

# EM&V Report

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Prepared for South Jersey Industries Utility:  
*South Jersey Gas*

Program Year 1:  
*July 1, 2021 -- June 30, 2022*

Prepared by:



ADM Associates, Inc.  
3239 Ramos Circle  
Sacramento, CA 95827  
916-363-8383

In Partnership with:  
Cadmus Group, LLC  
Brightline Group

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# **1. Abstract**

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Under contract with the South Jersey Industries Utilities (the Company), ADM Associates, Inc., The CADMUS Group, and The Brightline Group (the Evaluator) is providing measurement, evaluation, and verification (M&V) services for the South Jersey Gas Company's (SJG) 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 SJG 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**

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

- Residential Energy Efficient (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 SJG 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	15,077	973,949.05	883,918.48	91%	12,312,174.07
HPwES	235	66,827.38	67,652.07	101%	1,425,719.96
QHEC	1,288	6,213.49	5,674.79	91%	53,373.81
MI Weatherization	117	30,541.57	27,682.13	91%	792,359.51
HERs	171,730	1,425,920.00	1,494,014.00	105%	1,494,014.00
Com DI*	10	11,795.42	11,795.42	100%	156,037.88
ESB: Pres & Cust*	9	10,636.62	11,461.48	108%	211,226.19
Energy Management**	-	-	-	-	-
Engineered Solutions**	-	-	-	-	-
Multi-Family*	217	3,833.83	3,833.83	100%	38,338.34
<b>Total</b>	<b>188,683</b>	<b>2,529,717.36</b>	<b>2,506,032.20</b>	<b>99%</b>	<b>16,483,243.76</b>

\* 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	15,077	1,638,301	1,604,494	98%	14,022,880	340.12	282.58	83%
HPwES	235	162,536	113,663	70%	2,073,338	0.00	41.00	-
QHEC	1,288	71,830	136,405	190%	1,846,778	2.56	2.33	91%
MI Weatherization	117	37,975	33,026	87%	835,420	0.00	12.03	-
HERs	171,730	-	-	-	-	-	-	-
Com DI*	10	1,931	1,931	100%	28,964	1.09	1.09	100%
ESB: Pres & Cust*	9	-	-	-	-	-	-	-
Energy Management**	-	-	-	-	-	-	-	-
Engineered Solutions**	-	-	-	-	-	-	-	-
Multi-Family*	217	2,134	2,134	100%	32,008	0.21	0.21	100%
<b>Total</b>	<b>188,683</b>	<b>1,914,707</b>	<b>1,891,653</b>	<b>99%</b>	<b>18,839,388</b>	<b>343.98</b>	<b>339.24</b>	<b>99%</b>

\* 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 several opportunities for improvement that included data quality issues, program designs, marketing and awareness, and other issues. Table 1-3 lists the PY1 evaluation recommendations by program.

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

<b>EE Products</b>
Use targeted bill inserts and marketing emails to promote SJG's programs to specific customer groups, such as 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.
Continue to promote the Online Marketplace and Downstream programs through bill inserts and mailing marketing but look into additional methods for marketing to potential participants as well.
Add messaging or provide documentation to the Online Marketplace purchases on how to utilize a smart thermostat's energy savings features and report the energy saving capabilities.
Consider focused marketing or outreach events that highlight not only the available rebates, but the potential gas/energy savings from making upgrades.
Consider marketing campaigns that advertise specific measures that are popular with SJG customers and include messaging that describes how those measures will save on natural gas usage in the home.
<b>HPwES</b>
The PY1 realization rates should not be included in the TRM update because the Evaluators will conduct a pre/post billing analysis for PY2. The results of that analysis will provide a high rigor estimate of actual program impacts.
The IRA incentives may also impact HPwES program attribution. SGJ should consider program optimization options that incorporate the forthcoming Inflation Reduction Act (IRA) incentives for home weatherization and efficiency measures. The IRA incentives may also impact HPwES program attribution.
SJG should provide QA/QC data to the Evaluators who can leverage the data collected by Performance Systems Development (PSD) to inform the second, enhanced rigor evaluation while reducing customer contact points.
Make the Snugg Pro inputs available for M&V verification.
<b>QHEC</b>
Ensure the QHEC program's auditor explains SJG'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, window treatments, and smart thermostats.
Have a tracking data field for refused, unavailable, or in-compatible measures during visits.
<b>MI Weatherization</b>  Considering the number of SJG 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: <ul style="list-style-type: none"><li>■ Air sealing (pg 70, 2020 TRM). This measure primarily saves heating energy, but also saves some cooling energy. However, without explanation, the TRM states: "<i>there are no summer coincident electric peak demand savings estimated at this time.</i>"</li><li>■ 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.</li></ul>
SJG should work with the implementer, 3 <sup>rd</sup> -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.
SJG should continue to target homes with the highest energy use and closely monitor interest, especially in 2023 when the IRA efficiency tax credits are available.
Evaluators should leverage QA/QC data collected by PSD to inform the second, enhanced rigor evaluation.
<b>HERs</b>  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.
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.
<b>Commercial DI</b>  The Evaluators should follow up with SJG and implementation staff in PY2 to report on the program effects of focusing on the project pipeline when approving DI projects.
The Evaluators should review the QA/QC reports for effectiveness and possible inclusion in the M&V verification process in PY2 and beyond.

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.
<b>ESB: Prescriptive and Custom</b>
Continue trying to develop relationships with trade allies and explore options for marketing the program with a focus on the unique benefits of the program compared to the Direct Install offerings.
For Custom projects we recommend ex-ante analyses use the actual equipment efficiencies when available, instead of deferring to assumed or deemed efficiencies.

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
Include quantity field.
Review AHRI reference numbers to avoid incorrect or incomplete ID numbers.
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 Evaluators. Some specific examples are:
<ul style="list-style-type: none"> <li>■ Include an estimate of home Square Footage in the tracking data to facilitate accurate calculations for air sealing.</li> <li>■ Include baseline SEER and EFLH in the tracking data being used to calculate central AC replacement savings.</li> <li>■ Include efficiency or capacity for boiler and furnace replacements for new or existing systems in the tracking data.</li> </ul>

<b>QHEC</b>
Improve program tracking data quality by adding product model numbers and variables required in the NJ TRM algorithms to tracking data.
Improve reporting by incorporating quantity into tracking data savings calculations.
Improve realization rates by ensuring that program tracking data follows the agreed on savings algorithms agreed on in the Coordinated Measure List.
<b>MI Weatherization</b>
Include an estimate of building square footage for homes with Air Sealing.
Include all necessary Duct Sealing and Repair information in the tracking data.
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.
Improve data and savings calculation consistency while using the QA/QC process to identify issues.
<b>HERs</b>
Continue managing the program and program data in the same manner.
<b>Commercial DI</b>
Continue managing the program and program data in the same manner.
<b>ESB: Prescriptive and Custom</b>
Include formulas and energy calculations in project documentation to support M&V review.

### **1.3 TRM Update Values**

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 SJG'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 demographics assumptions. These suggested TRM updates would affect the EE Products, QHEC, and HPwES programs – see details in Table 1-5.

*Table 1-5: SJG Program Evaluation Data that may be Used to Inform NJ TRM Updates*

<b>Residential</b>							
<i>Measure</i>	<i>Notes</i>						
Water Heater (230)	AHRI lookups found 53% were 40 gal, 47% were 50 gal capacity tanks						
Tankless Water Heater (301)	Out of 12 survey responses, 63% replaced a tank and 38% replaced a tankless heater.						
Clothes Washer (634)	Define multi-family gallons/year as communal or within units. There was confusion by implementation in PY1.						
Faucets and Aerators (621)	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 (9,243)	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 (349)	(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 (337)	(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 (1) option to the Boiler Reset Controls (1) 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.						
<b>Commercial</b>							
<i>Measure</i>	<i>Notes</i>						
--	No data was collected for commercial TRM updates in PY1.						
<b>Demographics &amp; Home Characteristics</b>							
<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	94%	86%	86%	99%	7%	13%	107
Marketplace	93%	83%	63%	88%	10%	4%	70
Non-Participant	90%	83%	68%	86%	23%	14%	69
HER	92%	92%	85%	98%	18%	12%	142
QHEC	91%	88%	85%	100%	24%	23%	88
<b>Weighted Average</b>	<b>92%</b>	<b>87%</b>	<b>80%</b>	<b>95%</b>	<b>16%</b>	<b>13%</b>	<b>476</b>

## **2. Executive Summary**

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On May 23, 2018, NJ Governor signed into law the Clean Energy Act of 2018<sup>2</sup> (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% 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 achieve annual reductions of at least 2% 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 achieve annual reductions in the use of natural gas of at least 0.75% 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. The 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 SJG programs that reported participation during PY1.

### **2.1 Description of PY1 Programs**

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SJG's residential programs included:

- The Energy Efficient (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) started with a home energy audit and if the customer qualified, the contractors

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<sup>2</sup> P.L. 2018, c.17 (N.J.S.A. 48:3-87.8 et seq.).

used SnuggPro modeling software to calculate the cost and energy savings for the project. Potential measures included 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) provided 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 provided income eligible customers with an in-home audit and based on the results of the audit the participant may have also received weatherization measures at no cost.
- The Existing Homes Home Energy Reports program (HER) provided personalized reports to customers on their energy usage, comparisons to peers, and suggestions to save energy through direct mail and email channels.

SJG's commercial programs included:

- The Energy Solutions for Business Prescriptive and Custom subprograms included 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 of electric and/or natural gas measures for commercial and industrial customers.
- Energy Solutions for Business Energy Management and Engineered Solutions subprograms provided a holistic approach to improving energy usage through maintenance, tune-up, and retro-commissioning through the Management channel. The Solutions channel provided energy audits to public service and non-profit entities. Based on the results of the audit, incentives and on bill re-payment were available to complete a variety of energy savings projects. There was no planned participation for this subprogram in PY1.
- The Commercial Direct Install program provided a free energy audit, direct install measures, and suggestions for other SJG 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**

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The SJG PY1 portfolio of programs achieved the following ex-post results versus goals (Table 2-3):

- 128% of the PY1 therms savings goals.
- 106% of PY1 participation goals.
- 101% of lifetime therms PY1 savings goals.
- 44% of kWh PY1 savings goals.
- 31% of lifetime kWh PY1 savings goals.
- 384% 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, however this did not affect program participation for several programs, as HPwES, QHEC, HER, and Commercial DI all exceeded the participation goals. That said, 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.
- 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 SJG 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. SJG 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*

<b>Program</b>	<b>Estimated Participants</b>	<b>Projected Net Annual Natural Gas Savings (therms)</b>	<b>Projected Net Lifetime Natural Gas Savings (therms)</b>	<b>Projected Net Annual Electric Savings (kWh)</b>	<b>Projected Net Lifetime Electric Savings (kWh)</b>	<b>Projected Net Annual Peak Demand Savings (kW)</b>
EE Products	25,817	1,061,256.00	11,897,386.00	968,521	7,331,899	0.00
HPwES	200	65,981.00	1,121,678.00	195,457	3,322,774	7.00
QHEC	850	24,029.00	183,912.00	736,033	8,514,127	8.00
MI Weatherization	350	57,536.00	1,056,388.00	319,231	4,257,989	8.00
HERs	150,000	634,197.00	1,358,284.00	-	-	-
Com DI	15	20,713.00	310,699.00	692,442	10,386,630	19.00
ESB: Pres & Cust	843	77,700.00	176,888.00	617,447	14,216,211	36.00
Energy Management	0	0.00	0.00	0	0	0.00
Engineered Solutions	0	0.00	0.00	0	0	0.00
Multi-Family	652	18,001.00	242,927.00	813,087	12,842,277	12.00
<b>Total</b>	<b>178,727</b>	<b>1,959,413.00</b>	<b>16,348,162.00</b>	<b>4,342,218</b>	<b>60,871,907</b>	<b>90.00</b>

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

<b>Program</b>	<b>Program Participants</b>	<b>Gross Ex-Post Annual Natural Gas Savings (therms)</b>	<b>Gross Ex-Post Lifetime Natural Gas Savings (therms)</b>	<b>Gross Ex-Post Annual Electric Savings (kWh)</b>	<b>Gross Ex-Post Lifetime Electric Savings (kWh)</b>	<b>Gross Ex-Post Annual Peak Demand Savings (kW)</b>
EE Products	15,077	883,918.48	12,312,174.07	1,604,494	14,022,880	282.58
HPwES	235	67,652.07	1,425,719.96	113,633	2,073,338	41.00
QHEC	1,288	5,674.79	53,373.81	136,405	1,846,778	9.92
MI Weatherization	117	27,682.13	792,360	33,026	835,420	12.03
HERs	171,730	1,494,014	1,494,014	-	-	-
Com DI*	10	11,795.42	156,037.88	-	-	-
ESB: Pres & Cust*	9	11,461.48	211,226.19	-	-	-
Energy Management**	-	-	-	-	-	-
Engineered Solutions**	-	-	-	-	-	-
Multi-Family*	217	3,833.83	38,338.34	2,134	32,008	0.21
<b>Total</b>	<b>188,683</b>	<b>2,506,032.20</b>	<b>16,483,243.76</b>	<b>1,889,692</b>	<b>18,810,424</b>	<b>345.74</b>

\* 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: Participation and Gross Ex-Post Savings Realization Rate by Program for PY1*

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%	83%	103%	166%	191%	--
HPwES	118%	103%	127%	58%	62%	586%
QHEC	152%	24%	29%	19%	22%	124%
MI Weatherization	33%	48%	75%	10%	20%	150%
HERs	114%	236%	110%	--	--	--
Com DI*	67%	57%	50%	--	--	--
ESB: Pres & Cust*	1%	14%	119%	--	--	--
Energy Management**	--	--	--	--	--	--
Engineered Solutions**	--	--	--	--	--	--
Multi-Family*	33%	21%	16%	0%	0%	2%
<b>Total</b>	<b>106%</b>	<b>128%</b>	<b>101%</b>	<b>44%</b>	<b>31%</b>	<b>384%</b>

There were many challenges involved in launching SJG's 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's inflationary concerns.
- Customer's refusing work beyond an audit.

### **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 using the program tracking data.
- 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's design, barriers to participation, implementation, and outcomes. To investigate these areas, the Evaluators 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 **7,579 customers**, who purchased **9,832 measures** from the online marketplace channel, and **4,240 customers** received rebates for **5,245 qualified products**. The evaluation found that in PY1 the program resulted in gross ex-post savings of **883,918.48 therms** (91% realization rate, RR), **1,604,494 kWh** (98% RR) savings, and **282.58 kW** (83% RR) demand savings. Gross lifetime savings were **12,312,174.07 therms** and **14,022,880 kWh**.

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

- Consider working with contractors to bolster outreach and enrollment efforts for the EEP Downstream program.
- Continue to use bill inserts and marketing emails to promote SJG's programs.

- Add messaging or provide documentation to the Online Marketplace purchases on how to utilize a smart thermostat's energy savings features and report the energy saving capabilities.
- 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 SJG customers and messaging that describes how those measures will save on natural gas usage in the home.
- Add the date of purchase to Online Marketplace tracking data.

### HPwES

During PY1 the HPwES program had participation from **235 customers**, who installed **1,000 measures** into their homes. The evaluation found that in PY1 the program resulted in gross ex-post savings of **67,652.07 therms** (101% RR), **113,663 kWh** (70% RR), and **41 kW** (no ex-ante reported) demand savings. Gross lifetime savings were **1,425,719.96 therms** and **2,073,338 kWh**.

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

- Implementation interviews discussed the forthcoming Inflation Reduction Act (IRA) incentives for home weatherization and efficiency measures may substantively change the home weatherization market. SJG 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 3<sup>rd</sup> party QA/QC contractor, Performance Systems Development (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 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 SJG should coordinate with Snugg Pro staff to establish reporting protocols so that the Evaluators have access to all model inputs.
- 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

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

#### *QHEC*

During PY1 the QHEC program provided **1,288 customers** with **3,178 measures** with a total gross savings of **5,674.79 therms** (91% RR) of gas savings, **136,405 kWh** (190%) electricity savings, and **9.92 kW** (91%) demand reduction. Gross lifetime savings were **53,373.81 therms** and **1,846,778 kWh**.

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

- Ensure the QHEC program's auditor explains SJG's other offerings and their applicability thoroughly and clearly.
- Bill inserts and marketing emails to customers drive customer awareness for the QHEC program.
- Have a tracking data field for refused, unavailable, or in-compatible measures during Direct Install visits.
- Consider including additional gas saving measures in the program measure mix such as window treatments, simple weatherization measures, or professionally installed smart thermostats.

#### *MI Weatherization*

During PY1 the MI Weatherization program completed **117 projects** with a reported savings per home of 261 therms. This resulted in ex-post gross savings of **27,682.13 therms** (91% RR) gas savings, **33,026 kWh** (87% RR) electric savings, and **12.03 kW** (no ex-ante reported) demand savings. Gross lifetime savings were **792,359.51 therms** and **835,420 kWh**.

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

- Evaluators should leverage data collected by the implementer's 3<sup>rd</sup> 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.
- 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.

- The Evaluators should coordinate with other utility evaluators to determine if billing analysis results could be combined to increase the population and improve precision for a TRM update.
- 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 **1,494,014.00 therms** for a **105% realization rate**, with an average savings equal to **1.07%** of annual therms consumption. The NTG = 1 for this program and with the SJG assumed measure life of 2.1 years for the first year of claimed savings from all cohorts, generated lifetime savings of **3,137,429.40 therms**.

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

- Save and store historical billing data for all customers in each wave.
- 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, the Evaluators used values from applicable baseline tables for direct install measures that more accurately reflected the project’s baseline conditions.

### *Commercial DI*

During the first year of the program, 62 audits were conducted but 52 of the customers declined DI measures or retrofit projects which resulted in program level ex-ante gross annual savings of **11,795.42 therms** (100% RR), **1,931 kWh** (100% RR), and **15.00 kW** (100% RR). Lifetime savings for the measures installed sum to **156,037.88 therms** and **28,964 kWh**. The four evaluated projects in the M&V sample had a **103% realization rate** for the boiler, boiler fuel economizer, boiler reset controls, central air conditioner with gas furnace, demand control ventilation, pipe insulation, and low flow aerators installed. Ex-post results were not calculated for total program savings because the Evaluators were not able to complete a full evaluation of the limited implementation of the program.

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

- 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 SJG and implementation staff in PY2 to report on the program effects of focusing on the project pipeline when approving DI projects.
- The Evaluators should review the QA/QC reports for effectiveness and possible inclusion in the M&V verification process in PY2 and beyond. In July 2022, SJG hired PSD to conduct 3<sup>rd</sup> 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% of DI projects.

### *ESB: Prescriptive and Custom*

Nine projects were completed in PY1, of those, all were prescriptive projects. The program resulted in program level ex-post gross annual savings of **11,461.48 therms** (108% RR) and gross **lifetime savings of 211,226.19 therms**.

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

- 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.

### *Multi-Family*

The Multi-Family program got a late start in PY1 and also had delayed reporting of program data which is why the Evaluator, SJG staff, and the SWE decided that the first evaluation of this program should cover PY1 and PY2. During PY1 the program had **217 participants**, gross ex-ante savings of **3,833.34 therms** and **38,338.34 lifetime therms**, electric gross savings of **2,134 kWh** and **0.21 kW**.

### **2.4 Recommended TRM Adjustments**

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These suggested TRM updates would affect the EE Products, QHEC, and HPwES programs – details can be found in Table 2-4.

*Table 2-4: SJG Program Evaluation Data that may be Used to Inform NJ TRM Updates*

<b>Residential</b>							
<i>Measure</i>	<i>Notes</i>						
Water Heater (230)	AHRI lookups found 53% were 40 gal, 47% were 50 gal capacity tanks						
Tankless Water Heater (301)	Out of 12 survey responses, 63% replaced a tank and 38% replaced a tankless heater.						
Clothes Washer (634)	Define multi-family gallons/year as communal or within units. There was confusion by implementation in PY1.						
Faucets and Aerators (621)	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.						
<b>Commercial</b>							
<i>Measure</i>	<i>Notes</i>						
--	No data was collected for commercial TRM updates in PY1.						
<b>Demographics &amp; Home Characteristics</b>							
<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	94%	86%	86%	99%	7%	13%	107
Marketplace	93%	83%	63%	88%	10%	4%	70
Non-Participant	90%	83%	68%	86%	23%	14%	69
HER	92%	92%	85%	98%	18%	12%	142
QHEC	91%	88%	85%	100%	24%	23%	88
<b>Weighted Average</b>	<b>92%</b>	<b>87%</b>	<b>80%</b>	<b>95%</b>	<b>16%</b>	<b>13%</b>	<b>476</b>

### **3. Introduction to the M&V Report**

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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
- HPwES program
- QHEC program
- HERs program

Partial evaluations were conducted on the:

- MI-Weatherization program
- Commercial DI program
- ESB: Prescriptive and Custom program

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

- An Abstract with a brief list of program recommendations and overview of potential TRM updates.
- A brief Executive Summary which includes a description of the motivation for SJG's EE programs, discussion of the programs PY1 success compared to planned metrics, and an overview of each programs results.
- A benchmarking comparison to several successful gas utility EE programs.
- 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.
- 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**

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#### **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 SJG.
- 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  $\pm 10\%$  at the 90% confidence interval at the program level and  $\pm 15\%$  at the 85% confidence interval at the measure level for high impact measures (greater than 5% of program savings).<sup>3</sup>
- All surveys included a 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

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<sup>3</sup> If program participation for a specific measure subgroup exceeded 1,000, then the sample size was adjusted to achieve  $\pm 15\%$  at the 90% 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. The Evaluators 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).

The Evaluators have 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 the Evaluators used to calculate gas and electric savings that resulted from the SJG programs.

### **3.2.1 Residential Programs**

#### *Impact*

During the evaluation, the Evaluators:

- 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 and QHEC 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 List 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 Evaluators 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 Laboratory<sup>4</sup>.

#### *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.

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

### *Low Income Approach*

The Evaluators recoded American Community Survey (ACS)<sup>5</sup> data on household size and income to create a flag that indicated the percentage of households that were at or below 250% 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 Evaluators used the Missouri Census Data Center's<sup>6</sup> 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 SJG service territory to estimate the percentage of households served by the utility have incomes below 250% FPL. These findings were then be compared to customer self-report income data gathered through the program surveys to estimate which programs are likely underserving customers below 250% 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.

