following research questions for the commercial programs:

- Were participants satisfied with their experience?
- Are the incentive levels appropriately set? Should incentives be increased to promote participation? Could incentives levels be decreased without significantly impacting participation?