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

<sup>6</sup> 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 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 section 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

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

### 4.1 Conclusions by Program

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This section, 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, **107 responses** were collected, which was more responses than required for the overall 90% confidence interval with 10% precision (90/10). At the measure level, five 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 **70 responses**, more than was required for 90/10 and more than the measure level 85/15 requirement for all measures (Table 7-9). The non-participant survey had **69 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	2,276	321,184.78	55.1%	23	47	85/10.5
Gas Furnace with Water Heater	447	172,392.53	29.6%	22	32	85/12.3
Gas Combination Boiler	278	39,215.46	6.7%	21	23	85/14.5
Water Heater	533	16,117.37	2.8%	22	39	85/11.2
Smart Thermostat	363	14,654.31	2.5%	22	23	85/14.6
Gas Boiler	57	9,917.17	1.7%	17	1	85/72
Clothes Dryer	656	5,044.64	0.9%	22	9	85/25
Clothes Washer	634	4,080.60	0.7%	22	8	85/26
Reset Controls	1	27.56	0.0%	1	0	-
<b>Total</b>	<b>5,245</b>	<b>582,634.42</b>	<b>100%</b>	<b>172</b>	<b>182</b>	<b>85/5.2</b>

*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	8,880	358,924.20	91.7%	23	41	85/11.3
Low Flow Showerheads	663	15,613.79	4.0%	22	62	85/8.8
Water Savings Kit	189	15,372.76	3.9%	21	24	85/13.8
Faucet Aerators	100	1,403.88	0.4%	21	53	85/6.9
<b>Total</b>	<b>9,832</b>	<b>391,314.63</b>	<b>100.0%</b>	<b>87</b>	<b>180</b>	<b>85/5.3</b>

### *Impact Results*

The **15,077 measures** purchased and installed through the PY1 EE Products program saved **876,273.12 gross ex-post therms** which will have a lifetime savings of **12,235,720.41 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*

Measure Category	Quantity	Ex-Ante Savings (therms)	Ex-Post Savings (therms)	therms RR	EUL	Lifetime Savings (therms)
<b>Downstream</b>						
Gas Furnace	2,276	321,185	303,401	94%	20	6,068,021.57
Gas Furnace with Water Heater	447	172,393	88,217	51%	15	1,323,248.36
Gas Combination Boiler	278	39,215	66,297	169%	20	1,325,938.09
Smart Thermostat	363	14,654	14,654	100%	7.5	109,907.33
Gas Boiler	57	9,917	10,434	105%	20	208,675.13
Tankless Water Heater	301	10,160	10,176	100%	20	203,517.74
Gas Storage Tank Water Heater	230	5,205	9,779	188%	11	107,567.19
Clothes Dryer	656	5,045	5,045	100%	12	60,535.68
Clothes Washer	634	4,081	3,423	84%	11	37,647.46
Indirect- Fired Storage Tank Water Heater	2	752	253	34%	11	2,778.61
Reset Controls	1	28	0	N/A	10	0.00
<b>Online Marketplace</b>						
Smart Thermostat	8,880	358,924.20	343,230.89	96%	7.5	2,574,231.70
Low Flow Showerheads	663	15,613.79	14,317.84	92%	10	143,178.37
Water Saving Kit	189	15,372.76	13,394.21	87%	10	133,942.10
Faucet Aerators	100	1,403.88	1,298.47	92%	10	12,984.74
<b>Total</b>	<b>15,077</b>	<b>973,949.05</b>	<b>883,918.48</b>	<b>91%</b>	<b>14</b>	<b>12,312,174.07</b>

Some measures in the program also saved electric energy during PY1, the annual gross energy savings and demand was **1,604,494 kWh** and **282.58 kW** with a lifetime gross savings of **14,022,880 kWh**.

*Table 4-4: EE Products Gross Annual, Demand, and Lifetime Electric Savings*

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
<b>Downstream</b>									
Central Air Conditioner (Tier 1)	680	238,856	195,946	82%	15	2,939,190	316.00	259.24	82%
Smart thermostat	363	48,291	48,291	100%	7.5	362,179	N/A	N/A	N/A
Clothes Washer	634	36,354	50,577	139%	11	556,348	3.42	4.85	142%
Central Air Conditioner (Tier 2)	20	11,577	11,194	97%	15	167,905	15.32	14.81	97%
Ductless Mini-Split Heat Pump (Single)	4	1,624	3,374	208%	17	57,366	2.78	1.52	55%
Ductless Mini-Split Heat Pump (Multi)	2	812	1,776	219%	17	30,186	1.39	1.05	76%
Air Source Heat Pump (Tier 2)	1	460	504	109%	15	7,552	0.77	0.67	87%
Air Source Heat Pump (Tier 1)	1	233	329	142%	15	4,940	0.46	0.44	96%
<b>Online Marketplace</b>									
Smart Thermostat	8,880	1,265,809	1,211,128	96%	7.5	9,083,461	N/A	N/A	N/A
Low Flow Showerheads	663	9,704	37,165	378%	10	371,653	N/A	N/A	N/A
Water Saving Kit	189	21,225	39,646	187%	10	396,460	N/A	N/A	N/A
Faucet Aerators	100	3,356	4,564	136%	10	45,640	N/A	N/A	N/A
<b>Total</b>	<b>11,537</b>	<b>1,638,301</b>	<b>1,604,494</b>	<b>98%</b>	<b>8.7</b>	<b>14,022,880</b>	<b>340.14</b>	<b>282.58</b>	<b>83%</b>

### *Discussion of Realization Rates*

- The realization rates differed from 100% for gas furnaces, heaters, boilers, water heaters, and clothes washers 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) the Evaluators found the following results:

- SJG has strong working relationships with the residential program implementation vendors, though there were some initial communication and data tracking related challenges.

- 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.
- SJG'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.
- Staff facilitated discussions indicate there are sufficient QA/QC procedures and policies in place, though the ability to assess effectiveness of QA/QC procedures during PY1 was limited because of the recent start date of the third-party inspector.

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

- Nearly all respondents were homeowners, living in single-family homes, with gas home (94%) and water (86%) heating.
- The distribution of respondents skewed older, most identified as white and over half said their income said their income was more than 400% of the Federal Poverty Level (FPL).
- Downstream participants primarily learned about the program from contractors (90%); however, only 61% of respondents worked with a contractor to apply for the rebate.
- The Downstream rebate process is generally easily understood and uncomplicated to navigate.
- The On-Bill Repayment Program (OBRP) is enabling SJG customers to finance eligible equipment. Forty-eight percent of respondents reported applying for the program and eighty-seven percent of these customers were approved. Of those who did not apply for OBRP, 21% said they did not know a financing option was available through their utility.
- Downstream rebate customers were satisfied with the program overall and experience with SJG. Sixty-four percent said they had recommended the program to someone else and of those who had not recommended the program 82% said they would recommend it.

- Most respondents were not aware of SJG's energy efficiency offerings beyond its Downstream program.

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

- Eighty-eight respondents were homeowners, and 63% were living in single-family homes, with gas home (93%) and water (83%) heating.
- The distribution of respondents skewed older, most identified as white, said that English was the primary language spoken in their home, and reported household income levels above 400% of the FPL.
- Most smart thermostat customers installed and learned about their new thermostat independently.
- About three-quarters of smart thermostat customers have not noticed savings since installing them.
- Most customers indicated they learned about the Online Marketplace through a bill insert or other mailing from SJG.
- 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.
- Seventy-three percent said they had recommended the program to someone else and of those who had not recommended the program 63% said they would recommend it.
- Most Online Marketplace customers had not participated in other SJG offerings. The primary reason customers have not participated in other SJG programs was they were not aware of them, though a lack of time or perceived applicability were also driving factors.

#### *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 SJG's customer base.** Over half of survey respondents said their income said their income was more than 400% of the Federal Poverty Level (FPL).

**Recommendation: Use targeted bill inserts and marketing emails to promote SJG's programs to specific customer groups.** Customers noted SJG emails and bill inserts as well as internet searches as the primary sources of information for energy efficiency.

**Conclusion: Contractors are driving awareness and participation in the Downstream program.** Ninety percent of EEP Downstream survey respondents worked with a

contractor. Sixty-one percent of respondents worked with a service provider to apply for the rebate. Most smart thermostats rebated through the Downstream program were installed by contractors.

**Recommendation:** Consider working with contractors to bolster outreach and enrollment efforts for the EEP Downstream program. Downstream participants tend to learn about the program most frequently from contractors and typically work with their service provider to apply for their rebate. This may suggest an opportunity for SJG to increase program awareness and participation by holding an in-person training or webinar or through distributing additional outreach materials for the contractors to use during their service calls.

**Conclusion:** Direct outreach from SJG 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 SJG, 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 SJG to continue to build awareness and engagement with its EEP programs.

**Conclusion:** About three-quarters of Marketplace smart thermostat recipients have not noticed savings since installing them. Seventy-three 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 provide documentation to the Online Marketplace purchases on how to utilize a smart thermostat's energy savings features and report the energy saving capabilities. Since most smart thermostat customers installed and learned about their new thermostat independently, providing them guided materials on proper installation and set-up for optimizing energy savings may support program goals.

**Conclusion:** Sixty-one percent of non-participant survey respondents were unaware that South Jersey Gas offered rebates; awareness was highest for SJG's appliance rebate and HPwES programs. Bill inserts/mailers and emails from SJG are driving awareness and customers noted SJG emails and bill inserts as well as conversations with friends, family and colleagues as the primary sources of information about energy efficiency.

**Recommendation:** Consider focused marketing or outreach events that highlight 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 inserts and emails could foster increased interest and participation. Additionally, since many customers reported learning about energy efficiency through word of mouth, educational events could further drive interest and support community discussion.

**Conclusion:** **Non-participant survey respondents' attitudes indicate an opportunity to improve awareness and knowledge about energy efficiency and that customers were interested in various SJG offerings.** Though 81% of respondents agreed with the statement that "Energy efficiency saves money", only 41% said they knew of steps they could take to reduce their energy use. More than one-third of respondents stated they were interested in programs that offered incented high efficiency showerheads, LED lightbulbs, faucet aerators, advanced power strips, ENERGY STAR clothes washers, and ENERGY STAR clothes dryers.

**Recommendation:** **Consider marketing campaigns that advertise specific measures that are popular with SJG customers and include messaging that describes how those measures will save on natural gas usage in the home.**

#### *Barriers to Participation*

- **Customer awareness is a barrier to participation.** Sixty-one percent of respondents were unaware that South Jersey Gas offered rebates for energy efficient equipment and home improvements. The Evaluators compared the manner in which customers learned about the program across age groups and found that older customers tended to be aware of SJG's offerings at a higher rate, compared to younger customers. Fifty-nine percent of respondents over 55 years old were aware of SJG's offerings, compared to 33% between 35-55 years old and 4% of respondents that identified as under 35 years old.
- Non-participants that were aware of SJG's programs said they were unsure why they had not participated, or their home was already efficient. Survey respondents' attitudes regarding energy efficiency and uncertainty regarding the reasons they had not participated may indicate an opportunity to improve awareness and knowledge about energy efficiency.
- **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. 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*

The Evaluators invited a **census** of participants with a valid email address (n=130) to take an online survey. For a relatively small population (n=145) a sample size sufficient to determine savings with relative precision of  $\pm 10\%$  at the 90% confidence interval is 47. A sample size sufficient to determine savings with relative precision of  $\pm 15\%$  at the 85% confidence interval at the measure level is 20.

##### *Impact Results*

The **1,000 measures** installed in **235 homes** through the PY1 HPwES program saved **67,652.07 gross ex-post therms** which will have a lifetime savings of **1,425,719.96 therms** since the NTG was deemed at 1 for the first triennium of programs.

*Table 4-5: HPwES Gross Annual and Lifetime Gas Savings*

<b>Measure Category</b>	<b>Quantity</b>	<b>Ex-Ante Savings (therms)</b>	<b>Ex-Post Savings (therms)</b>	<b>therms RR</b>	<b>EUL</b>	<b>Lifetime Savings (therms)</b>
Air Sealing	234	15,772.83	8,128.22	52%	15	121,923.36
Insulation	221	17,274.31	17,274.31	100%	30	518,229.19
Furnace	187	22,162.02	30,583.59	138%	20	611,671.75
Boiler	5	668.84	923	138%	20	18,459.98
Boiler Combi	11	1,336.33	1,844.14	138%	20	36,882.71
Storage DHW (< 55 gal)	134	6,932.76	6,580.00	95%	11	72,379.96
Storage DHW (> 55 gal)	4	227	-48.58	NA	11	-534.36
Tankless DHW	31	2,258.63	2,172.73	96%	20	43,454.68
Central Air Conditioner	170	-	-	100%	15	-
Heat Pump	2	83.73	83.73	100%	15	1,255.95
Duct Sealing	1	110.93	110.93	100%	18	1,996.74
<b>Total</b>	<b>1,000</b>	<b>66,827.38</b>	<b>67,652.07</b>	<b>101%</b>	<b>21</b>	<b>1,425,719.96</b>

Some measures in the program also saved electric energy during PY1, the annual gross energy savings and demand was **113,663 kWh** and **41.00 kW** with a lifetime gross savings of **2,073,338 kWh**. (No ex-ante demand reduction was reported).

*Table 4-6: HPwES Gross Annual and Lifetime Electric Savings*

<b>Measure Category</b>	<b>Quantity (Homes w/ Measure)</b>	<b>Ex-Ante Savings (kWh)</b>	<b>Ex-Post Savings (kWh)</b>	<b>kWh RR</b>	<b>EUL</b>	<b>Lifetime Savings (kWh)</b>
Air Sealing	234	473	10,668	2257%	15	160,024
Insulation	221	24,453	24,453	100%	30	733,590
Central Air Conditioner	170	135,695	77,346	57%	15	1,160,190
Heat Pump	2	666	666	100%	15	9,985
Duct Sealing	1	530	530	100%	18	9,549
<b>Total</b>	<b>235</b>	<b>161,817</b>	<b>113,663</b>	<b>70%</b>	<b>18</b>	<b>2,073,338</b>

#### *Discussion of Realization Rates*

- The ex-post savings estimates and realization rates are not based on empirical data since the Evaluators were not provided with specific variables such as baseline R-value or home square footage needed to calculate. Therefore, the realization rate (1.01 for therms savings) will likely change in future program years once additional data is provided with program tracking data and documentation.

Detailed discussions of the realization rates can be found in Section 8.3.

### *Process Evaluation Results*

- Participation for the first program year exceeded expectations and contractors were quickly and readily able to recruit participants to the program. Moreover, though the number of surveyed participants was small (n=15) all respondents said they elected to do all recommended measures.
- Customers reported high satisfaction levels with the program and stated that they most liked the ease of participation as well as the rebate and financing options available.

### *Conclusions and Recommendations*

**Conclusion:** **The average savings per home (284 therms, around 25% 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 (1.01 for therms savings) is subject to change.

**Recommendation:** **The PY1 realization rates should not be included in the TRM update because the Evaluators 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:** **The primary participation barrier is inherent in the program design and allocated budget** (\$500 contractor incentive, \$5,000 per home, plus 0% interest OBR loans of up to \$15,000)<sup>7</sup>. SJG suggested they would have expended the entire 3-year budget in the first year if they had not imposed participation constraints of one project per contractor per month. Consequently, an unknown number of interested potential participations are precluded due to program budget constraints.

**Recommendation:** **The forthcoming Inflation Reduction Act (IRA) incentives for home weatherization and efficiency measures may substantively change the home weatherization market.** The IRA incentives may also impact HPwES program attribution. SJG should consider program optimization options. For example, SJG could limit projects with furnace or boiler replacements to reduce program budget allocated to heating system replacements, which may allow them to increase the number of projects (i.e. lower the average incentive per home and increase the number of participant homes).

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

<sup>7</sup> The Evaluators did not assess the cost of OBR interest, but most participants took advantage of the OBR option.

**Recommendation:** **SJG should provide QA/QC data to the Evaluators who can 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 SJG should coordinate with implementation and Snugg Pro staff to establish reporting protocols so that the Evaluators has access to all model inputs.

#### *Barriers to Participation*

- **The program was more popular than the budget was designed to support.** The primary participation barrier is inherent in the program design and allocated budget (\$500 contractor incentive, \$5,000 per home, plus 0% interest OBR loans of up to \$15,000). SJG suggested they would have expended the entire 3-year budget in the first year if they had not imposed participation constraints of one project per contractor per month. Consequently, an unknown number of interested potential participations are precluded due to program budget constraints.

#### **4.1.3 QHEC**

##### *Sampling and Survey Results*

The Evaluators 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% 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, **88 responses** were collected, which was a response rate of 16%. All measures met the 85/15 requirement in the SWE's basic rigor guidelines (Table 9-5).

*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 Received	Final Confidence Interval
Showerheads	117	136	4,569.68	73.5%	21	23	85/13.6
Aerators	101	143	783.36	12.6%	21	28	85/11.8
Pipe Insulation	240	741	860.45	13.8%	22	44	85/9.9
Advanced Power Strips	213	213	N/A	N/A	N/A	47	85/9.4
LEDs	617	1,945	N/A	N/A	N/A	35	85/12
<b>Total</b>	<b>1,288</b>	<b>3,178</b>	<b>6,213.49</b>	<b>100%</b>	<b>64</b>	<b>177</b>	<b>85/5</b>

*Impact Results*

The **3,178 measures** installed during the home energy consultations saved **5,674.79 gross ex-post therms** which will have a lifetime savings of **53,373.81 therms** since the NTG was deemed at 1 for the first triennium of programs.

*Table 4-8: QHEC Gross Annual and Lifetime Gas Savings*

Measure Category	Quantity	Ex-Ante Savings (therms)	Ex-Post Savings (therms)	therms RR	EUL	Lifetime Savings (therms)
Advanced Power Strips	213	N/A	N/A	N/A	8	--
Faucet Aerators	143	783.36	1,819.27	232%	10	18192.72
LEDs	1,945	N/A	N/A	N/A	15	--
Pipe Insulation	741	860.45	1,789.93	208%	11	19,689.20
Showerheads	136	4,569.68	2,065.59	45%	7.5	15,491.89
<b>Total</b>	<b>3,178</b>	<b>6,213.49</b>	<b>5,674.79</b>	<b>91%</b>	<b>9</b>	<b>53,373.81</b>

The program measures also saved electric energy during PY1, the annual gross energy savings and demand was **136,405 kWh** and **9.92 kW** with lifetime gross savings of **1,846,778 kWh**.

*Table 4-9: QHEC Gross Annual, Demand, and Lifetime Electric Savings*

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	213	21,896	19,926	91%	8	159,406	2.56	2.33	91%
Faucet Aerators	143	998	5,152	516%	10	51,518	N/A	N/A	N/A
LEDs	1,945	40,296	106,221	264%	15	1,593,321	4.02	7.60	189%
Pipe Insulation	741	291	1,210	417%	11	13,313	N/A	N/A	N/A
Showerheads	136	8,348	3,896	47%	8	29,220	N/A	N/A	N/A
<b>Total</b>	<b>3,178</b>	<b>71,829</b>	<b>136,405</b>	<b>190%</b>	<b>14</b>	<b>1,846,778</b>	<b>6.58</b>	<b>9.93</b>	<b>151%</b>

### *Discussion of Realization Rates*

- The Evaluators calculated the savings generated from low flow faucet 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. 34 of the TRM), which results in higher savings per aerator. The survey-derived in-service rate was 100% for bathroom and kitchen faucet aerators.
- The Evaluators calculated the savings generated from efficient showerhead measures using variables in the 2021 TRM as specified in the coordinated measure list. The Evaluators were unable to verify ex-ante per unit savings. The survey-derived in-service rate applied to showerheads was 93%.
- The Evaluators 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 in-service rate of 95%.
- For LEDs, the agreed on TRM equations changed in the Coordinated Measure List during the evaluation period, affecting ex-ante hour of use values. The Evaluators used hour of use values provided in the 2020 NJ TRM for interior and exterior installation locations. The difference between ex-ante and ex-post hour of use values resulted in realization rates over 100%. A survey-derived in-service rate of 98% was also applied to ex-post electricity savings.

### *Process Evaluation Results*

During the in-depth interviews (IDI) the Evaluators 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. SJG, 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 9.4.1, highlights were:

- QHEC is serving a range of SJG customers, though the distribution of QHEC participants skewed older and most identified as white and said that English was the primary language spoken in their home.
- 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.
- Customers that participate in the QHEC tend to go on to complete additional energy efficiency actions that are recommended during the visit.
- The QHEC program is providing a consistent participation experience.
- Customers were satisfied with the QHEC measures and the program overall.

### *Conclusions and Recommendations*

**Conclusion: There is an opportunity to better inform QHEC participants about SJG's other energy efficiency offerings.** Of the customers that had not participated in another program (n=51), 61% said they were unaware that SJG had other energy efficiency incentives or rebates programs.

**Recommendation:** **Ensure the QHEC program's auditor explains SJG'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.

**Additionally, consider different marketing approaches for QHEC.** Bill inserts and marketing emails spread customer understanding of the QHEC program as a first step; however, 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 goals in PY1.** Honeywell's program manager confirmed that the SJG QHEC program will not meet its savings goals for PY1. The SJG energy efficiency manager said that they would meet savings goals in year two but was "not as confident" about meeting goals in year three. The program is enrolling a sufficient number of customers, but it is not finding enough measure installation opportunities per home.

**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, window treatments, and smart thermostats could provide additional savings opportunities for the program. **Specifically, consider the energy savings value of a professionally installed smart thermostat.** Though the QHEC program did not yield savings for smart thermostat installations, 5 thermostats were installed by QHEC auditors (4 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)<sup>7</sup> and added savings from the QHEC auditor's professional smart thermostat installation could support program savings goals.

**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 SJG staff as having had minor effects on the QHEC program as well.

**Recommendation:** **Have a tracking data field for refused, unavailable, or incompatible measures during visits.** With lower-than-expected therms savings and

<sup>7</sup> E.g., Pennsylvania Technical Reference Manual, Volume 2: Residential Measures, page 47.

measure installs in PY1, this type of accountability could provide SJG 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 SJG residential programs.** Regarding participation in other programs, 66% said they had not participated in any additional SJG offerings after their QHEC participation. Of customers who had not participated in another program (n=51), 39% said they were aware of other programs (n=51).
- **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 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. 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 SJG 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.

#### 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  $\pm 10\%$  at the 90% confidence interval at the program level and  $\pm 15\%$  at the 85% 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 Evaluators 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).

##### *Impact Results*

The 117 projects resulted in ex-post gross savings of **27,682.13 therms** which will have a lifetime savings of **792,359.51 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*

Measure Category	Quantity	Ex-Ante Savings (therms)	Ex-Post Savings (therms)	therms RR	EUL	Lifetime Savings (therms)
Insulation	116	21,711.07	21,711.07	100%	30	651,332.11
Air Sealing	115	5,880.07	3,020.63	51%	15	88,201.03
Duct Sealing	27	2,915.27	2,915.27	100%	18	52,474.80
Tune-up	1	35.16	35.16	100%	10	351.57
<b>Total</b>	<b>117</b>	<b>30,541.57</b>	<b>27,682.13</b>	<b>91%</b>	<b>28.6</b>	<b>792,359.51</b>

The program also saved electric energy during PY1, the annual gross energy savings and demand was **33,026 kWh** and **12.03 kW** with lifetime gross savings of **835,420 kWh**. (No ex-ante demand reduction was reported).

*Table 4-11: MI Weatherization Gross Annual, and Lifetime Electric Savings*

Measure Category	Quantity	Ex-Ante Savings (kWh)	Ex-Post Savings (kWh)	kWh RR	EUL	Lifetime Savings (kWh)
Insulation	116	21,171	21,171	100%	30	635,139
Air Sealing	115	9,315	4,366	47%	15	65,488
Duct Sealing	27	7,489	7,489	100%	18	134,793
Tune-up	1	-	-	NA	10	-
<b>Total</b>	<b>259</b>	<b>37,975</b>	<b>33,026</b>	<b>87%</b>	<b>25</b>	<b>835,420</b>

### *Discussion of Realization Rates*

- **Air Sealing:** Building square footage was not included in the tracking data so the Evaluators used publicly available tax records to estimate building conditioned square footage for a sample of participants (n=52). Average size of homes receiving some type of air sealing measure was 1,648 ft<sup>2</sup>. Following the NJCEP protocol, this results in average savings of 26.4 therms. Though the NJCEP protocol 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 Evaluators compared the reported therms savings (108 therms/home, see Table 10-4) 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 ft<sup>2</sup>) 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 Evaluators were unable to estimate savings using the NJCEP protocol. The Evaluators reviewed the savings to ensure the reported estimates were reasonable and within range of expected savings. Homes had an average of 1,252 ft<sup>2</sup> of insulation added, saving 186 therms per home, which equates to a relatively high 0.15 therms/ ft<sup>2</sup> of insulated area. This

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

- **Tune-Up 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% reduction in annual heating energy if outdoor temperature reset controls are implemented. Only one participant received a tune-up. The measure description was “gas furnace tune-up” and the reported savings was 35 therms. This may be conservative (if annual heating consumption is 700 therms, a 5% reduction would save 35 therms).

### *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 SJG energy efficiency programs.
- 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 helps 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 estimates and realization rates are not based on empirical data.** The average savings per home (261 therms) is not unreasonable but may be high<sup>9</sup>. The evaluation team independently calculated savings for air sealing, which impacted the realization rate, but accepted savings for other measure (assumed ex-ante

<sup>9</sup> SJG's MI Weatherization program had larger homes (1,965 ft<sup>2</sup> versus 1,648 ft<sup>2</sup>) but lower savings per home (ETG: 208 therms. SJG: 261 therms per home).

= ex-post) because the tracking data did not include information required by the 2020 TRM protocols. Consequently, the realization rate does not reflect actual program impacts. Savings of 261 therms per home equates to a heat loss reduction or efficiency improvement of at least 20%.

Many of the reported insulation savings estimates (on average insulation savings was ~0.15 therm/ft<sup>2</sup> area treated) can only be achieved<sup>10</sup> if in situ R-value is less than R-3.5.

The average reported savings for duct improvement (108 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:** **SJG 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 % for supply and return
  - Duct leakage assessment (leaky, average, tight) or actual leakage measurements (at 25 Pa, or preferably normal static operation pressure "NSOP")
  - Duct insulation (existing R-value, final R-value if insulation is added)

**Conclusion:** **The results of pre/post monthly therm consumption billing analysis will provide a different estimate of actual program impacts per home.** However, the number of MI Weatherization projects is too low<sup>11</sup> 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.

<sup>10</sup> 2020 TRM Insulation Protocol, pg 75: 
$$\frac{\left(\frac{1}{R_b} - \frac{1}{R_q}\right) \times 5,160 \text{ HDD} \times 24 \times \text{Area}}{100,000 \frac{\text{Btu}}{\text{therm}} \times 80\% \text{ AFUE}}$$

<sup>11</sup> Typically, a sample of 500+ homes would be necessary to determine weather-related therm reduction of ~10%.

**Recommendation:** Considering the number of SJG 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 (\$17,000) was nearly 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 SJG cannot increase the per-home incentive limit, participants may have more energy savings opportunities. Therefore, other programs (HPwES, Energy Efficient Products) may be of interest to participants.

**Recommendation:** SJG should work with the implementer, 3<sup>rd</sup>-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 (117 completed projects by July 1, 2022) was lower than target (350 homes). This was due to program start-up delays and inability to do door-to-door marketing.

**Recommendation:** SJG should continue to use HER and bill inserts to target homes with the highest energy use. They should closely monitor interest, especially in 2023

when the Inflation Reduction Act efficiency tax credits are available and as cost of heating is of increasing interest. SJG should also 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.

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

**Recommendation:** **Evaluators should leverage QA/QC data collected by PSD to inform the second, enhanced rigor evaluation.**

**Conclusion:** **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.

**Recommendation:** **For the PY2 evaluation, the evaluators should conduct auditor interviews, contractor interviews, and contractor ride-alongs.** If participation exceeds ~300 homes<sup>12</sup>, 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?
- 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 SJG use Home Energy Report (HER) information to target customers with 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?

<sup>12</sup> Assuming 15% response rate, approximately 300 participants would be needed to establish NTG and other key parameters with 10% precision at the 90% confidence level.

- 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?

### *Barriers to Participation*

The Evaluators 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
- Lack of trust in effectiveness of a government-funded program. For example, one participant mentioned the program to a friend who responded with skepticism because they are not confident a contractor has incentive to do quality work if the homeowner is not paying for it (SJG participant).
- Owners of rental homes have little incentive to participate if tenant 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 (228,839) and non-participants (51,307). The data started on 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 Evaluators sent 3,123 customers that received HERs an email invitation. **Seventy-three participants and 69 non-participants** completed the survey. Five participants were screened-out from the survey.

#### *Impact Results*

The SJG HER program began before the launch of the CEA programs in PY1, Legacy Wave 1 began in 2016, Legacy Wave 2 began in 2017, and Legacy Wave 3 began in 2019. All three waves had seen their participant counts decrease due to customers

moving out by 6% by the end of PY1, the **171,730** participants take these move out rates into account. The program saved **1,494,014 therms** for a **105% realization rate**, with an average annual savings of **1.07%** of overall therms usage.

*Table 4-12: HER Gross Annual Gas 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	122,476	-	9.63	1,209,338.00	1.16%	-
Legacy Wave 2	14,108	-	7.1	102,491.00	1.22%	-
Legacy Wave 3	35,146	-	5.04	182,185.00	0.68%	-
<b>Total</b>	<b>171,730</b>	<b>1,425,920.00</b>	<b>8.48</b>	<b>1,494,014.00</b>	<b>1.07%</b>	<b>105%</b>

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

Because the SJG 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) the Evaluators 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 customers have received HERs for years, from both electric and gas utilities. This is an area for further research for this program.
- The HER program provides the possibility for cross-promotion of other residential programs, although the PY1 surveys from other SJG programs did not mention Home Energy Reports as a source of awareness for other programs.
- The HER 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. The Evaluators asked respondents if they had completed any of eight one-time energy saving actions that have been suggested to SJG HER recipients.

#### *Conclusions and Recommendations*

**Conclusion: HER Program verified annual savings of 1,494,014 therms for PY1 are positive and statistically significant for all three 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 0.7% and 1.2% of annual billed use in PY1. Typical behavioral programs display average annual gas savings between 0.25% and 2%. Therefore, verified savings are within the range the Evaluators typically find for behavioral programs.
- The downstream and upstream double counted savings of 8,110 therms for PY1 were removed from the estimated savings from the regression results. This ensures there is no double counting of savings of observable, billed energy usage in the SJG portfolio. The double counted savings represent 0.5% 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 25% for the treatment group and 25% for the control group. In addition, the annual attrition rate in PY1 is roughly 6% 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:* **Most participant survey respondents reported receiving paper reports and reading all or most of them, but generally have not visited the online portal.** Eighty-five percent of participants said they read most or all the reports but only 38% of participants recalled logging onto SJG's online portal.

*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 taking by SJG 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.

#### *Barriers to Participation*

- **The perceived accuracy and value of information, as well as 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 and they cited various reasons for not reading 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 the 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. Thirty-eight percent of participants recalled logging onto SJG'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.

#### 4.1.6 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. Therefore, program impact results include savings for the single project in PY1 that had measures installed following the DI program design.

##### *Impact Results*

During the first year of the program, 62 Audits were conducted. Of those, 10 customers elected to have DI measures installed which resulted in program level ex-ante annual savings of **11,795.42 therms** and **156,037.88 therms of lifetime savings**. Because the number of completed projects were limited during this ramp-up year, the bulk of the Evaluators' evaluation of the program focused on a process evaluation.

*Table 4-13: DI PY1 Program Gross Ex-Ante Gas Savings by Measure*

Measure Name	Quantity	Annual Savings (therms)	Total Annual Savings (therms)	Measure Life	Lifetime Savings (therms)
Boiler	2	1,430.10	2,860.20	20	57,204.00
Boiler Fuel Economizer	4	509.05	617.86	15	9,267.90
Boiler Reset Controls	2	255.38	510.75	10	5,107.50
Central Air Conditioning with Gas Furnace	2	26.31	52.63	15	789.45
Demand Control Ventilation	2	21.76	43.52	15	652.80
Pipe Insulation	8	51.65	5,911.63	11	65,027.93
Low Flow Aerators	48	322.48	1,798.83	10	17,988.30
<b>Total</b>	<b>68</b>	<b>2,616.73</b>	<b>11,795.42</b>	<b>13</b>	<b>156,037.88</b>

The program measures also saved electric energy during PY1, the annual gross energy savings and demand was **1,931 kWh** and **1.09 kW** and lifetime gross savings of **28,964 kWh**.

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

Measure	Ex-Ante Savings (therms)	Ex-Post Savings (therms)	RR therms
Boiler	2,860.20	2,860.20	100%
Boiler Fuel Economizer	617.86	617.86	100%
Boiler Reset Controls	510.75	510.75	100%
Central Air Conditioning with Gas Furnace	52.63	52.63	100%
Demand Control Ventilation	43.52	435.2	1000%
Pipe Insulation	5,829.42	5,829.44	100%
Low Flow Aerators	1,287.97	1,287.97	100%
<b>Total</b>	<b>11,202.35</b>	<b>11,594.05</b>	<b>103%</b>

*Table 4-15: DI M&V Sampled Site Gross Ex-Ante and Ex-Post Electric Savings by Measure including Realization Rates*

Measure	Ex-Ante Savings (kWh)	Ex-Post Savings (kWh)	Ex-Ante Savings (kW)	Ex-Post Savings (kW)	RR kWh	RR kW
Central Air Conditioning with Gas Furnace	303	303	100%	0.26	0.26	100%
Demand Control Ventilation	1,628	1,628	100%	0.83	0.83	100%
<b>Total</b>	<b>1,931</b>	<b>1,931</b>	<b>100%</b>	<b>1.09</b>	<b>1.09</b>	<b>100%</b>

### *Process Evaluation Results*

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

- Staff noted budgetary concerns because of significant past participation in the NJCEP DI program and customer interest developed during PY1. 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 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.** SJG'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 Evaluators should follow up with SJG 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 SJG 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, SJG 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% 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 Evaluators should review the QA/QC reports for effectiveness and possible inclusion in the M&V verification process in PY2 and beyond.**

**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 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 waive 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 SJG DI customers, as there was some reluctance to provide their electric bill to SJG. SJG 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 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 SJG DI customers, as there was some reluctance to provide their electric bill to SJG. SJI contacts posited that this step may spur internal conversations at customers' companies which in turn lead them not to participate.
- **The contacts noted a variety of reasons for “partial” or “near” participants.** The SJG energy efficiency analyst observed that time and financial resources were the two primary reasons customers did not continue after having an audit. She also observed that SJG serves a substantial number of seasonal businesses on the Jersey Shore and that a “decent chunk” of this type of customer had assessments but had not completed projects yet. She expected to follow-up and encouraged participation after summer ended.
- 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. South Jersey Gas' energy efficiency manager 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.

#### **4.1.7 ESB: Prescriptive and Custom**

##### *Sampling and Survey Results*

For PY1, the Evaluators 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, all were prescriptive projects. The program resulted in program level ex-post annual savings of **11,461.48 therms** and **211,226.19 lifetime therms**.

*Table 4-16: ESB PY1 Program Gross Ex-Ante Gas Savings by Measure*

Measure Name	Quantity	Annual Savings (therms)	Total Annual Savings (therms)	Measure Life	Lifetime Savings (therms)
Gas Condensing Boiler	3	--	7,211.26	20	144,225.29
Gas Furnace	4	--	1,916.52	20	38,330.40
Smart Thermostat	1	120.51	120.51	7.5	903.83
Instantaneous Water Heater	1	1,388.33	1,388.33	20	27,766.67
<b>Total</b>	<b>9</b>	--	<b>10,636.62</b>	<b>20</b>	<b>211,226.19</b>

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

*Table 4-17: ESB M&V Sampled Site Gross Ex-Ante and Ex-Post Gas by Measure including Realization Rates*

Measure	Ex-Ante Savings (therms)	Ex-Post Savings (therms)	RR therms
Gas Condensing Boiler	7,211.26	7,751.72	107%
Gas Furnace	1,916.52	2,144.26	112%
Smart Thermostat	120.51	370.79	308%
Instantaneous Water Heater	1,388.33	1,194.71	86%
<b>Total</b>	<b>10,636.62</b>	<b>11,461.48</b>	<b>108%</b>

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

### *Discussion of Realization Rates*

The overall savings for the prescriptive sub-program was 11,461.48 therms resulting in a 108% realization rate. The higher realization rate can be attributed to a variety of factors:

- The furnace measures were calculated using different baseline efficiencies. The ex-ante calcs used slightly higher efficiencies for baseline equipment resulting in a high realization rate. In addition, one project had different post-install efficiencies for (9) furnace units. It appears that the wrong efficiencies were mistakenly used from a different spec sheet.
- Two of the condensing boilers projects also had different baseline efficiencies in the ex-ante review. This difference also caused an increase in the realization rate.

- One project was submitted as a “programmable thermostat” measure, but we found that it was actually a “smart thermostat” measure. This changed the methods used to calculate savings resulting in a 308% realization rate for this project.
- The gas instantaneous water heater had a low realization rate, but the exact cause was indeterminable because the baseline calculations and formulas could not be provided. The most likely explanation for the low realization rate was the type of efficiency used in the calculations. The NJ protocols say to use the energy factor (EF) rating for units under 200 Btu/hr and the instantaneous water heaters are rated at 199 Btu/hr. However, the water heaters are only rated in thermal efficiency (TE) and their size was very close to 200 Btu/hr so the Evaluators calculated savings using TE. It seems possible that the ex-ante analysis used EF and estimated or calculated the EF for the new water heaters.

### *Process Evaluation Results*

During the in-depth interviews (IDI) the Evaluators noted the following:

- An easy application process is perceived as a program strength.
- Extensive utility collaboration was perceived to be a program strength. 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.
- 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 is an opportunity to further develop SJG’s relationships with Prescriptive and Custom trade allies.** The Prescriptive and Custom program requires customers to independently engage with contractors. AEG’s lead engineer shared that there are a limited number of firms available to develop calculations and assist customers with projects. AEG staff noted that there had been one sparsely attended trade ally training early in PY1.

**Recommendation: Continue trying to develop relationships with trade allies.** 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. Explore options for marketing the program with a focus on the unique benefits of the program compared to the Direct Install offerings.

**Conclusion:** **The types of projects seen so far have been prescriptive condensing boilers, gas furnaces, smart thermostats, and gas instantaneous water heaters 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 the utilities' lack of legacy programs was a barrier to the program's implementation as customers and contractors are not as familiar with it. Utility 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.** SJG contacts observed that the program incentives were sufficient, while the AEG contacts said that the incentive levels were a barrier to implementation success. SJG's energy efficiency manager suggested that a wide variety of robust rebate values and measures are being offered to customers. The AEG contacts noted that trade allies had shared comments with them regarding the incentive levels and acknowledged that the program can pay up to 50 percent of project costs and that "did not seem low."
- **There is an opportunity to further develop SJG's relationships with Prescriptive and Custom trade allies.** The Prescriptive and Custom program requires customers to independently engage with contractors. 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.
- **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 Evaluators

visited the SJG website and found opportunities to improve the ease of navigation and user design for customers and trade.

## 4.2 Cross Participation

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Three percent of PY1 program participants engaged with more than 1 program during the program year. Table 4-18 provides details on the number of program participants that interacted with 1 or more programs. Table 4-19 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. Seventy-eight percent cross participants between the QHEC and Moderate Income programs received their home energy assessments first. Cross program participation between the QHEC and EEP programs was modest, with one Appliance rebate participant, three HVAC rebate participants, and one HPwES participant receiving their energy assessment prior to participating in another SJG program.<sup>13</sup>

*Table 4-18: Cross Participation PY1*

Description	Metric
Unique participant count across all programs	188,690
Percent of participants in multiple programs	3%
Count of participants in 1 program	185,355
Count of participants in 2 programs	5,471
Count of participants in 3 programs	152
Count of participants in more than 3 programs	5

<sup>13</sup> Purchase dates were not included in the Online Marketplace program tracking data.

*Table 4-19: 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	73%	-	2	13	9	40	9	0	278
HPwES	56%	2	-	3	2	12	0	0	121
EEP - HVAC	53%	13	3	-	41	164	5	0	1,744
EEP - Appliance	59%	9	2	41	-	59	1	0	466
EEP - Online Marketplace	41%	40	12	164	59	-	13	0	2,911
Moderate Income	58%	9	0	5	1	13	-	0	64
Multi Family	0%	0	0	0	0	0	0	-	0
Behavioral	3%	278	121	1,744	466	2,911	64	0	-

### 4.3 Low Income Participation

The Evaluators determined that an estimated 32% of households served by SJG have incomes below 250% FPL.

In each of the program surveys, the Evaluators asked respondents about the number of people living in the home and the estimated annual household income to determine participants' income levels (see Table 4-20). Based on customers' self-reported data, Based on customers' self-reported data, the Quick Home Energy Checkup, Energy Efficient Products, and Behavioral programs may be underserving the low income communities in SJG's service territory.

*Table 4-20: Customer Self-Report Income Data*

Program	Below 250% FPL	Between 250-400% FPL	n
Non-Participant Survey	23%	14%	69 <sup>14</sup>
QHEC	24%	23%	88 <sup>15</sup>
EEP - HVAC and Appliances	7%	13%	107 <sup>16</sup>
EEP - Online Marketplace	10%	4%	70 <sup>17</sup>
Behavioral <sup>18</sup>	18%	12%	73 <sup>19</sup>

## 4.4 Evaluability of Programs

Under the basic rigor guidelines provided by the SWE, SJG'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 Evaluators 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, 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.

<sup>14</sup> Thirty-two percent said their income was more than 400% of the FPL. Thirty percent of respondents either preferred not to state (28%) or did not know (3%) their household income (does not sum to 30% due to rounding).

<sup>15</sup> Twenty-seven percent said their income was more than 400% of the FPL. Twenty-six percent of respondents either preferred not to state (20%) or did not know (6%) their household income.

<sup>16</sup> Fifty-two percent said their income was more than 400% of the FPL. Twenty-seven percent of respondents either preferred not to state (26%) or did not know (1%) their household income.

<sup>17</sup> Fifty-one percent said their income was more than 400% of the FPL. Thirty-four percent of respondents either preferred not to state (27%) or did not know (7%) their household income.

<sup>18</sup> Values in the table are for customers receiving Home Energy Reports. Surveyed control group customers indicated 10% of homes have incomes below 250% FPL and 14% of homes have incomes between 250-400% FPL (n=69).

<sup>19</sup> Forty-one percent said their income was more than 400% of the FPL. Twenty-nine percent of respondents either preferred not to state (22%) or did not know (7%) their household income.

**Incorrect AHRI reference numbers.** AHRI reference numbers are included in the program tracking data records for several measures. The Evaluators use the reference number to access measure specifications for the exact model product the customer has purchased. The PY1 tracking data included numerous incorrect or incomplete AHRI reference numbers, which prevented the Evaluators from calculating ex-post savings for those measures. 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.** 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 realization rates closer to 100%.

**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 which appliance (the heater or water heater) was reference by each, and 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.

**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 Evaluators.** The Evaluators were 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.

**Improve program tracking data quality by adding product model numbers and variables required in the NJ TRM algorithms to tracking data.** Program tracking data did not include product model numbers to verify product specifications (e.g., flow rate of the installed water conservation measures). In the absence of product specifications, ex-post savings were calculated with deemed average values that are less accurate than actual specification values.

**Improve reporting by incorporating quantity into tracking data savings calculations.** Program tracking data did not initially include a quantity column. As a result, the ex-ante savings in the tracking data were only reported at the unit level and the Evaluators were required to multiply the reported per unit savings by the quantity to tabulate the reported total ex-ante savings.

**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.

#### 4.4.4 MI Weatherization

The Evaluators identified and selected a sample of 5 projects for review and in-depth participant interviews. The Evaluators discussed each line item in the work order with the participants and participants confirmed the measures reported aligned with the work completed.

**Include an estimate of building square footage for homes with Air Sealing.** Building square footage was not included in the tracking data so the Evaluators used publicly available tax records to estimate building conditioned square footage. Average size of homes receiving some type of air sealing measure was 1,648 ft<sup>2</sup>. Following the NJCEP, this results in average savings of 26.4 therms (significantly lower than the average reported savings of 51.1 therms per home with air sealing).

**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 ft<sup>2</sup>) 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 1,252 ft<sup>2</sup> of insulation added, saving 186 therms per home, 0.15 therms/ ft<sup>2</sup>. This is comparable to the savings estimated using the TRM methodology for improving R-5 insulation to R-30. This value (0.15 therms/ ft<sup>2</sup>) 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% of annual heating therms use.

**Include location of Ducts that were improved.** The average reported savings for duct improvement (108 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 QA/QC process was recently established. SJG hired a 3<sup>rd</sup> party contractor, PSD, to inspect quality of work, verify the work on the invoice matches work performed, and identify missed opportunities. Although the Evaluators reviewed a sample of projects via in-depth participant interviews and participants generally confirmed the measures reported aligned with the work completed, the QA/QC process may be a valuable step in improving data collection methods.

#### 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 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 Evaluators 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 Evaluators reported and what SJG reported 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 Evaluators found that the information provided an accurate picture of the Direct Install projects and all the necessary information to perform a minimum rigor evaluation.

#### 4.4.7 ESB: Prescriptive and Custom

**Include formulas and energy calculations in project documentation to support M&V review.** Most of the savings' calculations submitted show the model inputs and incentive estimate but don't have transparency into the actual methods and formulas used to find the energy savings.

## 5. Comparisons to Similar Efficiency Programs

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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 SJG programs too, these utilities included 2019-2021 program evaluations in New Mexico, Oklahoma, Arkansas, Illinois, and Maryland. In the sections below the Evaluators have 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 SJG program data bolded in the tables below.

### 5.1 Energy Efficient Products

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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% for the various measures within the programs, the NTG was stipulated at 1 for SJG in PY1 for the portfolio. Program satisfaction was similar to the other programs. SJG 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 SJG's was a downstream and marketplace program.

*Table 5-1: Benchmarking Data for Three EE Products Programs and the PY1 SJG 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
<b>2022</b>	<b>NJ</b>	<b>NA</b>	<b>NA</b>	<b>100%</b>	<b>400,000</b>	<b>11,819</b>	<b>96%</b>	<b>Contractor and Mail Marketing</b>	<b>Downstream &amp; Marketplace</b>	<b>TRM Algorithm</b>

The measures in the SJG 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	48%	Clothes Dryers	27%	Water Heaters	24%	Ranges	2%		
2021 AR	Furnaces	60%	Tankless WH	20%	Smart Thermostats	20%				
2021 AR	Furnaces	68%	Smart Thermostats	24%	Water Heaters	9%				
2022 SJG	Smart Thermostats	37%	Furnaces	33%	Gas Furnaces with Water Heaters	18%	Combination Heaters	4%	Water Heaters	2%

## 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% with spillover of 3% for the other program while the NTG was stipulated at 1 for SJG in PY1 for the portfolio. The program design for the other program was similar except that all SJG 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 SJG 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%	400,000	235	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 in Table 5-3*

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 SJG	Furnaces	33%	Insulation	26%	Air Sealing	24%	Storage DHW	10%	Tankless DHW	3%

### 5.3 Quick Home Energy Check-Up

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% with one of them including spillover.

*Table 5-5: Benchmarking Data for Two QHEC Programs and the PY1 SJG 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%	400,000	1,288	66%	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). SJG'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 SJG	Aerators & Showerheads	86%	Pipe Insulation	14%				

## 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 SJG but the other programs had values from 70-93% in 2021. Program awareness was different for the programs with SJG's best source being utility mailers.

*Table 5-7: Benchmarking Data for Three MI Weatherization Programs and the PY1 SJG 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%	400,000	117	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. SJG'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 in Table 5-7*

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	8%				
2021 AR	Duct Sealing	73%	Air Sealing	20.3%	Attic Insulation	6%	Low Flow Showerhead	0.1%	Aerators	0.01%
2021 AR	Duct Sealing	75%	Air Sealing	18%	Attic Insulation	3%	Low Flow Showerhead	3%	Aerators	2%
2022 SJG	Insulation	70%	Air Sealing	19%	Duct Sealing	10%	Tune-Up	0.1%		

## 5.5 Home Energy Reports

The HERs program was relatively similar in size to the benchmark program and had a satisfaction of 82% in PY1. SJG saw significantly more participants reporting that they read the reports than the other program (Table 5-9). The SJG cohorts report reading the

home energy reports at a higher rate than the other program, which may contribute to the higher annual savings percentage (Table 5-10).

*Table 5-9: Benchmarking Data for One HER Program and the PY1 SJG 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
<b>2022</b>	<b>NJ</b>	<b>NA</b>	<b>NA</b>	<b>100%</b>	<b>400,000</b>	<b>176,161</b>	<b>82%</b>	<b>86% read reports</b>	<b>Behavioral</b>	<b>Regression Analysis</b>

The HERs program was relatively similar in size to the benchmark program and had a satisfaction of 82% in PY1. SJG saw significantly more participants reporting that they read the reports than the other program (Table 5-9). The SJG cohorts report reading the home energy reports at a higher rate than the other program, which may contribute to the higher annual savings percentage (Table 5-10).

*Table 5-10: HER Measures by Percentage of Program Savings for the Programs in Table 5-9*

PY / State	Measure Group 1	M1 % of Therms
2021 IL	HER	0.9% of Annual Usage
<b>2022 SJG</b>	<b>HER</b>	<b>1.02% of Annual Usage</b>

## **5.6 Energy Solutions for Business - Custom**

The SJG program had challenges with marketing the program in PY1 and had no custom projects; however, the program designs and M&V methodologies were all the same compared to the other the programs.

*Table 5-11: Benchmarking Data for Three Commercial Custom Programs and the PY1 SJG 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%	400,000	0	NA	Marketing	Consultation	Engineering Modeling

*Table 5-12: Commercial Custom Measures by Percentage of Program Savings for the Programs in Table 5-11*

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	59%	Retro-Commissioning	16%	Boiler Retrofit	13%	Steam Trap	9%	Insulation	4%
2021 AR	Steam Traps	58%	Oil Heater	25%	Boiler Replacement	6%	Insulation	5%	Condensate Return	4%

## 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. The NTG for the other programs ranged from 77-98% as some of the participants would have had to make repairs to their systems regardless of the program incentives. The Evaluators 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 SJG 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%	400,000	9	NA	Marketing	Consultation	TRM Algorithm

The SJG program included boilers, water heaters, and smart thermostats 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 SJG 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	67%	Fryer	34%				
2021 AR	Furnaces	37%	Boilers	35%	Water Heaters	24%	Food Service	4%
2022 SJG	Gas Condensing Boiler	68%	Gas Furnace	18%	Instantaneous Water Heater	13%	Smart Thermostat	1%

## 5.8 Commercial Direct Install

Program participation in the direct install programs was similar, but SJG 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% (Table 5-15). Contractors drove the program awareness for the other programs, as SJG 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 SJG 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%	400,000	10	NA	Marketing	Consultation	TRM Algorithm

While in PY1 SJG 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
OK 2021	Steam Trap	NA	Drysmart Units	NA	Low Flow Spray Valves	NA	Aerators and Showerheads	NA	Weather Stripping-Doors	NA
AR 2021	Weather Stripping	100%								
AR 2021	Weather Stripping	NA	Pre-Rinse Spray Valves	NA	Aerators and Showerheads	NA				
IL 2020	Steam Trap	84%	Boiler Tune Up	12%						
SJG 2022	Pipe Insulation	52%	Boiler	26%	Low Flow Aerators	11%	Boiler Fuel Economizer	6%	Boiler Reset Controls	5%

## 6. TRM Updates and Measure Savings Comparison

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### 6.1 TRM Updates

This section will contain a list of data collected to support TRM updates, reasons we didn't collect data for updates, highlights of major findings or a big table with everything in it.

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 Evaluators identified as potentially part of these TRM updates.

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

Residential							
Measure		Notes					
Water Heater (230)		AHRI lookups found 53% were 40 gal, 47% were 50 gal capacity tanks					
Tankless Water Heater (301)		Out of 12 survey responses, 63% replaced a tank and 38% replaced a tankless heater.					
Clothes Washer (634)		Define multi-family gallons/year as communal or within units. There was confusion by implementation in PY1.					
Faucets and Aerators (621)		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.					
Commercial							
Measure		Notes					
--		No data was collected for commercial TRM updates in PY1.					
Demographics & Home Characteristics							
PY1 Survey	Home Gas Heat	Water Gas Heat	S.F Home	Own Home	250% FPL	250-400% FPL	Survey N
Downstream	94%	86%	86%	99%	7%	13%	107
Marketplace	93%	83%	63%	88%	10%	4%	70
Non-Participant	90%	83%	68%	86%	23%	14%	69
HER	92%	92%	85%	98%	18%	12%	142
QHEC	91%	88%	85%	100%	24%	23%	88
<b>Weighted Average</b>	<b>92%</b>	<b>87%</b>	<b>80%</b>	<b>95%</b>	<b>16%</b>	<b>13%</b>	<b>476</b>

### 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 5-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 direct install programs such as QHEC. The F percentage multipliers for the type of water heating fuel are:
  - Likely too low for the SJG 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 SJG.
  - 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 SJG 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 four residential surveys across 3 program channels and a non-participant survey with a total of 387 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 SJG 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 7-46, Table 7-53, Table 7-57, Table 9-18, and Table 11-40.

## 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 Gas Savings PY1 Actuals and 2022 Addendum Recalculations*

Program	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	582,634.42	575,073.53	99%	511,677.08	496,501.15	97%
EE Products Marketplace	391,314.63	380,779.31	97%	372,241.41	355,279.88	95%
QHEC	6,213.49	6,016.15	97%	5,674.79	3,162.81	56%
Commercial DI	1,890.12	1,957.54	104%	1,890.12	2,024.96	107%
ESB Prescriptive	10,636.62	9,127.78	86%	11,461.48	10,085.92	88%
<b>PY1 Portfolio</b>	<b>1,785,997.45</b>	<b>1,766,262.49</b>	<b>99%</b>	<b>2,505,248.42</b>	<b>2,469,358.26</b>	<b>99%</b>

The recalculations would have dropped the program level ex-post savings to as low as 56% for QHEC and increased it to 107% for Commercial DI, but at the portfolio level the change would have only been a 1% 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 SJG 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 Gas Savings 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
<b>EE Products Downstream</b>							
Gas Combi Heat Tier 1 (AFUE 95-96.9)	278	34,958.32	31,112.90	89%	66,296.90	59,926.87	90%
Gas Storage Tank Water Heater (<55 gal)	230	3,050.25	1,799.65	59%	9,778.84	6,435.75	66%
Tankless Water Heater (UEF>=0.87)	301	5,953.80	3,488.93	59%	10,175.89	4,713.08	46%
<b>Total</b>	<b>809</b>	<b>43,962.37</b>	<b>36,401.48</b>	<b>83%</b>	<b>86,251.63</b>	<b>71,075.70</b>	<b>82%</b>
<b>EE Products Marketplace</b>							
Low Flow Showerheads	663	7,263.27	1,380.02	19%	14,317.84	6,660.42	47%
Water Saving Kit	189	5,735.94	1,261.91	22%	13,394.21	5,068.82	38%
Faucet Aerators	100	345.71	167.67	49%	1,298.47	319.75	25%
<b>Total</b>	<b>952</b>	<b>13,344.92</b>	<b>2,809.60</b>	<b>21%</b>	<b>29,010.52</b>	<b>12,048.99</b>	<b>42%</b>
<b>QHEC</b>							
Showerheads	136	2,051.13	1,907.55	93%	2,065.59	960.88	47%
Faucet Aerators	143	84.00	30.24	36%	1,819.27	412.00	23%
<b>Total</b>	<b>279</b>	<b>2,135.13</b>	<b>1,937.79</b>	<b>91%</b>	<b>3,884.86</b>	<b>1,372.88</b>	<b>35%</b>
<b>Commercial DI</b>							
Boiler Replacement	2	1430.1	1,487.30	104%	2,860.20	2,974.61	104%
Boiler Reset Controls	2	255.38	265.60	104%	510.75	531.18	104%
Low Flow Water Items	48	322.48	322.48	100%	1,287.97	1,287.97	100%
Pipe Insulation	8	51.65	51.65	100%	5,829.44	5,829.44	100%
<b>Total</b>	<b>60</b>	<b>2,059.61</b>	<b>2,127.03</b>	<b>103%</b>	<b>10,488.36</b>	<b>10,623.20</b>	<b>101%</b>
<b>ESB: Prescriptive</b>							
Furnace	4	1,916.52	1,916.52	100%	2,144.26	2,143.31	100%
Condensing boiler	3	7,211.26	7,211.26	100%	7,751.72	7,942.61	102%
<b>Total</b>	<b>7</b>	<b>9127.78</b>	<b>9,127.78</b>	<b>100%</b>	<b>9,895.98</b>	<b>10,085.92</b>	<b>102%</b>
<b>PY1 Total</b>							
<b>Total</b>	<b>2,107</b>	<b>70,629.81</b>	<b>52,403.68</b>	<b>74%</b>	<b>139,531.35</b>	<b>105,206.68</b>	<b>75%</b>

*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	Ex-Post Savings (kWh)	2022 Addendum Ex-Post Savings (kWh)	Ex-Post Ratio
<b>EE Products Downstream</b>							
Central AC (Tier 1)	680	238,856.00	211,473.00	89%	195,946.00	211,148.00	108%
Central AC (Tier 2)	20	11,577.00	12,008.00	104%	11,194.00	12,062.00	108%
ASHP (Tier 1)	1	232.57	355.00	153%	329.00	611.00	186%
Ductless Mini-Split Heat Pump (Multi)	2	812.06	857.00	106%	1,776.00	1,591.00	90%
Ductless Mini-Split Heat Pump (Single)	4	1,624.13	1,241.00	76%	3,374.00	2,399.00	71%
ASHP (Tier 2)	1	460.17	543.00	118%	503.00	1,067.00	212%
<b>Total</b>	<b>700</b>	<b>250,433.00</b>	<b>223,481.00</b>	<b>89%</b>	<b>207,140.00</b>	<b>223,210.00</b>	<b>108%</b>
<b>EE Products Marketplace</b>							
Low Flow Showerheads	663	9,704.00	5,873.66	61%	37,165.00	22,495.00	61%
Water Saving Kit	189	21,225.00	21,225.00	100%	39,646.00	15,128.00	38%
Faucet Aerators	100	3,356.00	5,570.96	166%	4,564.00	593.00	13%
<b>Total</b>	<b>952</b>	<b>34,285.00</b>	<b>32,669.62</b>	<b>95%</b>	<b>81,375.00</b>	<b>38,216.00</b>	<b>47%</b>
<b>QHEC</b>							
Faucet Aerators	143	998	194.61	20%	5,152	612	12%
Showerheads	136	8,348	10,101.08	121%	3,896	2,358	61%
LED Specialty Candelabra 25w Equivalent	241	3,348	975.36	29%	6,040	3,355	56%
LED Specialty Downlight 55w Equivalent	4	128	35.31	28%	233	128	55%
LED Specialty Downlight 65w Equivalent	179	4,600	1,974.11	43%	12,870	7,210	56%
LED Specialty Downlight 75w Equivalent	4	117	48.14	41%	318	174	55%
LED Specialty Downlight 90w Equivalent	24	850	324.00	38%	2,406	1,511	63%
LED Specialty Globe 25w Equivalent	98	1,361	349.10	26%	2,325	1,285	55%
LED Specialty Globe 40w Equivalent	568	8,680	3,621.92	42%	24,092	13,304	55%
LED Standard 100w Equivalent	77	3,049	1,437.14	47%	8,555	5,008	59%
LED Standard 60w Equivalent	669	15,800	6,616.99	42%	42,716	23,700	55%
LED Standard 75w Equivalent	81	2,363	1,025.84	43%	6,666	3,826	57%
<b>Total</b>	<b>2,224</b>	<b>49,642</b>	<b>26,704</b>	<b>54%</b>	<b>115,269</b>	<b>62,472</b>	<b>54%</b>
<b>PY1 Total</b>							
<b>Total</b>	<b>3,876</b>	<b>334,360.00</b>	<b>282,854.21</b>	<b>85%</b>	<b>403,784.40</b>	<b>323,898.17</b>	<b>80%</b>

*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 Addendum ML	Ex-Ante Lifetime Savings (kWh)	2022 Addendum Ex-Ante Lifetime Savings (kWh)	Ex-Ante Ratio	Ex-Post Lifetime Savings (kWh)	2022 Addendum Ex-Post Lifetime Savings (kWh)	Ex-Post Ratio
LED Specialty Candelabra 25w Equivalent	241	15	4	50,220	3,901	8%	90,604	13,422	15%
LED Specialty Downlight 55w Equivalent	4	15	4	1,920	141	7%	3,500	512	15%
LED Specialty Downlight 65w Equivalent	179	15	4	69,000	7,896	11%	193,051	28,841	15%
LED Specialty Downlight 75w Equivalent	4	15	4	1,755	193	11%	4,766	697	15%
LED Specialty Downlight 90w Equivalent	24	15	4	12,750	1,296	10%	36,089	6,044	17%
LED Specialty Globe 25w Equivalent	98	15	4	20,415	1,396	7%	34,872	5,141	15%
LED Specialty Globe 40w Equivalent	568	15	4	130,200	14,488	11%	361,380	53,217	15%
LED Standard 100w Equivalent	77	15	4	45,735	5,749	13%	128,325	20,033	16%
LED Standard 60w Equivalent	669	15	4	237,000	26,468	11%	640,742	94,799	15%
LED Standard 75w Equivalent	81	15	4	35,445	4,103	12%	99,993	15,305	15%
<b>PY1 Total</b>	<b>1,945</b>	<b>15</b>	<b>4</b>	<b>604,440</b>	<b>65,632</b>	<b>11%</b>	<b>1,593,321</b>	<b>238,010</b>	<b>15%</b>

## **7. Appendix A: EE Products Program Evaluation Report**

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### **7.1 Introduction**

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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 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 (PY1) 7,579 customers purchased 9,832 measures from the online marketplace, and 4,240 customers received rebates for 5,953 qualified products. PY1 resulted in 883,918.48 therms savings, 1,604,494 kWh savings, and 282.58 kW demand savings<sup>20</sup>.

The program design is illustrated as a logic map in Figure 7-1, developed from conversations with program and implementation staff, and a review of program documentation, and the Evaluators' 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.

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<sup>20</sup> There were several differences between the participant definitions between the M&V program tracking data reports and SJG management data reports. This resulted in some small differences between the SJG reported ex-ante values and the M&V reported values.

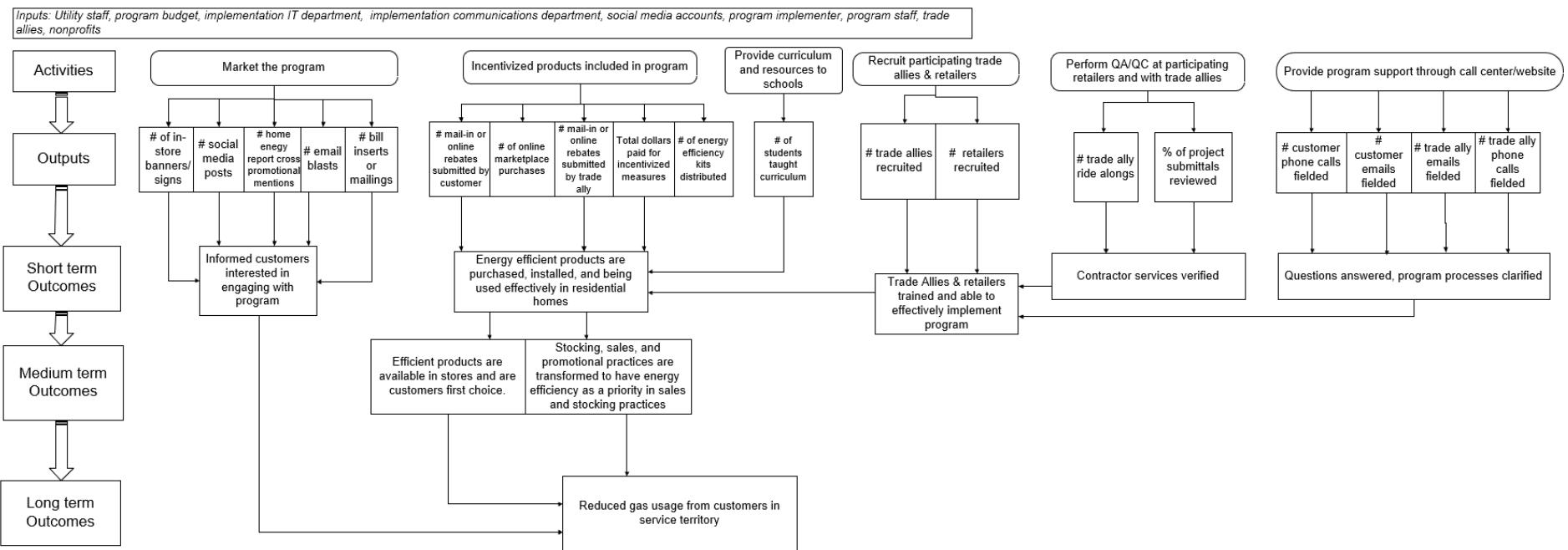


Figure 7-1: Energy Efficient Products Program Logic Model

## **7.2 Methodology**

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This section describes the methodology the Evaluators used to calculate electricity and fuel savings that resulted from the program.

During its evaluation, the Evaluators:

- Quantified the number of program participants and number of installed measures
- Conducted three customer surveys to collect additional data needed to calculate program savings
- Calculated the electric (kWh and kW) 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 State of New Jersey Energy Efficiency Technical Reference Manual (NJ TRM) and the Maryland/Massachusetts Technical Reference Manual Version 10 (MD/MA TRM) were used to determine verified gross energy impacts and measure life (for lifetime savings). Table 7-1 summarizes the TRM's used in this analysis.

*Table 7-1: EEP TRM Summary*

<b>Measure</b>	<b>TRM</b>
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 (p. 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 as minutes (M).

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

*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) <sup>21</sup>
	<=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% natural gas
	= 97% electric
$C$	= 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, the Evaluators 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 Evaluators determined from the marketplace participant survey.

### Showerheads

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

*kWh Annual Savings*

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

*Equation 2*

<sup>21</sup> Actual gallon per minute (gpm) flowrate derived from model in tracking data

*Therms Annual Savings*

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

*Equation 3*

$$\begin{aligned} \text{Water Savings} \left( \frac{\text{gals}}{\text{year}} \right) \\ = (GPM_{baseline} - GPM_{ee}) x Throttle_{factor} x \frac{\text{minutes}}{\text{shower}} x \frac{\text{showers}}{\text{day}} x 365 \frac{\text{days}}{\text{year}} \end{aligned}$$

*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
	= 13% <sup>22</sup>
$F_{gas}$	= Percent of water heaters which are gas
	= 86% <sup>23</sup>
8.33	= Conversion factor for energy required (Btu) to heat one gallon of water by 1°F
$GPM_{baseline}$	= 2.5
$GPM_{ee}$	= actual product gallon per minute flowrate
$Throttle_{factor}$	= 0.9
$\frac{\text{minutes}}{\text{shower}}$	= 8.2

<sup>22</sup> Percent of water heaters fueled by electricity for participants who received water conservation measures derived from the Evaluator's participant survey.

<sup>23</sup> Percent of water heaters fueled by natural gas for participants who received water conservation measures derived from the Evaluator's participant survey.

<i>showers/day</i>	= 2.03
100,000	= Conversion factor from Btu to therms
3,412	= Conversion factor from Btu to kWh

For this measure, the Evaluators 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 Evaluators 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.

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

*Equation 5*

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

*Equation 6*

Where:

<i>%Electric DHW</i>	= proportion of water heating supplied by electricity = 2.3% (from participant survey)
<i>GPM_base</i>	= Flow rate of the baseline showerhead (gallons per minute) = showerheads, 2.5 = aerators, 2.2
<i>GPM_ee</i>	= Flow rate of the efficient showerhead (gallons per minute) = showerheads, 2.0 = kitchen aerators, 1.8 = bathroom aerators, 1.5
<i>kWh/ΔGPM</i>	= Electric energy savings of efficient showerhead per gallon per minute (GPM) = showerheads, 390.1 = aerators, 63.7
<i>%Gas DHW</i>	= proportion of water heating supplied by natural gas

	= 95.5% (from participant survey)
<i>therm/ΔGPM</i>	= natural gas energy savings of efficient showerhead per gallon per minute (GPM)
	= showerheads, 16.8
	= aerators, 5.0

*Central Air Conditioners, Air Source Heat Pump, and Mini-Split (AC or HP)*

The Evaluators calculated annual cooling energy savings (kWh/yr) and demand reduction (kW) for central air conditioners, Air Source Heat Pumps, and Mini-splits (AC or HP) using Equation 7 and Equation 8 (2020 NJ TRM, pg. 15).

$$\text{Energy Savings } \left( \frac{\text{kWh}}{\text{yr}} \right) = \text{Tons} * 12 \frac{\text{kBtuh}}{\text{Ton}} * \left( \frac{1}{\text{SEER}_b} - \frac{1}{\text{SEER}_q} \right) * \text{EFLH}_c * \text{ESF}$$

*Equation 7*

$$\text{Peak Demand Savings (kW)} = \text{Tons} * 12 \text{ kBtuh/Ton} * (1/\text{EER}_b - 1/\text{EER}_q) * \text{CF} * \text{DSF}$$

*Equation 8*

Where:

<i>Tons</i>	= The rated cooling capacity of the unit being installed
<i>SEER<sub>b</sub></i>	= 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
<i>SEER<sub>q</sub></i>	= The Seasonal Energy Efficiency Ratio of the qualifying unit being installed.
<i>EER<sub>b</sub></i>	= The Energy Efficiency Ratio of the Baseline Unit.
	= 11.3
<i>EER<sub>q</sub></i>	= The Energy Efficiency Ratio of the unit being installed.
	= (11.3/13) * <i>SEER<sub>q</sub></i>
<i>CF</i>	= The coincidence factor which equates the installed unit's connected load to its demand at time of system peak
	= 69%

$EFLH_c$	= The Equivalent Full Load Hours of operation for the average unit (cool)
	= cooling, 600 hours
$ESF$	= Energy savings factor or the assumed savings due to proper sizing and proper installation
	= 109.2% <sup>24</sup>
$DSF$	= Demand savings factor or the assumed peak demand capacity saved due to proper sizing and proper installation
	= 109.2%

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

- 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% to 50% and the EFLHc for kWh savings from 600 to 562.

The Evaluators calculated annual heating energy savings (kWh/yr) for air source heat pumps and mini-splits (AC or HP) using (2020 NJ TRM, pg. 15-20).

$$\text{Energy Savings } \left( \frac{\text{kWh}}{\text{yr}} \right) = Tons * 12 \frac{\text{kBtuh}}{\text{Ton}} * \left( \frac{1}{HSPF_b} - \frac{1}{HSPF_q} \right) * EFLH_h * ESF$$

*Equation 9*

Where:

$Tons$	= The rated heating capacity of the unit being installed
$HSPF_b$	= The Heating Seasonal Performance Factor of the Baseline unit
	= Split systems (HP) = 8.2
	= Single package (HP) = 8.0
$HSPF_q$	= Heating Seasonal Performance Factor of the unit being installed
$EFLH_h$	= Equivalent Full Load Hours of operation for the average unit (heat)
	= heating, 965

<sup>24</sup> Changed from 9.2% to 109.2% for ease of calculation.

$ESF$	= Energy savings factor or the assumed savings due to proper sizing and proper installation
	= 109.2%

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

- Make and model number
- *Tons* (Can be confirmed using model number)
- *HSPFq* (Can be confirmed using model number)

The 2022 NJ TRM Addendum changes the heating energy savings (kWh) algorithm to:

$$\text{Energy Savings } \left( \frac{\text{kWh}}{\text{yr}} \right) = \text{heating capacity} * \left( \frac{1}{COP_b} - \frac{1}{COP_q} \right) * EFLH_h / 3412$$

*Equation 10*

Where:

*heating capacity* = The rated heating capacity of the unit being installed (Btu/hr)

*COPb* = Coefficient of performance of the Baseline unit  
(HSPFb/3.412)

= 2.34

*COPq* = Coefficient of performance of the efficient unit  
(HSPFq/3.412)

*EFLH<sub>h</sub>* = Equivalent Full Load Hours of operation for the average unit  
(heat)  
= heating, 503

#### *Boiler Reset Controls*

The Evaluators calculated annual fuel savings using Equation 11 (2020 NJ TRM, pg. 28).

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

*Equation 11*

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	$\geq 1.6 ft^3$	1.57	6.5
Front Load	$< 1.6 ft^3$	1.13	8.3
Front Load	$\geq 1.6 ft^3$	1.84	4.7

For clothes washers purchased before April 1<sup>st</sup>, 2022, annual energy savings calculations used the deemed values listed in Table 7-4 (2020 NJ TRM, 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<sup>st</sup> 2022, the Evaluators calculated annual energy savings using Equation 12 (2021 NJ TRM, pg. 60).

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

*Equation 12*

Where:

- Capacity* = Rated volume( *ft*<sup>3</sup>) of ENERGY STAR machine
- IMEF<sub>b</sub>* = Federal minimum Integrated Modified Energy Factor by configuration and capacity (see Table 2-3)
- IMEF<sub>ee</sub>* = Integrated Modified Energy Factor for ENERGY STAR machine
- SF<sub>washer</sub>* = proportion of total savings attributed to machine  
= 5%
- 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<sub>ee</sub>* (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.

## Gas Boilers

The Evaluators verified gas boiler model numbers included in program tracking data met TRM qualifications and calculated annual fuel savings using Equation 13 (2020 NJ TRM, pg. 24).

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

*Equation 13*

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 <sub>b</sub>
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 14 through Equation 16 (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.

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

*Equation 14*

$$\text{Boiler Fuel Savings } \left( \frac{\text{therms}}{\text{yr}} \right) = \left( \text{Cap}_{in} * \text{EFLH}_h * \frac{\left( \frac{\text{AFUE}_q}{\text{AFUE}_b} - 1 \right)}{\frac{1000 \text{kBtu}}{\text{MMBtu}}} \right) * 10$$

*Equation 15*

$$\begin{aligned} \text{Domestic Hot Water Fuel Savings } \left( \frac{\text{therms}}{\text{yr}} \right) \\ = \left( \left( 1 - \left( \frac{\text{UEF}_b}{\text{UEF}_q} \right) \right) \times \text{Baseline Water Heater Usage} \right) * 10 \end{aligned}$$

*Equation 16*

Where:

- $\text{Cap}_{in}$  = Input capacity of qualifying unit in kBtu/hour
- $\text{EFLH}_h$  = The Equivalent Full Load Hours of operation per year for the average unit during the heating season  
= 965 hours
- $\text{AFUE}_q$  = Annual Fuel Utilization Efficiency of the qualifying boiler
- $\text{AFUE}_b$  = Annual Fuel Utilization Efficiency of the baseline boiler  
= Gas fired boiler, 82%  
= Oil fired boiler: 84%
- $\text{UEF}_q$  = Uniform energy factor of the qualifying energy efficient water heater  
= 0.87
- $\text{UEF}_b$  = Uniform energy factor of the baseline water heater (storage water heater)  
= 0.657

Baseline	= Annual usage of the baseline water heater
Usage	= 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 17.

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

*Equation 17*

Where:

$UEF_q$	= Uniform energy factor of qualifying energy efficient water heater
$UEF_b$	= Uniform energy factor of the baseline water heater.
	= 0.87
$GPD$	= gallons per day of hot water use
	= 55.70 <sup>25</sup>
$T_{set}$	= 125° F
$T_{main}$	= 60° F

### *Gas Furnaces*

The Evaluators calculated annual fuel savings for high efficiency gas furnaces using Equation 18 (2020 NJ TRM, pg. 23).

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

*Equation 18*

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

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).

*Table 7-6: Baseline Annual Fuel Utilization Efficiency*

Installation Type	AFUE <sub>b</sub>
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 the 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 did not require variables from the program tracking data other than the quantity.

### *Water Heaters*

The program included indirect fired storage tank water heaters, gas storage tank water heaters, and gas tankless water heaters. Methods for determining savings for each are presented separately below.

#### Indirect Fired Storage Tank Water Heaters

The Evaluators verified that rebated indirect fired storage tank water heater model numbers met the TRM specifications and calculated annual fuel savings using Equation 19 through Equation 24 (2020 NJ TRM, pg. 37).

$$\Delta \text{therms} = \text{Therm}_{Std} - \text{Therm}_{Eff}$$

*Equation 19*

$$\text{Therm}_{out} = EF_{std} \times \text{Therm}_{StdTank}$$

*Equation 20*

$$\text{Therm}_{Std} = \text{Standby}_{Std} \times 8760 \times \frac{1}{AFUE_{Std}} + \text{Therm}_{out} \times \frac{1}{AFUE_{Std}}$$

*Equation 21*

$$\text{Therm}_{Eff} = \text{Standby}_{Eff} \times 8760 \times \frac{1}{AFUE_{Eff}} + \text{Therm}_{out} \times \frac{1}{AFUE_{Eff}}$$

*Equation 22*

$$\text{Standby}_{Std} = Vol_{Std} \times \left( \frac{^{\circ}F}{hr_{Std}} \right) \times 8.33$$

*Equation 23*

$$\text{Standby}_{Eff} = Vol_{Eff} \times \left( \frac{^{\circ}F}{hr_{Eff}} \right) \times 8.33$$

*Equation 24*

Where:

$\text{Therm}_{Std}$  = Calculated therms for a standard tank

= 206

$\text{Therm}_{Eff}$  = Calculated therms of the replacement tank

= 177.52

$EF_{Std}$	= Federal standard energy factor
	= 0.58
$Therm_{StdTank}$	= therms used by standard tank
	= 223
$Standby_{Std}$	= Standby loss from standard water heater
	= 434 Btu/hr
$AFUE_{Std}$	= Annual Fuel Utilization Efficiency of standard water heater
	= 80%
$Standby_{Eff}$	= Standby loss from efficient water heater
	= 397 Btu/hr
$AFUE_{Eff}$	= Annual Fuel Utilization Efficiency of efficient water heater
	= 93%
$Vol_{Std}$	= Volume of standard water heater (gallons)
	= 63.50
$Vol_{Eff}$	= Volume of efficient water heater (gallons)
	= 51.20
$^{\circ}F/hr_{Std}$	= Heat lost per hour from standard water heater tank
	= 0.80
$^{\circ}F/hr_{Eff}$	= Heat lost per hour from efficient water heater tank
	= 0.93

A conversion factor for the density of water (8.33 lbs./gallon) was also used.

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

- Make and model number
- $Standby_{Eff}$  (if available, can be confirmed using AHRI<sup>26</sup> reference number)
- $AFUE_{Eff}$  (if available, can be confirmed using AHRI reference number)
- $Vol_{Eff}$  (if available, can be confirmed using AHRI reference number)

<sup>26</sup> Air Conditioning, Heating, and Refrigeration Institute

### Gas Storage Tank Water Heaters

The Evaluators verified that rebated gas storage tank instant water heater model numbers met the TRM specifications and calculated annual fuel savings using Equation 25 (2020 NJ TRM, pg. 29).

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

*Equation 25*

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)
<i>Baseline usage</i>	= 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 26.

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

*Equation 26*

Where:

$UEF_q$	= Uniform energy factor of qualifying energy efficient water heater
$UEF_b$	= Uniform energy factor of the baseline water heater. = 0.87

$GPD$  = gallons per day of hot water use

= 55.70<sup>27</sup>

$T_{set}$  = 125° F

$T_{main}$  = 60° F

### Tankless Water Heater

The Evaluators verified that rebated tankless water heater model numbers met TRM specifications and calculated annual fuel savings using Equation 27 (2020 NJ TRM, pg. 31).

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

*Equation 27*

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<sup>28</sup>

The 2022 NJ TRM addendum changes the calculation for Tankless Water Heater algorithm savings to Equation 28.

*Fuel Savings (therm/yr)*

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

*Equation 28*

<sup>27</sup> Based on average number of people in the household. Data collected from the EEP participant survey.

<sup>28</sup> The Evaluators assumed that tankless water heaters were the type replaced in this program. This results in a  $UEF_b$  of .81 for every rebated tankless water heater in PY1.

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 <sup>29</sup>
$T_{set}$	= 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, the Evaluators reviewed program documents, spoke with program staff, conducted interviews with trade allies, and surveyed customers.

The Evaluators 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 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

<sup>29</sup> Based on average number of people in the household. Data collected from the EEP participant survey.

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 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 submitted 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 rebate amount, the application process (whether through the Company directly or through their contractor), and the product they installed? What are any 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 any 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 any 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*

The Evaluators 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 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 any 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  $\pm 10\%$  at the 90% confidence interval at the program level and  $\pm 15\%$  at the 85% confidence interval at the measure level.<sup>30</sup> The sample size calculation for achieving 90% confidence with 10% precision is shown in Equation 29.

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

*Equation 29*

Where:

$n_0$	= Minimum sample size
$N$	= Population size
$Z_{\alpha/2}$	= Z value at 90% 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)

<sup>30</sup> 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  $\pm 15\%$  at the 90% confidence interval.

### *Sampling Results*

Survey responses for 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	2,276	321,184.78	55.1%	23	47	85/10.4
Gas Furnace with Water Heater	447	172,392.53	29.6%	22	32	85/12.3
Gas Combination Heater	278	39,215.46	6.7%	21	23	85/14.4
Water Heater	533	16,117.37	2.8%	22	39	85/11.1
Smart Thermostat	363	14,654.31	2.5%	22	23	85/14.6
Gas Boiler	57	9,917.17	1.7%	17	1	85/72
Clothes Dryer	656	5,044.64	0.9%	22	9	85/24
Clothes Washer	634	4,080.60	0.7%	22	8	85/25
Reset Controls	1	27.56	0.0%	1	0	-
<b>Total</b>	<b>5,245</b>	<b>582,634.42</b>	<b>100%</b>	<b>172</b>	<b>182</b>	<b>85/5.2</b>

*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	8,880	358,924.20	91.7%	23	41	85/11.2
Low Flow Showerheads	663	15613.79	4.0%	22	62	85/8.7
Water Savings Kit	189	15,372.76	3.9%	21	24	85/13.8
Faucet Aerators	100	1,403.88	0.4%	21	53	85/6.8
<b>Total</b>	<b>9,832</b>	<b>391,314.63</b>	<b>100.0%</b>	<b>87</b>	<b>180</b>	<b>85/5.3</b>

### **7.3 Gross 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 6.2.1. Program savings are summarized in Table 7-10 and Table 7-11 as well as discussed in detail by measure category in the following sections.

*Table 7-10: EEP Gross Annual Gas Savings*

Measure Category	Quantity	Ex-Ante Savings (therms)	Ex-Post Savings (therms)	RR therms
<b>Downstream</b>				
Gas Furnace	2,276	321,184.78	303,401.08	94%
Gas Furnace with Water Heater	447	172,392.53	88,216.56	51%
Gas Combination Heater	278	39,215.46	66,296.90	169%
Smart Thermostat	363	14,654.31	14,654.31	100%
Gas Boiler	57	9,917.17	10,433.76	105%
Tankless Water Heater	301	10,160.07	10,175.89	100%
Gas Storage Tank Water Heater	230	5,205.20	9,778.84	188%
Clothes Dryer	656	5,044.64	5,044.64	100%
Clothes Washer	634	4,080.60	3,422.50	84%
Indirect- Fired Storage Tank Water Heater	2	752.10	252.60	34%
Reset Controls	1	27.56	0.00	N/A
<b>Online Marketplace</b>				
Smart Thermostat	8,880	358,924.20	343,230.89	96%
Low Flow Showerheads	663	15,613.79	14,317.84	92%
Water Saving Kit	189	15,372.76	13,394.21	87%
Faucet Aerators	100	1,403.88	1,298.47	92%
<b>Total</b>	<b>15,077</b>	<b>973,949.05</b>	<b>883,918.48</b>	<b>91%</b>

*Table 7-11: EEP Gross Annual Electric Savings*

<b>Measure Category</b>	<b>Quantity</b>	<b>Ex-Ante Savings (kWh)</b>	<b>Ex-Post Savings (kWh)</b>	<b>RR kWh</b>
<b>Downstream</b>				
Central Air Conditioner (Tier 1)	680	238,855.98	195,946.01	82%
Smart thermostat	363	48290.55	48290.55	100%
Clothes Washer	634	36,353.51	50,577.13	139%
Central Air Conditioner (Tier 2)	20	11,577.11	11,193.66	97%
Ductless Mini-Split Heat Pump (Single)	4	1,624.13	3,374.48	208%
Ductless Mini-Split Heat Pump (Multi)	2	812.06	1,775.65	219%
Air Source Heat Pump (Tier 2)	1	460.17	503.50	109%
Air Source Heat Pump (Tier 1)	1	232.57	329.31	142%
<b>Online Marketplace</b>				
Smart Thermostat	8,880	1,265,809	1,211,128	96%
Low Flow Showerheads	663	9,704	37,165	378%
Water Saving Kit	189	21,225	39,646	187%
Faucet Aerators	100	3,356	4,564	136%
<b>Total</b>	<b>11,537</b>	<b>1,638,301</b>	<b>1,604,494</b>	<b>98%</b>

*Table 7-12: EEP Gross Demand Reduction*

Measure Category	Quantity	Ex-Ante Demand Reduction (kW)	Ex-Post Demand Reduction (kW)	RR kW
<b>Downstream</b>				
Central Air Conditioner (Tier 1)	680	316.00	259.24	82%
Central Air Conditioner (Tier 2)	20	15.32	14.81	97%
Clothes Washer	634	3.42	4.85	142%
Ductless Mini-Split Heat Pump (Single)	4	2.78	1.52	55%
Ductless Mini-Split Heat Pump (Multi)	2	1.39	1.05	76%
Air Source Heat Pump (Tier 2)	1	0.77	0.67	87%
Air Source Heat Pump (Tier 1)	1	0.46	0.44	94%
Smart thermostat	363	N/A	N/A	N/A
<b>Online Marketplace</b>				
Smart Thermostat	8,880	N/A	N/A	N/A
Low Flow Showerheads	663	N/A	N/A	N/A
Water Saving Kit	189	N/A	N/A	N/A
Faucet Aerators	100	N/A	N/A	N/A
<b>Total</b>	<b>11,537</b>	<b>340.12</b>	<b>282.58</b>	<b>83%</b>

### 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 (13%)<sup>31</sup> vs. gas (86%)<sup>32</sup> water heating. Table 7-13 and Table 7-14 include annual savings for faucet aerators.

<sup>31</sup> Percent of water heaters fueled by electricity for participants who received water conservation measures derived from the Evaluator's participant survey

<sup>32</sup> Percent of water heaters fueled by natural gas for participants who received water conservation measures derived from the Evaluator's participant survey

*Table 7-13: EEP Faucet Aerator Gross Annual Gas Savings*

<b>Measure Name</b>	<b>Quantity</b>	<b>Ex-Ante Savings (therms)</b>	<b>Ex-Post Savings (therms)</b>	<b>RR therms</b>
Kitchen Faucet Aerator	88	1,137.84	1,084.43	95%
Bathroom Faucet Aerator	12	266.04	214.04	80%
<b>Total</b>	<b>100</b>	<b>1,403.88</b>	<b>1,298.47</b>	<b>92%</b>

*Table 7-14: EEP Faucet Aerator Gross Annual Electric Savings*

<b>Measure Name</b>	<b>Quantity</b>	<b>Ex-Ante Savings (kWh)</b>	<b>Ex-Post Savings (kWh)</b>	<b>RR kWh</b>
Kitchen Faucet Aerator	88	2,720	3,812	140%
Bathroom Faucet Aerator	12	636	752	118%
<b>Total</b>	<b>100</b>	<b>3,356</b>	<b>4,564</b>	<b>136%</b>

### 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) with a correction changing minutes to fraction of an hour. Both bathroom and kitchen faucet aerator ex-ante savings values were calculated without the minutes to hours correction applied. The Evaluators also 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, 85% for bathroom faucet aerators and 84% for kitchen faucet aerators. Ex-post calculations used flow rate verified by model number shown below in Table 7-15.

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

<b>Measure Name</b>	<b>Ex-Ante GPM</b>	<b>Ex-Post GPM</b>	<b>Ex-Ante Per-Unit therms</b>	<b>Ex-Post Per-Unit therms</b>	<b>Ex-Ante Per-Unit kWh</b>	<b>Ex-Post Per-Unit kWh</b>
Kitchen Faucet Aerator	<i>Unknown</i>	1.0 or 1.5	12.93	12.32	31	43
Bathroom Faucet Aerator	<i>Unknown</i>	1.0	22.17	17.84	53	63

### *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 (13%)<sup>33</sup> vs. gas (86%)<sup>34</sup> water heating. Table 7-16 and Table 7-17 include annual savings for showerheads.

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

Measure Name	Quantity	Ex-Ante Savings (therms)	Ex-Post Savings (therms)	RR therms
Low-flow Showerhead	663	15,613.79	14,317.84	92%
<b>Total</b>	<b>663</b>	<b>15,613.79</b>	<b>14,317.84</b>	<b>92%</b>

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

Measure Name	Quantity	Ex-Ante Savings (kWh)	Ex-Post Savings (kWh)	RR kWh
Low-flow Showerhead	663	9,704	37,165	383%
<b>Total</b>	<b>663</b>	<b>9,704</b>	<b>37,165</b>	<b>383%</b>

#### 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 69% for the ex-post savings. For showerhead electric savings, the Evaluators 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.

*Table 7-18: EEP 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	Unknown	1.25 or 1.5	23.55	21.60	15	56

<sup>33</sup> Percent of water heaters fueled by electricity for participants who received water conservation measures derived from the Evaluator's participant survey

<sup>34</sup> Percent of water heaters fueled by natural gas for participants who received water conservation measures derived from the Evaluator's participant survey

### *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 7.3. Additionally, the Evaluators used the marketplace participant survey to determine the proportion of participants with electric (13%)<sup>35</sup> vs. gas (86%)<sup>36</sup> water heating. Table 7-19 and Table 7-20 include annual savings for water savings kits.

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

Measure Name	Quantity	Ex-Ante Savings (therms)	Ex-Post Savings (therms)	RR therms
Water Savings Kit	189	15,372.76	13,394.21	87%
<b>Total</b>	<b>189</b>	<b>15,372.76</b>	<b>13,394.21</b>	<b>87%</b>

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

Measure Name	Quantity	Ex-Ante Savings (kWh)	Ex-Post Savings (kWh)	RR kWh
Water Savings Kit	189	21,225	39,646	187%
<b>Total</b>	<b>189</b>	<b>21,225</b>	<b>39,646</b>	<b>187%</b>

### 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 95.23 therms and 278 kWh.

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, 85% for bathroom faucet aerators and 84% 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-

<sup>35</sup> Percent of water heaters fueled by electricity for participants who received water conservation measures derived from the Evaluator's participant survey

<sup>36</sup> Percent of water heaters fueled by natural gas for participants who received water conservation measures derived from the Evaluator's participant survey

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 69% for the ex-post savings. For showerhead electric savings, the Evaluators could not verify the reported (ex-ante) values.

### 7.3.2 Air Source Heat Pumps and Mini-Splits

The Evaluators verified the specifications of all air source heat pumps and mini-splits included in the tracking data using the AHRI database. There were 7 unique AHRI numbers and the Evaluators were able to verify all of them. The annual electric savings are shown in Table 7-21.

*Table 7-21: EEP Air Source Heat Pump and Mini-Split Gross 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
Ductless Mini-Split Heat Pump (Single)	4	4	1,624	2.78	3,374	1.52	208%	55%
Ductless Mini-Split Heat Pump (Multi)	2	2	812	1.39	1,776	1.05	219%	76%
Air Source Heat Pump (Tier 2)	1	1	460	0.77	503	0.67	109%	87%
Air Source Heat Pump (Tier 1)	1	1	233	0.46	329	0.44	142%	94%
<b>Total</b>	<b>8</b>	<b>8</b>	<b>3,129</b>	<b>5.40</b>	<b>5,983</b>	<b>3.68</b>	<b>191%</b>	<b>68%</b>

#### *Discussion of Realization Rate*

Realization rates for air source heat pumps are above 100% because ex-ante savings calculations did not include heating season savings. The Evaluators included heating season savings for instances in which tracking data indicated systems were in use for home heating, following the 2020 TRM guidelines. The Evaluators were unable to verify ex-ante savings for mini-splits.

### 7.3.3 Central Air Conditioner

The Evaluators verified the specifications of each central air conditioner included in the tracking data using the AHRI database. There were 377 unique AHRI numbers and the

Evaluators were able to verify 94% of them (353 models). The annual savings are shown in Table 7-22.

*Table 7-22: EEP 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 Conditioners (Tier 1)	680	656	238,856	316.00	195,946	259.24	82%	82%
Central Air Conditioners (Tier 2)	20	20	11,577	15.32	11,194	14.81	97%	97%
<b>Total</b>	<b>700</b>	<b>676</b>	<b>250,433</b>	<b>331.31</b>	<b>207,140</b>	<b>274.05</b>	<b>83%</b>	<b>83%</b>

#### *Discussion of Realization Rate*

Realization rates for central air conditioners are lower than 100% due to differences between ex-ante deemed variables and the verified model specifications used for the ex-post calculations. Additionally, 24 units for which the AHRI reference numbers could not be verified. Table 7-23 shows the average ex-ante and ex-post variables used in electric savings calculations.

*Table 7-23: EEP Central Air Conditioner 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 Conditioners (Tier 1)	2.71	16.10	2.81	16.09	351	299	0.46	0.40
Central Air Conditioners (Tier 2)	2.69	21.04	2.70	21.11	579	560	0.77	0.74

#### **7.3.4 Boiler Reset Controls**

There was one boiler reset control in the program tracking data. The annual savings are shown in Table 7-24.

*Table 7-24: EEP 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	0.00	N/A
<b>Total</b>	<b>1</b>	<b>1</b>	<b>27.56</b>	<b>0.00</b>	<b>N/A</b>

#### *Discussion of Realization Rate*

Ex-post savings could not be calculated for boiler reset controls. 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.

#### **7.3.5 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](http://energystar.gov)). Appliance savings are reported in Table 7-25 and Table 7-26.

*Table 7-25: EEP 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)	387	387	1,857.60	1,596.71	86%
Clothes Washer (Tier 2)	247	247	2,223.00	1,825.79	82%
Clothes Dryer	656	656	5,044.64	5,044.64	100%
<b>Total</b>	<b>1,290</b>	<b>1,290</b>	<b>9,125.24</b>	<b>8,467.14</b>	<b>93%</b>

*Table 7-26: EEP 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)	387	387	21,286	1.93	29,657	2.80	139%	145%
Clothes Washer (Tier 2)	247	247	15,068	1.48	20,921	2.06	139%	139%
<b>Total</b>	<b>634</b>	<b>634</b>	<b>36,354</b>	<b>3.42</b>	<b>50,577</b>	<b>4.85</b>	<b>139%</b>	<b>142%</b>

### *Discussion of Realization Rate*

The realization rate for clothes dryers was 100% and ranged from 89% to 150% 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%, while higher realization rates resulted from ex-post calculations using verified product specifications (see Table 7-27).

*Table 7-27: EEP ENERGY STAR Clothes Washer Measure Specified 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)	95	456.00	195.11	5,225	0.48	13,597	1.34	43%	260%	281%
Clothes Washer (Tier 2)	60	540.00	142.79	3,660	0.36	9,514	0.94	26%	260%	260%
<b>Total</b>	<b>155</b>	<b>996.00</b>	<b>337.90</b>	<b>8,885</b>	<b>0.84</b>	<b>23,110</b>	<b>2.27</b>	<b>34%</b>	<b>260%</b>	<b>272%</b>

The average capacities and IMEF ratings for ex-post savings calculations after April 1, 2022 are shown in Table 7-28. The capacities and IMEF ratings were not provided in the program tracking data.

*Table 7-28: EEP Clothes Washer 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)	Unknown	Unknown	4.97	2.29
Clothes Washer (Tier 2)	Unknown	Unknown	4.57	2.29

### **7.3.6 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 88 unique gas boiler AHRI reference numbers in the program tracking data. The Evaluators were unable to verify 20 of the unique gas boiler AHRI reference numbers. As a result, ex-post savings could not be calculated for 21 gas boilers. Gas Boiler fuel savings are shown in Table 7-29.

*Table 7-29: EEP 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)	10	10	1,287.50	1,361.24	106%
Tier 2 Gas Boiler (AFUE 95)	47	47	8,629.67	9,072.52	105%
Gas Combi Heat Tier 1 (AFUE 95-96.9)	278	257	39,215.46	66,296.90	169%
<b>Total</b>	<b>335</b>	<b>314</b>	<b>49,132.63</b>	<b>76,730.66</b>	<b>156%</b>

#### *Discussion of Realization Rate*

The realization rate for gas boilers was 106% and 169% for gas combination boilers. Realization rates other than 100% are the result of ex-ante savings that were calculated using deemed parameters or estimates and ex-post savings that were calculated using verified model parameters. Table 7-30 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 7-30: EEP Gas Boiler 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)	103.50	92.55	108.00	92.55	128.75	136.12
Tier 2 Gas Boiler (AFUE 95)	117.85	95.02	126.02	95.02	183.61	193.03
Gas Combi Heat Tier 1 (AFUE 95-96.9)	124.01	94.71	130.80	95.00	141.06	257.96

#### **7.3.7 Gas Furnaces**

The Evaluators' review of program tracking data identified that a total of 2,387 gas furnaces were rebated to customers during PY1. The Evaluators verified the types (weatherized/non-weatherized), capacities, and Annual Fuel Utilization Efficiency (AFUE) ratings of each model with the AHRI database to ensure accurate savings calculations. There were 495 unique AHRI reference numbers in the program tracking data. The Evaluators were unable to verify 101 of the AHRI reference numbers, as a result, ex-post savings could not be calculated for 117 gas furnaces. Tier 1 and Tier 2 gas furnace annual fuel savings are shown in Table 7-31 below.

*Table 7-31: EEP 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)	2,146	2,039	300,504.38	283,945.17	94%
Gas Furnace - Tier 2 (AFUE 97)	130	120	20,680.40	19,455.91	94%
<b>Total</b>	<b>2,276</b>	<b>2,159</b>	<b>321,184.78</b>	<b>303,401.08</b>	<b>94%</b>

#### *Discussion of Realization Rate*

Ex-post savings could not be calculated for the 112 gas furnace models that the Evaluators could not verify. Also, ex-post savings calculations used verified furnace specifications rather than ex-ante deemed values. Table 7-32 shows the average capacities and AFUEs used in the ex-post savings calculations and the average capacity and AFUEs from the reported tracking data.

*Table 7-32: EEP Gas Furnace 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)	71.19	96.36	72.36	95.96	140.03	139.26
Gas Furnace - Tier 2 (AFUE 97)	76.68	97.52	77.28	97.37	159.08	162.13

#### **7.3.8 Gas Heater with Water Heater**

Program tracking data included 447 gas heaters with water heaters. 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 406 gas furnaces, 15 boilers, 268 storage tank water heaters, 147 tankless water heaters, and 6 indirect fired storage tank water heaters. As a result, no ex-post savings were calculated for 26 gas heaters and 26 water heaters. 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 savings is shown in Table 7-33.

*Table 7-33: EEP Gas Heater with Water Heater Gross Annual Gas Savings*

<b>Measure Name</b>	<b>Quantity</b>	<b>Verified Heaters</b>	<b>Verified Water Heaters</b>	<b>Ex-Ante Savings (therms)</b>	<b>Ex-Post Savings (therms)</b>	<b>RR therms</b>
Tier 1 Qualifying Gas Heater w Gas Water Heat (<55 gal)	289	273	272	109,568.57	50,729.34	46%
Tier 2 Qualifying Gas Heater w Gas Water Heat (>=55 gal)	158	148	149	62,823.96	37,487.21	60%
<b>Total</b>	<b>447</b>	<b>421</b>	<b>421</b>	<b>172,392.53</b>	<b>88,216.56</b>	<b>51%</b>

*Discussion of Realization Rate*

The Evaluators were able to verify only 94% of the AHRI reference numbers included in the tracking data and therefore could not calculate ex-post savings for the remaining models. Additionally, the Evaluators calculated ex-post savings using verified model specifications. Table 7-34through Table 7-38 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 7-34: EEP Gas Heater with Water Heater Average Gas Savings Per-Unit*

<b>Measure Name</b>	<b>Ex-Ante Per-Unit (therms)</b>	<b>Ex-Post Per-Unit (therms)</b>
Qualifying Gas Heater w Gas Water Heat (<55 gal)	379.13	185.82
Qualifying Gas Heater w Gas Water Heat (>=55 gal)	397.62	253.29

*Table 7-35: EEP Average Ex-Ante and Ex-Post Furnace Variables*

<b>Measure Name</b>	<b>Average Ex-Ante Capacity</b>	<b>Average Ex-Ante AFUE</b>	<b>Average Ex-Post Capacity</b>	<b>Average Ex-Post AFUE</b>
Qualifying Gas Heater w Gas Water Heat (<55 gal)	67.67	96.15	73.25	96.15
Qualifying Gas Heater w Gas Water Heat (>=55 gal)	Unknown	96.02	76.37	96.02

*Table 7-36: EEP Average Ex-Ante and Ex-Post Boiler Variables*

<b>Measure Name</b>	<b>Average Ex-Ante Capacity</b>	<b>Average Ex-Ante AFUE</b>	<b>Average Ex-Post Capacity</b>	<b>Average Ex-Post AFUE</b>
Qualifying Gas Heater w Gas Water Heat (<55 gal)	<i>Unknown</i>	94.19	125.20	94.19
Qualifying Gas Heater w Gas Water Heat (>=55 gal)	<i>Unknown</i>	93.62	125.00	93.62

*Table 7-37: EEP Average Ex-Ante and Ex-Post Storage Tank Water Heater Variables*

<b>Measure Name</b>	<b>Average Ex-Ante Gallons</b>	<b>Average Ex-Ante UEF</b>	<b>Average Ex-Post Gallons</b>	<b>Average Ex-Post EUF</b>
Qualifying Gas Heater w Gas Water Heat (<55 gal)	<i>Unknown</i>	<i>Unknown</i>	44.21	0.70

*Table 7-38: EEP Average Ex-Ante and Ex-Post Tankless Water Heater Variables*

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

### 7.3.9 Water Heaters

The Evaluators' review of program tracking data identified that a total of 230 gas storage tank water heaters, 301 tankless water heaters, and 2 indirect-fired storage tank water heaters were rebated during PY1. 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 43 unique gas storage tank water heater AHRI reference numbers, 38 unique tankless water heaters, and 2 unique indirect-fired storage tank water heaters in the program tracking data. The Evaluators were unable to verify 7 of the storage tank water heaters and 8 of the tankless water heater AHRI reference numbers. As a result, the Evaluators could not calculate ex-post savings for 7 storage tank water heaters and 9 tankless water heaters. Water heater savings are shown in Table 7-39.

*Table 7-39: EEP Water Heater Annual Gross Annual Gas Savings*

<b>Measure Name</b>	<b>Quantity</b>	<b>Verified Quantity</b>	<b>Ex-Ante Savings (therms)</b>	<b>Ex-Ante Savings (therms)</b>	<b>RR therms</b>
Gas Storage Tank Water Heater (<55 gal)	230	223	5,205.20	9,778.84	188%
Indirect - Fired Storage Tank Water Heater (<55 gal)	2	2	752.10	252.60	34%
Tankless Water Heater ( $\text{UEF} \geq 0.87$ )	301	292	10,160.07	10,175.89	100%
<b>Total</b>	<b>533</b>	<b>517</b>	<b>16,117.37</b>	<b>20,207.32</b>	<b>125%</b>

#### *Discussion of Realization Rate*

Ex-ante savings calculations used deemed model specifications. A realization rate of 136% for the measure category resulted from calculating ex-post savings using verified model specifications. Table 7-40 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 7-40: EEP Water Heater Average Ex-Ante and Ex-Post Variables*

<b>Measure Name</b>	<b>Average Ex-Ante Gallons</b>	<b>Average Ex-Ante UEF</b>	<b>Average Ex-Post Gallons</b>	<b>Average Ex-Post EUF</b>	<b>Ex-Ante Per-Unit therms</b>	<b>Ex-Post Per-Unit therms</b>
Gas Storage Tank Water Heater (<55 gal)	<i>Unknown</i>	<i>Unknown</i>	45.41	0.71	22.63	43.85
Tankless Water Heater ( $\text{UEF} \geq 0.87$ )	N/A	<i>Unknown</i>	N/A	0.95	33.75	34.85

#### **7.3.10 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. Table 7-41 and Table 7-42 report annual savings for smart thermostats.

*Table 7-41: EEP Smart Thermostat Gross Annual Gas Savings*

<b>Distribution Channel</b>	<b>Quantity</b>	<b>Verified Quantity</b>	<b>Ex-Ante Savings (therms)</b>	<b>Ex-Ante Savings (therms)</b>	<b>RR therms</b>
Downstream	363	363	14,654.31	14,654.31	100%
Online Marketplace	8,880	8880	358,924	343,231	96%
<b>Total</b>	<b>9,243.00</b>	<b>9,243</b>	<b>373,578.51</b>	<b>357,885.20</b>	<b>96%</b>

*Table 7-42: EEP Smart Thermostat Gross Annual Electric Savings*

Distribution Channel	Quantity	Verified Quantity	Ex-Ante Savings (kWh)	Ex-Ante Savings (kWh)	RR kWh
Downstream	363	363	48,291	48,291	100%
Online Marketplace	8,880	8880	1,265,809	1,211,128	96%
<b>Total</b>	<b>9,243</b>	<b>9,243</b>	<b>1,314,100</b>	<b>1,259,419</b>	<b>96%</b>

#### *Discussion of Realization Rate*

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

#### **7.3.11 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.

#### **7.3.12 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 7-43 and Table 7-44. EULs were sourced from the 2020 NJ TRM and the MD/MA V10 TRM.

*Table 7-43: EEP Lifetime Gas Savings*

Measure Category	Quantity	Ex-Post Savings (therms)	EUL	Lifetime Savings (therms)
<b>Downstream Distribution Channel</b>				
Gas Furnace	2,276	303,401.08	20	6,068,021.57
Gas Combination Heater	278	66,296.90	20	1,325,938.09
Gas Furnace with Water Heater	447	88,216.56	15	1,323,248.36
Gas Boiler	57	10,433.76	20	208,675.13
Tankless Water Heater	301	10,175.89	20	203,517.74
Smart Thermostat	363	14,654.31	7.5	109,907.33
Gas Storage Tank Water Heater	230	9,778.84	11	107,567.19
Clothes Dryer	656	5,044.64	12	60,535.68
Clothes Washer	634	3,422.50	11	37,647.46
Indirect- Fired Storage Tank Water Heater	2	252.60	11	2,778.61
Reset Controls	1	0.00	10	0.00
<b>Online Marketplace</b>				
Smart Thermostat	8,880	343,230.89	7.5	2,574,231.70
Low-flow showerhead	663	14,317.84	10	143,178.37
Water Saving Kit	189	13,394.21	10	133,942.10
Faucet Aerators	100	1,298.47	10	12,984.74
<b>Total</b>	<b>15,077</b>	<b>883,918.48</b>	<b>N/A</b>	<b>12,312,174.07</b>

Table 7-44: EEP Lifetime Electric Savings

Measure Category	Quantity	Ex-Post Savings (kWh)	EUL	Lifetime Savings (kWh)
<b>Downstream Distribution Channel</b>				
Central Air Conditioner (Tier 1)	680	195,946	15	2,939,190
Clothes Washer	634	50,577	11	556,348
Smart thermostat	363	48,291	7.5	362,179
Central Air Conditioner (Tier 2)	20	11,194	15	167,905
Ductless Mini-Split Heat Pump (Single)	4	3,374	17	57,366
Ductless Mini-Split Heat Pump (Multi)	2	1,776	17	30,186
Air Source Heat Pump (Tier 2)	1	503	15	7,552
Air Source Heat Pump (Tier 1)	1	329	15	4,940
<b>Online Marketplace</b>				
Smart Thermostat	8,880	1,211,128	7.5	9,083,461
Low Flow Showerheads	663	37,165	10	371,653
Water Saving Kit	189	39,646	10	396,460
Faucet Aerators	100	4,564	10	45,640
<b>Total</b>	<b>11,537</b>	<b>1,604,494</b>	<b>N/A</b>	<b>14,022,880</b>

### 7.3.13 Data Review

The Evaluators reviewed program tracking data for all measures included in Program Year 1 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, 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. The Evaluators use the reference number to access measure specifications for the exact model product the customer has purchased. The PY1 tracking data included numerous incorrect or incomplete AHRI reference numbers, which prevented the Evaluators from calculating ex-post savings for those measures. Realization rates were negatively impacted by incorrect or incomplete AHRI reference numbers.

**Missing baseline conditions.** Program tracking data did not include the baseline water heater type, so the Evaluators made conservative estimates in place of this data (e.g., the Evaluators assumed that tankless water heaters replaced older tankless water heaters).

**Missing measure specifications or savings algorithm variables.** Program tracking data did not include several variables necessary for calculating savings following the NJ TRM specifications. For example, the flow rate of water conservation measures, the boiler capacity for boiler reset controls, and the capacity and IMEF ratings of clothes washers were not included in the program data.

#### *Opportunity to Improve Realization Rates*

Realization rates reflect the ratio of forecasted savings to verified savings. Realization rates close to 100% reflect an accurate forecast of program performance. The Evaluators provide the following recommendations to improve realization rates.

**Calculate ex-ante savings using actual measure parameter values by record, rather than using deemed 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 realization rates closer to 100%.

**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 which appliance (the heater or water heater) was reference by each, and 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**

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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 Evaluators conducted four discussions with SJG, SJI, Uplight, and Honeywell staff to investigate the design and implementation of SJG'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:

- SJG staff (August 2022): South Jersey Gas' energy efficiency manager, SJG residential program analyst
- 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.

SJI's EM&V manager attended each call, and SJI's director of energy efficiency attended the SJG staff call. The Evaluators received additional follow-up information from SJI's financial planning analyst, program staff, and marketing manager via email.

**SJG has strong working relationships with the residential program implementation vendors, though there were some initial communication and data tracking related challenges.** The SJG staff indicated that communication with implementation companies was sufficient, though SJG's energy efficiency analyst noted that there had been a significant amount of turnover at Honeywell this past year and that had created a challenge "getting them up to speed" each time there were new 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." SJG's energy efficiency analysts have re-occurring one-on-one meetings with each program's implementation staff.

**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 SJG 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. 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 gas savings if they fall outside of an acceptable range.

**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. SJG 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 a 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 10% 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.** SJG, 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's cross-promotes programs through the Behavioral program and conducts targeted outreach for the Online Marketplace program. All marketing is coordinated through SJG's marketing team and approval is granted through SJG for all marketing efforts. SJI's director noted that there is a robust contractor network in SJG's territory as it has been in operation since 2009. Furthermore, the SJG program manager stated that in the past this program had sufficient interest through contractor-driven door-to-door canvassing. Contractor outreach was supplemented by additional marketing channels such as emails and bill inserts.

**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 the Evaluators with a summary roll-up of the monthly marketing reporting that is provided to SJI and SJG; 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 the Evaluator'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 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.** The staff indicated that communication with implementation companies was sufficient, though SJG's energy efficiency analyst noted that there had been a significant amount of turnover at Honeywell this past year and that had created a challenge "getting them up to speed" each time new staff was hired. 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. SJI's director of energy efficiency noted that there is a robust contractor network in SJG's territory as the EEP Downstream program has been in operation since 2009. Furthermore, the SJG program manager stated that in the past this program had sufficient interest through contractor-driven door-to-door canvassing. The SJG energy efficiency manager observed that the current rebate levels were in "lockstep" with other utilities across the state and the amounts were "fair, market-based, customer focused" amounts.

**Training was offered to SJG EEP Downstream contractors to ensure understanding of the program transition.** SJG staff noted offering training to their participating network of contractors for the downstream program just before the transition from state to utility administration of programs. The SJG contacts suggested that the participating network

of contractors is aware of the SJG programs, but non-participating contractors are likely not as aware of the offerings. SJG held trainings throughout the year educating contractors on Residential and Commercial program offerings and the on-bill repayment program, financing processes, and the income eligible weatherization program.

**The On-Bill Repayment Program option was perceived as a benefit and an added feature that attracts customers to the EEP Downstream program.** The SJG energy efficiency analyst noted that the legacy SJG EEP program did not offer financing if customers received an EEP rebate; the program now allows customers to receive a rebate and participate in the on bill repayment program. The SJG energy efficiency program manager observed that despite budgetary constraints and requirements to coordinate incentive levels, “customers are still taking advantage of the rebates”.

**SJG’s Online Marketplace did not meet its budget spending expectations in PY1; this was attributed to initially limited marketing and a limited range of products.** 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. 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 meets 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 Evaluators conducted an email survey of Downstream participants in August 2022. A total of 4,396 customers participated in the Downstream program through June 2022 and 3,464 (89%) had email addresses in program tracking data.

A sample of 1,204 customers were sent an invitation to share their feedback and 458 customers received a reminder email. Customers were offered a \$10 incentive to take the survey. Ten customers that were invited to take the survey were disqualified; these customers indicated that program tracking data was incorrect for one or more reasons. Four percent of email invitations bounced. One hundred and seven customers that participated in the Downstream program completed the survey (nine 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 7.3.13 provides information about measure verification. The Evaluators 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 non-differences are mentioned.<sup>37</sup>

**Nearly all respondents were homeowners, 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 7-45 summarizes Downstream Survey respondents' home characteristics.

<sup>37</sup> The Evaluators 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 7-45: EEP Downstream Respondent Home Characteristics*

<b>Question</b>	<b>Response</b>	<b>Percent</b>
Do you own or rent your home? (n=107)	Rent	1%
	Own	99%
Which of the following best describes your home type? (n=107)	Single-family detached	86%
	Duplex	3%
	Apartment/condo in a 2-4 unit building	1%
	Apartment/condo in a 5+ unit building	8%
	Single family townhouse or row house	1%
When was your home built? (n=107)	Before 1960	22%
	1960 to 1979	24%
	1980 to 1999	22%
	2000 to 2009	24%
	2010 or later	7%
Including yourself, how many people live in your household? (n=107)	1	10%
	2	48%
	3	13%
	4	20%
	5	4%
	6 or more	4%
	Prefer not to say	2%
About how many square feet is your home? (n=106)	Less than 1,000 square feet	3%
	1,000-1,999 square feet	46%
	2,000-2,999 square feet	35%
	3,000-3,999 square feet	8%
	4,000 or more square feet	3%
	Don't know	5%
What is the main fuel used to heat your home? (n=107)	Electricity	5%
	Natural gas	94%
	Geothermal	1%
What is the main fuel used to heat your water? (n=107)	Electricity	12%
	Natural gas	86%
	Geothermal	1%
	Don't know	1%

**The distribution of respondents skewed older, most identified as white and over half said their income was more than 400% of the Federal Poverty Level (FPL).** About 7% of respondents noted that their income was below 250% of the Federal Poverty Level (FPL), while 13% said it was between 250% and 400% of the FPL.<sup>38</sup> In comparison, using Census Bureau data the Evaluators estimate that about 32% of households served by SJG have incomes under 250% of FPL.<sup>39</sup> Table 7-46 provides additional self-reported survey-taker demographic information.

*Table 7-46: EEP Downstream Respondent Demographics and Additional Background Information*

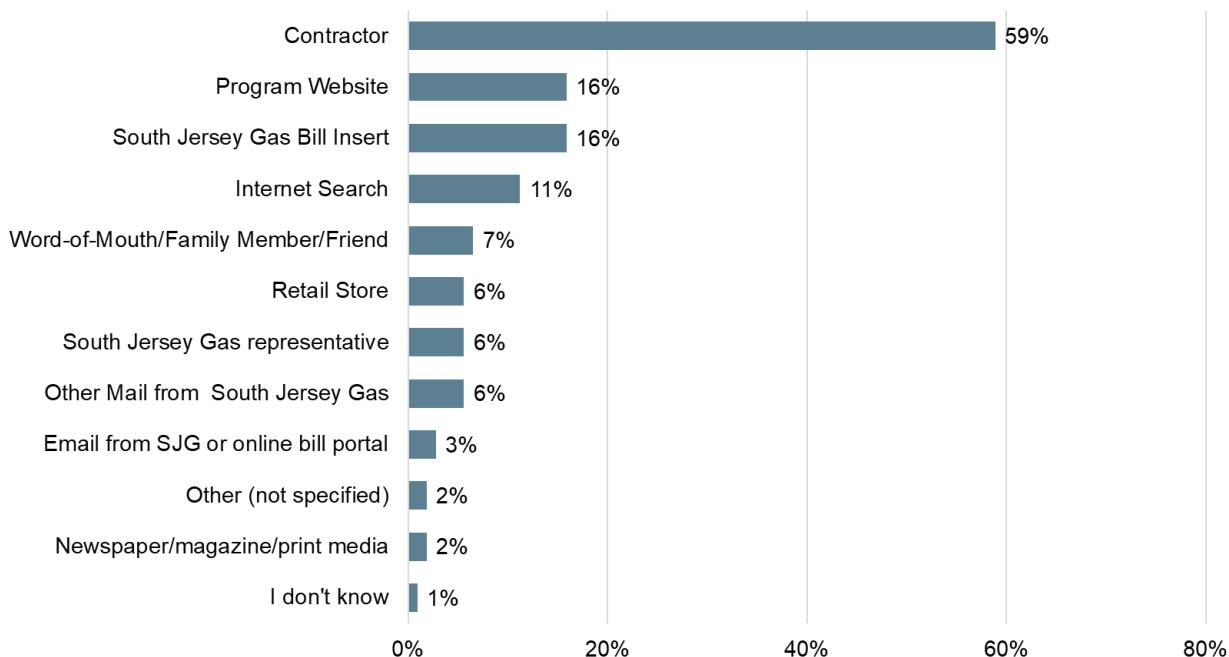
Question	Response	Percent (n=107)
What is your age?	Under 35 years old	7%
	35-55 years old	33%
	Over 55 years old	58%
	Prefer not to answer	3%
How would you identify your race or ethnicity?	Asian	1%
	Black/African American	2%
	Caucasian/White	85%
	Hispanic or Latino	1%
	Prefer not to say	11%

**Contractors are driving awareness of the Downstream program.** Ninety percent of respondents worked with a contractor.<sup>40</sup> Contractors were the primary source of program awareness. Figure 7-2 displays customers' source of program awareness. The Evaluators compared the manner in which customers learned about the program across age groups. There were too few responses to make meaningful conclusions.

<sup>38</sup> Fifty-two percent said their income was more than 400% of the FPL. Thirty-four percent of respondents either preferred not to state (26%) or did not know (1%) their household income.

<sup>39</sup> U.S. Census Bureau 2020 American Community Survey (ACS) Five Year Estimates Public Use Microdata Sample (PUMS). See section 3.2.1 of the main report for further details.

<sup>40</sup> Based on reported contractor information in the program tracking data.



*Figure 7-2: EEP Downstream Participants' Sources of Program Awareness (n=107)<sup>41</sup>*

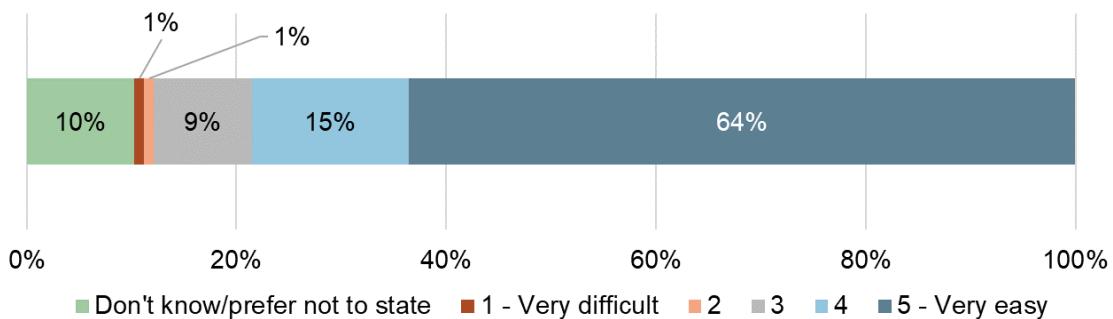
**Downstream customers typically apply through a contractor.** Sixty-one percent of respondents worked with a service provider to apply for the rebate (n=106). Other respondents said they applied online through the utility website (18%), through the mail with a printed form (20%) or by faxing (two percent), emailing (one percent) or calling (one percent) South Jersey Gas.

**The Downstream rebate process is generally easily understood and uncomplicated to navigate.** Seventy-nine percent said it was easy to apply for the rebate (see Figure 7-3). <sup>42</sup> Customers that rated the process a 3 or less were given an opportunity to elaborate (n=12).

- Five customers indicated the application form was challenging and noted challenges obtaining required information.
- Two customers did not elaborate on their rating.
- Two made general comments suggesting the process be made simpler or less confusing.
- One communicated challenges with the electronic signature requirement.
- One had difficulty finding the rebate form.

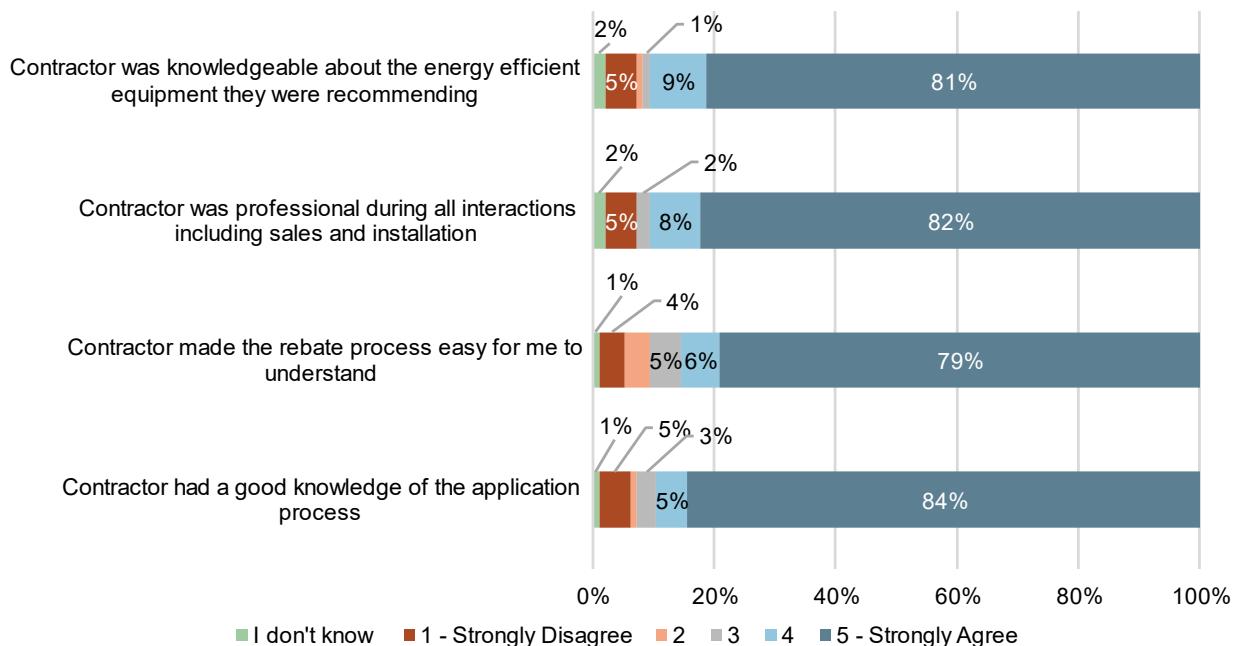
<sup>41</sup> Does not sum to 100% because customers could select more than one response.

<sup>42</sup> Rated the ease of the application process a 4 or 5 on a scale from 1 (very difficult) to 5 (very easy).



*Figure 7-3: Ease of EEP Downstream Rebate Application (n=107)*

**Contractors are professional, knowledgeable, and generally make the rebate process easy to understand.** Figure 7-4 displays the customer agreement with four statements about their experience with the contractor that assisted them with their Downstream program participation.



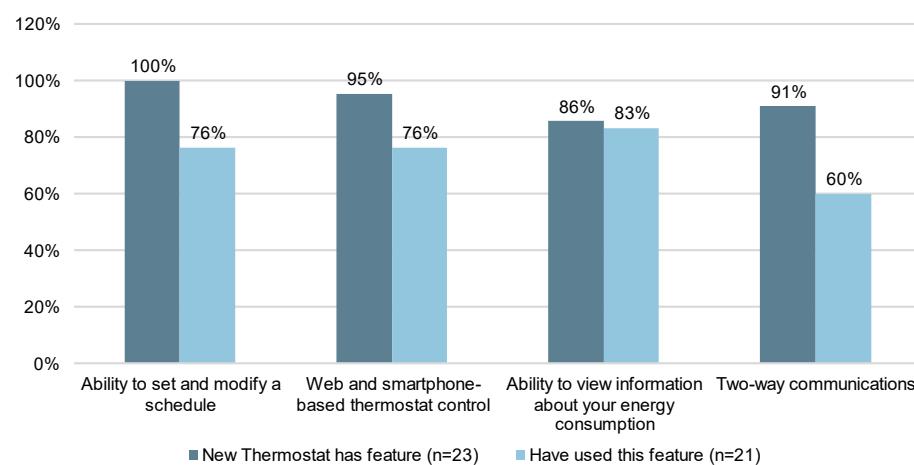
*Figure 7-4: Customer Agreement with Statements about EEP Downstream Contractor (n=96)*

**Washer and dryer customers cited various reasons for choosing the model of washer and dryer, but the rebate was cited by most downstream customers.** Table 7-47 displays the reasons customers chose the model or type of clothes washer and dryer.

*Table 7-47: Reasons customers chose model or type of clothes washer and dryer<sup>43</sup>*

Response	Clothes Washer Percentage (n=8)	Clothes Dryer Percentage (n=9)
There was a rebate for it	6	6
It costs less to operate	5	4
It was a good price	4	3
It uses less water	4	N/A
It was a good brand	3	5
It's good for the environment	2	4
It had the features I wanted	5	4
It was the right size	2	4
Washer had microbial material to protect from mold (write in response)	1	N/A

**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-five percent of smart thermostat customers said they had used at least one of the features, though 19% said they had used all four smart thermostat features that the Evaluators inquired about in the survey.

*Figure 7-5 EEP Downstream Smart Thermostat Features & Feature Use*

**Most smart thermostats rebated through the Downstream program were installed by contractors.** Of the customers who indicated their thermostat was installed, nearly all

<sup>43</sup> Does not sum to 100% because customers could select more than one response.

it done by a contractor (91%), though a portion did it themselves (nine percent). Correspondingly, nearly half learned about the features from the contractor, though a substantial portion noted learning about the features from the user manual. Table 7-48 displays the ways Downstream smart thermostat customers learned about their thermostats' features.

*Table 7-48 How EEP Downstream customers learned about smart thermostat features<sup>44</sup>*

Response	Percent (n=23)
From an HVAC technician, electrician, or other professional	48%
Thermostat's user manual	35%
Online (YouTube, manufacturer's website, etc.)	17%
Independently	9%
From a friend or family member	9%
Information provided by South Jersey Gas	4%
Smart thermostat app (write in response)	4%

**The On-Bill Repayment Program (OBRP) is enabling SJG customers to finance eligible equipment.** Forty-eight percent of the 45 respondents that purchased eligible products said they applied for the OBRP. Eighty-seven percent of these customer said they were approved for the program. All of these customers worked with a contractor to complete their downstream rebate project. Seventy-seven percent of these customers said they would not have been able to install the equipment (51%) or did not know if they would have been able to (26%) 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=47), 21% said they did not know a financing option was available through their utility. Further, of the customers who were not aware of the OBRP, 31% said they would have installed additional equipment if they knew about the financing option. Table 7-49 displays the reasons downstream participants said they did not apply for the OBRP.

<sup>44</sup> Does not sum to 100% because customers could select more than one response.

*Table 7-49: Reasons EEP Downstream customers did not apply for financing through the OBRP<sup>45</sup>*

Response	Percentage (n=47)
Not interested	57%
I did not know there was a financing option available	21%
Applied for and/or used other source of financing for equipment	6%
Prefer not to use financing	6%
Did not qualify	6%
I could not figure out how to apply	2%
Was financially able to pay without financing (write in response)	2%
Don't know	4%

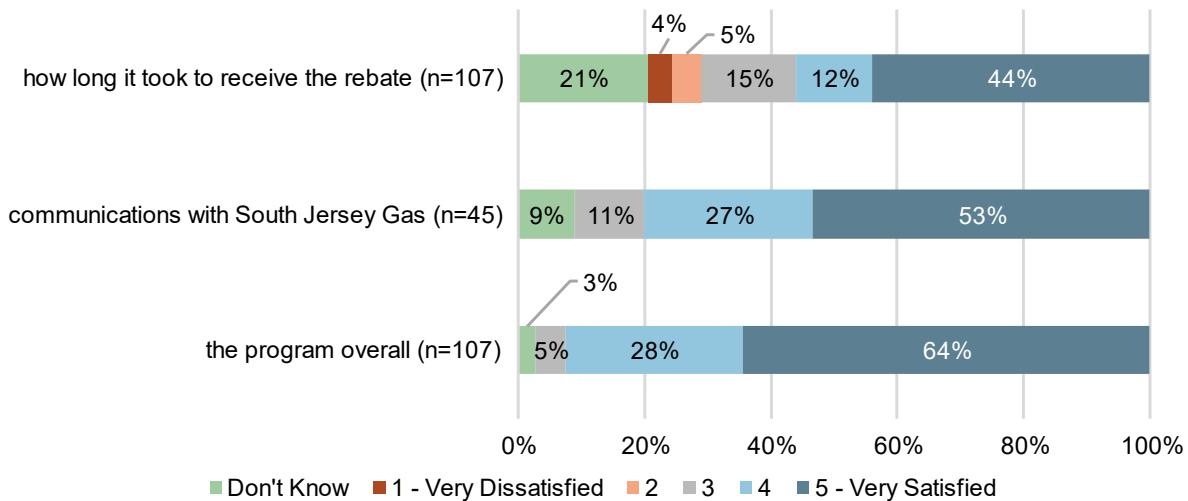
**Downstream rebate customers are satisfied with the rebated equipment.** Eighty-seven percent of respondents indicated satisfaction with the rebated measure they purchased (n=81).<sup>46</sup> Forty-eight percent of customers said they had noticed savings on their SJG bill since installing the rebated measures (n=107).

**Downstream rebate customers were satisfied with the program overall and experience with SJG.** Sixty-four percent said they had recommended the program to someone else and of those who had not recommended the program 82% said they would recommend it.<sup>47</sup> Further, when asked what they would change about the Downstream program, 46% of respondents said they either would not change anything or did not know what they would change. Figure 7-6 displays participant satisfaction and Table 7-50 displays recommendations to improve the program.

<sup>45</sup> Does not sum to 100% because customers could select more than one response.

<sup>46</sup> Rated their satisfaction a 4 or 5 on a scale from 1 (very dissatisfied) to 5 (very satisfied).

<sup>47</sup> 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 7-6: EEP Downstream Rebate Participant Satisfaction*

*Table 7-50: EEP Downstream Respondent Recommendations to Improve Program<sup>48</sup>*

Response	Percentage (n=107)
<b>Prompted Responses – Select All That Apply</b>	
Improve the program application process	18%
Speed up rebate payment time	15%
South Jersey Gas should improve program marketing	5%
South Jersey Gas could provide more info about how much I will save by installing the rebated equipment	12%
Increase rebate amount	29%
<b>Unprompted Responses – Open-end or “Other” Recommendations</b>	
Improve program communication regarding inspection requirement	2%
Allow customers to apply for the rebate online	2%
Do not provide rebate payment to contractors, only provide to customers	2%
Expand range of qualifying equipment	1%
Make the application easier to find on the SJG website	1%
Improve program communication regarding OBRP	1%

**The primary reason customers have not participated in other SJG 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 SJG's energy efficiency

<sup>48</sup> Respondents could provide more than one recommendation. Three customers wrote in responses related to other SJG offerings, indicating interest in receiving more information about available rebates or improving rebate reimbursement processes.

offerings beyond its Downstream program. Sixty-four percent of customers said they were unaware or did not know of other South Jersey Gas incentive or rebate programs for energy efficient equipment or improvements. Table 7-52 displays the reasons Downstream customers that were aware of other programs said they had not participated in other SJG offerings. The Evaluators investigated the sources of awareness for customers who were aware of other SJG offerings compared to those who were only aware of the Downstream program. We found that customers who were unaware of other SJG offerings learned about the Downstream program through a contractor at a higher rate compared to customers who were aware of other SJG programs. (see Table 7-52).

*Table 7-51: Sources of program awareness for EEP Downstream participants (aware vs. unaware of other SJG programs)*

Source	Downstream participants unaware of other SJG offerings (n=49)	Downstream participants aware of other SJG offerings (n=41)
Contractor*	69%	44%
South Jersey Gas Bill Insert	10%	22%
Program Website*	4%	27%
South Jersey Gas representative	2%	12%
Other Mail from South Jersey Gas	2%	7%
Internet Search	10%	15%
Retail Store	8%	5%
Newspaper/magazine/print media	2%	2%
Word-of-Mouth/Family Member/Friend	6%	7%
Email (source not specified)	8%	2%
Email from South Jersey Gas	0%	5%

*Table 7-52: Reasons EEP Downstream Participants Have Not Participated in Other SJG Offerings*

Response	Percent (n=28)
Available programs are not applicable to my home	39%
Not interested	21%
Did not have the time	11%
There are too many steps to participate	7%
Became aware of SJG offering after purchase or improvement	7%
Do not have current need to participate in SJG energy efficiency offerings	7%
Utilizing other utility energy efficiency offering (write in response)	4%
Don't know	7%

#### **7.4.3 Online Marketplace Survey Results**

The Evaluators conducted an email survey of online marketplace customers in August 2022. A total of 7,255 customers made purchases through the marketplace through June 2022 and 7,135 (98%) had email addresses in program tracking data. A sample of 560 customers were sent an invitation to share their feedback and 140 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 (two said they did not make the purchase; one did not recall making the purchase). One percent of email invitations bounced.

Seventy customers that purchased measures through SJG's Online Marketplace completed the survey (13% 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 7.3.13 provides information about measure verification.

**Most respondents were homeowners, living in small-to-moderate-sized single-family homes, with gas home and water heating.** Ninety percent of respondents said they lived with no more than three other people. Table 7-53 summarizes Online Marketplace survey respondents' home characteristics.

*Table 7-53: EEP Online Marketplace Respondent Home Characteristics*

<b>Question</b>	<b>Response</b>	<b>Percentage (n=70)</b>
Do you own or rent your home?	Rent	6%
	Own	88%
Which of the following best describes your home type?	Single-family detached	63%
	Duplex	7%
	Triple decker	1%
	Apartment/condo in a 2-4 unit building	11%
	Apartment/condo in a 5+ unit building	3%
	Single family townhouse or row house	9%
When was your home built?	Before 1960	21%
	1960 to 1979	26%
	1980 to 1999	21%
	2000 to 2009	23%
	2010 or later	9%
	Don't know	0%
Including yourself, how many people currently live in your household?	1	13%
	2	50%
	3	16%
	4	11%
	5	7%
	6 or more	1%
	Prefer not to say	1%
About how many square feet is your home?	Less than 1,000 square feet	6%
	1,000-1,999 square feet	53%
	2,000-2,999 square feet	27%
	3,000-3,999 square feet	9%
	4,000 or more square feet	1%
	Don't know	4%
What is the main fuel used to heat your home?	Electricity	6%
	Natural gas	93%
	Don't know	1%
What is the main fuel used to heat your water?	Electricity	14%
	Natural gas	83%
	Don't know	3%

**The distribution of respondents skewed older, most identified as white and said that English was the primary language spoken in their home.** About 10 percent of respondents noted that their income was below 250% of the Federal Poverty Level (FPL), while four percent said it was between 250% and 400% of the FPL.<sup>49</sup> In comparison, using Census Bureau data the Evaluators estimated that about 32% of households served by SJG have incomes under 250% of FPL.<sup>50</sup> Table 7-54 provides additional self-reported survey-taker demographic information.

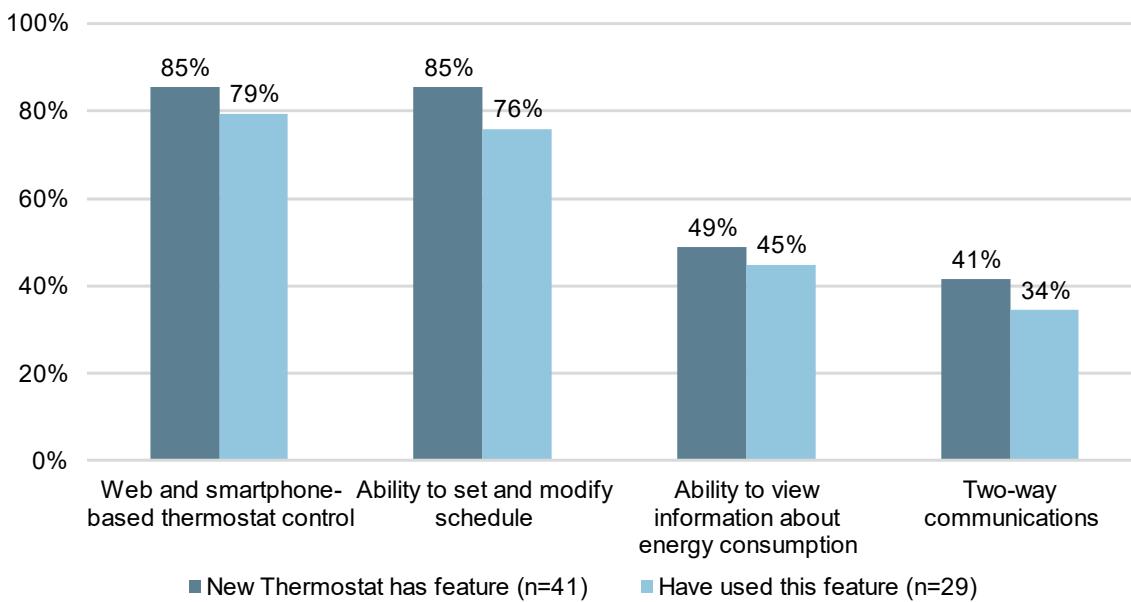
*Table 7-54: EEP Online Marketplace Respondent Demographics*

Question	Response	Percentage (n=70)
What is your age?	Under 35 years old	7%
	35-55 years old	27%
	Over 55 years old	64%
	Prefer not to answer	1%
How would you identify your race or ethnicity?	Asian	3%
	Black/African American	1%
	Caucasian/White	79%
	Hispanic or Latino	1%
	Not Listed (not specified)	1%
	Prefer not to say	16%
What is the primary language spoken in your home?	English	96%
	Spanish	1%
	Hindi	1%
	Prefer not to answer	1%

**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 7-7 displays smart thermostat features and customers' reported feature use. Ninety percent of smart thermostat customers said they had used at least one the features, but only 14% said they had used all four smart thermostat features that the Evaluators inquired about in the survey.

<sup>49</sup> Fifty-one percent said their income was more than 400% of the FPL. Thirty-four percent of respondents either preferred not to state (27%) or did not know (7%) their household income.

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



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

**Most smart thermostat customers installed and learned about their new thermostat independently.** Of the 33 customers who indicated their thermostat was installed, most had done the installation themselves (67%), though a portion had a HVAC technician or other professional (18%) or friend/family member complete the installation (12%). One customer did not recall who installed the thermostat (three percent). Most smart thermostat customers learned about its features through the user manual or online (see Table 7-55). Seven percent indicated they had learned about it from information from SJG.

*Table 7-55: How did customers learn about smart thermostat features?*<sup>51</sup>

Response	Percentage (n=41)
User manual	46%
Online (YouTube, manufacturer's website, etc.)	39%
Information provided by South Jersey Gas	17%
From a friend or family member	7%
From an HVAC technician, electrician, or other professional	5%
Still not sure how to use the features (write in response)	2%
I don't know	7%

**About three-quarters of smart thermostat customers have not noticed savings since installing them.** The Evaluators asked customers that purchased a smart

<sup>51</sup> Does not sum to 100% because respondents could select more than one option.

thermostat if they had noticed savings on their gas bill since installing the equipment they purchased from the Online Marketplace. Seventy-three percent of smart thermostat customers said they either had not noticed savings on their gas bill (29%) or did not know if they had noticed savings (44%) 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, though there were too few responses to make a meaningful conclusion (n=13). Of the 13 customers who said their thermostat had the ability to view information about energy consumption, most said they had not noticed savings.

**Most customers indicated they learned about the Online Marketplace through a bill insert or other mailing from SJG.** Figure 7-8 displays customers' source of program awareness.

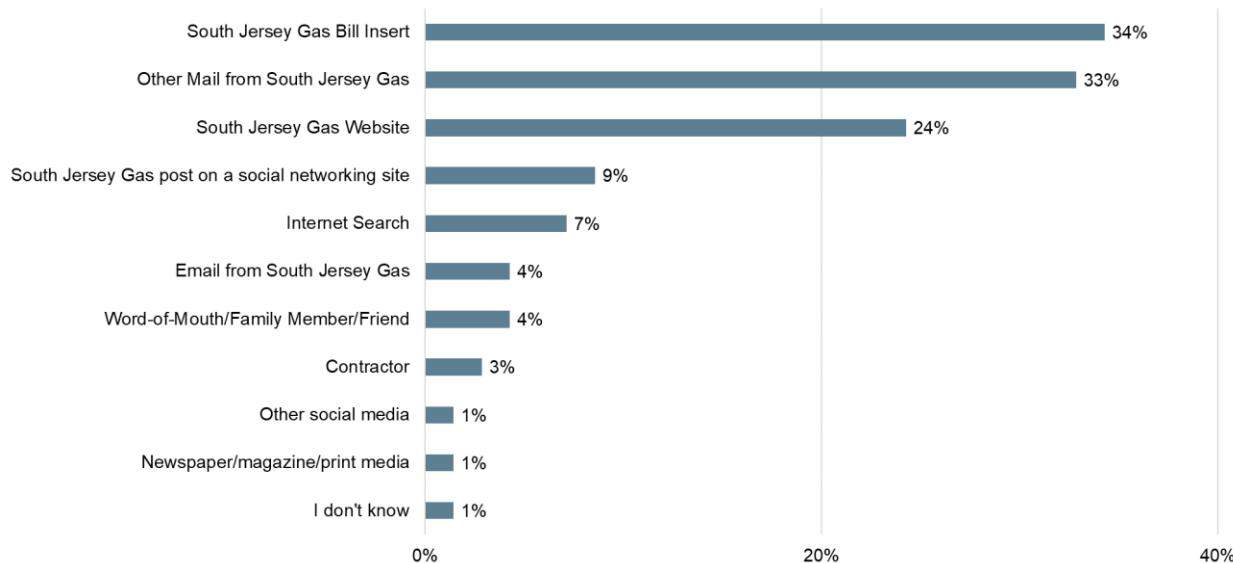
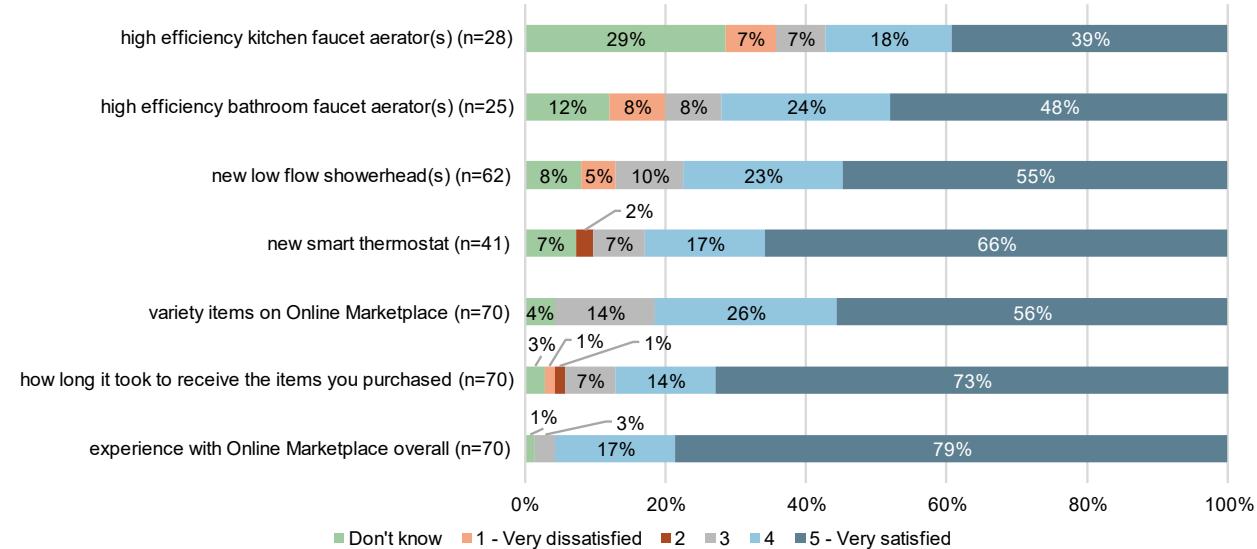


Figure 7-8: EEP Online Marketplace Customers' Sources of Program Awareness (n=70)

**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. Seventy-three percent said they had recommended the program to someone else and of those who had not recommended the program 63% said they would recommend it.<sup>52</sup> Further, when asked what they would change about the Online Marketplace, 41% of respondents said they either would not

<sup>52</sup> Rated their likelihood of recommending the program a 7 or higher on a scale from 0 (not at all likely) to 10 (extremely likely).

change anything or did not know what they would change.<sup>53</sup> Figure 7-9 displays customer satisfaction and Table 7-56 displays recommendations to improve the program.



*Figure 7-9: EEP Online Marketplace Customer Satisfaction*

*Table 7-56: EEP Online Marketplace Recommendations to Improve Program<sup>54</sup>*

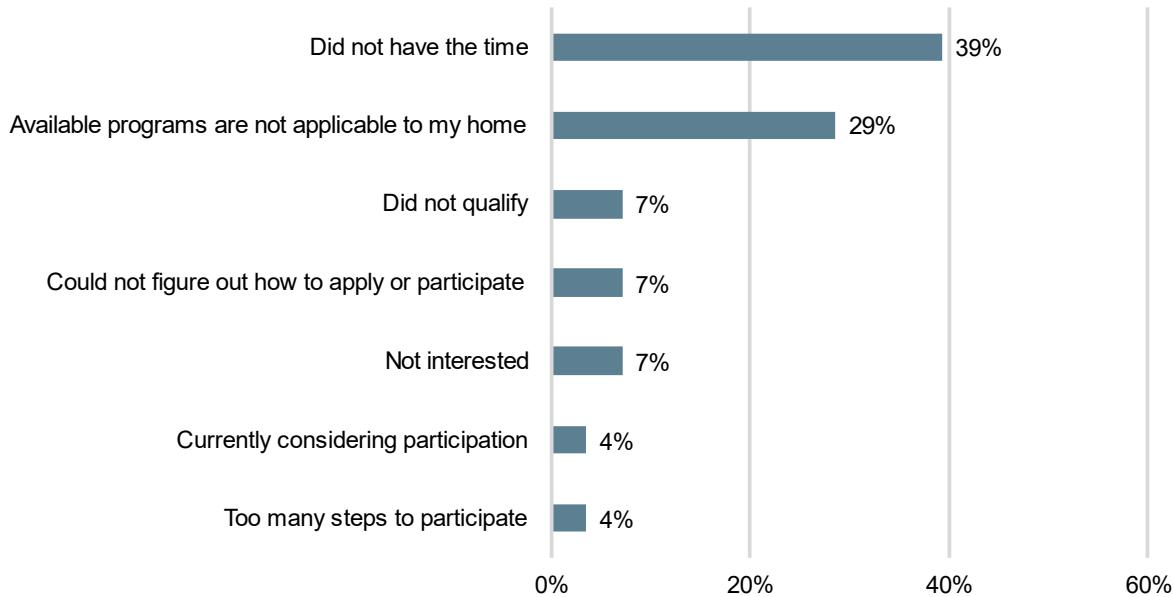
Response	Count	Percentage (n=70)
<b>Prompted Responses – Selected All That Apply</b>		
Increase variety of products available	26	37%
South Jersey Gas could provide more info about how much I will save by installing incented products	11	16%
Make website easier to navigate	7	10%
Speed up product shipment	4	6%
South Jersey Gas should improve marketing	4	6%
<b>Unprompted Responses – Open-end or “Other” Recommendations</b>		
Improve return policy	1	1%
Offer an Online Marketplace app	1	1%
Provide shipment tracking	1	1%
Allow customer to ship to home address	1	1%
Add “hose sprayers” to the offered products.	1	1%
Add different showerheads with wider head (i.e. heads with “rain” option)	1	1%

<sup>53</sup> Total does not sum to 41% due to rounding.

<sup>54</sup> Respondents could provide more than one recommendation.

**Most Online Marketplace customers had not participated in other SJG offerings.** Ten percent of respondents said they had participated in another SJG program since making their purchase through the Online Marketplace. Most of these customers said that their experience with the Online Marketplace was important in their decision to participate in another SJG offering.

**The primary reason customers have not participated in other SJG 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 SJG's energy efficiency offerings beyond its Online Marketplace. Of the 63 respondents who had not participated in another offering, 51% said they were unaware of South Jersey Gas offering other incentives or rebates programs for energy efficient equipment or improvements. Figure 7-10 displays the reasons Online Marketplace customers said they had not participated in other SJG offerings. Of the respondents that said the programs were not applicable to their homes, three-quarters said they were homeowners. Most of these customers said they had gas home and 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 SJG offerings to their homes in the Evaluators' PY2 residential customer surveys.



*Figure 7-10: Reasons EEP Online Marketplace Customers Did Not Participated in Other SJG Offerings (n=28)*

#### 7.4.4 Nonparticipant Survey Results

In August 2022, the Evaluators conducted a survey of SJG customers who had not participated in any program in the past 12 months. SJI staff provided the Evaluators with

a list of 3,000 customers for the nonparticipant survey. The Evaluators invited 2,126 customers to participate in an online survey. Each unique customer with a valid email address was sent an invitation. Prior to sending invitations, the Evaluators verified the list did not contain any customers who had participated in SJG's energy efficiency programs or had been invited to take the Evaluators' HERs survey (either as participants or non-participants). A \$5 gift certificate was offered as an incentive for the survey. Sixty-nine customers completed the survey (six percent response rate). About three percent of email invitations bounced. Statistically significant differences as well as notable similarities are noted.<sup>55</sup>

Most 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 7-57 summarizes respondents' home characteristics.

<sup>55</sup> The Evaluators 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 7-57: EEP Non-participant Respondent Home Characteristics*

Question	Response	Percentage (n=69)
Do you own or rent your home?	Rent	14%
	Own	86%
Which of the following best describes your home type?	Single-family detached	68%
	Duplex	3%
	Triple decker	1%
	Apartment/condo in a 2-4 unit building	6%
	Apartment/condo in a 5+ unit building	6%
	Single family townhouse or row house	14%
	Mobile home or trailer	1%
When was your home built?	Before 1960	26%
	1960 to 1979	19%
	1980 to 1999	28%
	2000 to 2009	19%
	2010 or later	3%
	Don't know	6%
Including yourself, how many people currently live in your household?	1	12%
	2	39%
	3	10%
	4	20%
	5	10%
	6 or more	6%
	Prefer not to say	3%
About how many square feet is your home?	Less than 1,000 square feet	4%
	1,000-1,999 square feet	38%
	2,000-2,999 square feet	25%
	3,000-3,999 square feet	10%
	4,000 or more square feet	4%
	Don't know	19%
What is the main fuel used to heat your home?	Electricity	7%
	Natural gas	90%
	Don't know	3%
What is the main fuel used to heat your water?	Electricity	10%
	Natural gas	83%
	Don't know	7%

The Evaluators also asked respondents to provide demographic information. Seventy-two percent identified as white and 91% said that English was the primary language spoken in their home. Twenty-three percent of respondents noted that their income was below 250% of the Federal Poverty Level (FPL) and 14% said it was between 250% and 400% of the FPL.<sup>56</sup> In comparison, using Census Bureau data the Evaluators estimated that about 32% of households served by SJG have incomes under 250% of FPL.<sup>57</sup> Table 7-58 provides additional self-reported survey-taker demographic information.

*Table 7-58: EEP Non-participant Respondent Demographics*

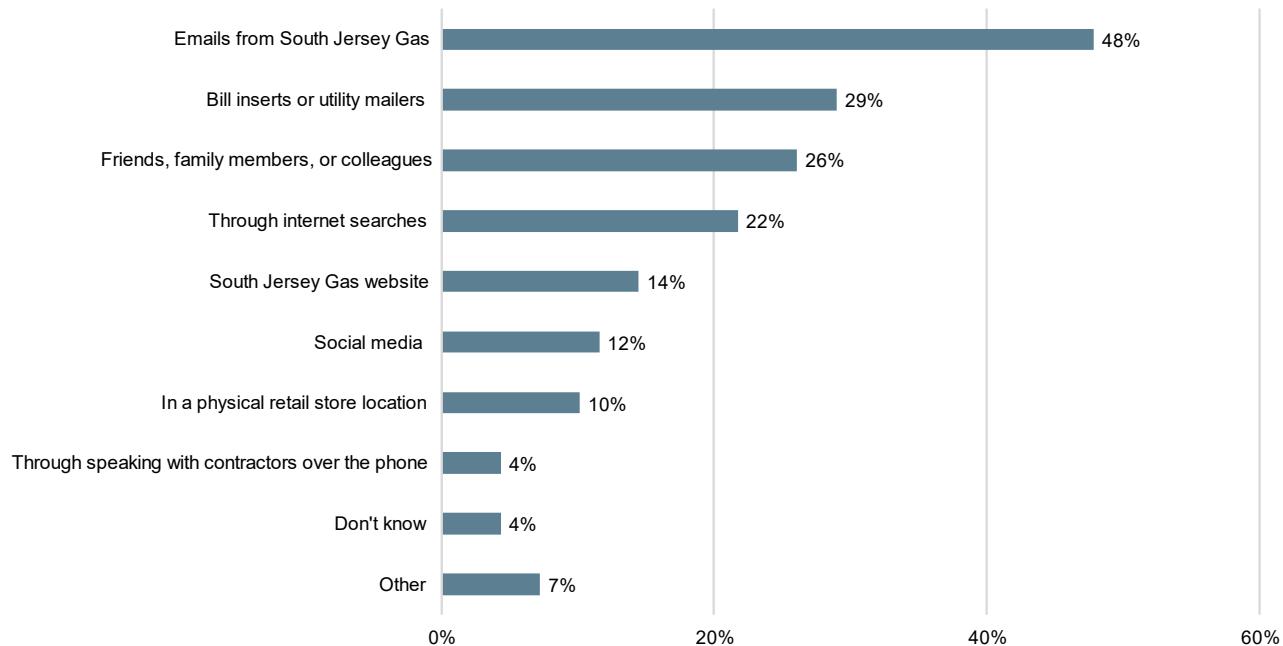
Question	Response	Percentage (n=69)
What is your age?	Under 35 years old	7%
	35-55 years old	38%
	Over 55 years old	51%
	Prefer not to answer	4%
How would you identify your race or ethnicity?	Asian	0%
	Black/African American	16%
	Caucasian/White	72%
	Hispanic or Latino	9%
	Middle Eastern or North African	1%
	Haitain	1%
	Prefer not to say	6%
What is the primary language spoken in your home?	English	91%
	Spanish	3%
	Gujarathi	3%
	Portuguese	1%
	Prefer not to say	1%

**Sixty-one percent of respondents were unaware that South Jersey Gas offered rebates for energy efficient equipment and home improvements.** The Evaluators compared the manner in which customers learned about the program across age groups. There were too few responses to make meaningful conclusions.

<sup>56</sup>Thirty-one percent said their income was more than 400% of the FPL. Thirty-one percent of respondents either preferred not to state (29%) or did not know (3%) their household income.

<sup>57</sup>U.S. Census Bureau 2020 American Community Survey (ACS) Five Year Estimates Public Use Microdata Sample (PUMS)

**Customers noted SJG emails and bill inserts as well as conversations with friends, family and colleagues as the primary sources of information for energy efficiency.** Figure 7-11 displays how customers get information about making home improvements, reducing gas/energy usage, and maintaining home heating and air systems. The Evaluators compared reported sources of information for respondents who indicated they had heard about the SJG rebates before the survey to those who had not heard about them at the time of the survey; we did not find any significant differences.



*Figure 7-11: Sources of information for home improvements, reducing gas/energy usage, and maintaining HVAC system (n=69)<sup>58</sup>*

**Awareness was highest for SJG's appliance rebate and HPwES programs.** Table 7-59 displays the SJG offerings that respondents noted hearing about before the survey. The table percentages do not total 100% as respondents could indicate awareness of more than one program.

<sup>58</sup> Total is greater than 100% because customers could select more than one source. Customers that noted other sources of awareness included Consumer Reports and their HVAC service provider, and sources that were not further specified (e.g., "email", "customer service", "I rent").

*Table 7-59: What types of programs are EEP non-participants aware of?*

Answer	Percentage (n = 27)
Appliance rebates	70%
Whole-house energy-saving solutions through the Home Performance with ENERGY STAR Program	33%
FREE home weatherization services for income-qualified customers	33%
HVAC and Water Heating Rebates	30%
A FREE in-home energy assessment with the Quick Home Energy Checkup (QHEC)	30%
Discounted energy-saving products through the online South Jersey Gas Marketplace	26%
Instant Home Energy Analysis survey on South Jersey Gas website to create home energy profile	19%
0% APR financing for HVAC equipment through the On-Bill Repayment Program (OBRP)	15%
An on-site energy assessment and incentives for multi-family buildings	11%
I don't know	4%

**Bill inserts/mailers and emails from SJG are driving customer awareness.** Table 6-45 shows non-participants' sources of program awareness. Fifty-six percent of respondents indicated they learned about the energy efficiency programs from an email from SJG. The respondents who indicated learning about SJG's programs from a friend, family member or colleague all indicated the information they heard had been positive.<sup>59</sup>

*Table 7-60: EEP Non-participants' sources of program awareness*

Source	Percentage (n = 27)
Email from South Jersey Gas	56%
Bill insert or utility mailer	48%
Through an internet search (e.g., Google search)	19%
South Jersey Gas website	19%
Friend, family member, or colleague	11%
A radio advertisement	11%
A print advertisement	11%
Social media post	7%
Through an internet advertisement	7%

<sup>59</sup> Rated the information a 4 or 5 on a scale from 1 (extremely negative) to 5 (extremely positive).

**More than half of respondents that were aware of SJG's offerings learned about them over six weeks ago.** Though some customers indicated learning about SJG's offerings in the past two weeks (four percent) or between 3 to 6 weeks ago (15%), 63% said they had heard about the offerings more than 6 weeks ago. Nineteen percent could not recall when they had heard about the rebates or services offered by SJG.

**A portion of non-participants indicated interest in some of SJG's offerings.** The Evaluators asked customers if they were interested in various SJG offerings, and though results varied, no offering garnered more than about half of customers indicating interest in participation (see Table 7-61). Between 7% and 16% of respondents indicated uncertainty regarding their interest in receiving or participating in each of SJG's offerings, suggesting additional information could motivate interest. Customers were given an opportunity to provide suggestions for additional offers; nine percent of customers wrote in recommendations. Non-participants' write-in recommendations included:

- Central air conditioner replacement (two respondents)
- Central air conditioner checkup, analysis (one respondent)
- Attic insulation (two respondents)
- Instant hot water heater (one respondent)

*Table 7-61: EEP Non-participants' interest in SJG offerings (n=69)*

Offering	Yes	No	I don't know
an instant discount for high efficiency showerheads	48%	42%	10%
free installation of LED lightbulbs, faucet aerators and advanced power strips	41%	45%	14%
a rebate for an ENERGY STAR clothes washer	38%	55%	7%
a rebate for an ENERGY STAR clothes dryer	38%	52%	10%
an instant discount for a smart thermostat	38%	52%	10%
a self-guided online home energy analysis	32%	54%	14%
an instant discount for high efficiency faucet aerators	29%	55%	16%
a rebate for an ENERGY STAR water heater	28%	59%	13%
a rebate for an ENERGY STAR gas furnace	28%	59%	13%

**Non-participants that were aware of SJG's programs said they were unsure why they had not participated, or their home was already efficient.** See Table 7-62 for non-participants' reasons for not participating in any SJG offering.

*Table 7-62: EEP Non-participants' reasons for not participating in any SJG offering*

Reasons	Percent (n=25)
<b>Prompted Responses – Selected All That Apply</b>	
Not interested in what South Jersey Gas is offering	12%
Time it would take to participate	8%
It seems inconvenient	4%
I don't know (Exclusive)	26%
<b>Unprompted Responses – Open-end or “Other” Recommendations</b>	
House is already efficient/has ENERGY STAR rated appliances	32%
I do not think I will save energy or reduce gas use by participating	4%
The programs are too confusing	4%
Participated in SJG programs more than 12 months ago	4%

**Non-participants that lack authority to make improvements generally have not spoken to their landlord about energy efficiency.** Twelve percent of customers said they had no or limited authority to make repairs. Of these customers one said they had spoken with their landlord, and their landlord indicated they were not interested in participating in SJG's programs.

**Most respondents indicated they had not participated in any electric utility or NJCEP energy efficiency program offerings.** Ninety percent of respondents said they had not taken advantage of any energy efficiency programs offered through their electric utility in the last twelve months; 68% said they had not ever participated in any NJCEP offerings. None of the respondents indicated participating in an NJCEP in the past 12 months. Seven percent of respondents said they participated in an energy efficiency program offered through their electric utility, noting having received equipment rebates, participating in the QHEC program, and making a purchase through the Online Marketplace, and using the Instant Home Energy analysis tool online.

**Survey results indicate customers are satisfied with SJG and customers generally view SJG as a trusted source for information regarding saving energy in their homes.** Seventy-four percent of customers said SJG was a trustworthy source of information about saving energy in their home. Eighty-six percent said they were interested in receiving energy saving tips and information on SJG's available rebates for energy efficiency.

**Customers that trust SJG and are satisfied are generally more interested in energy saving tips and rebate programs offered by SJG.** Eighty-four percent of customers that said SJG was trustworthy said they were moderately or very interested in getting information on energy saving tips and rebate programs offered by SJG; similarly, 81%

that were satisfied with SJG indicated they were moderately or very interested in getting information from SJG.

There is an opportunity to encourage more SJG customers to install smart thermostats. Sixty-two percent of customers indicated that they did not have smart thermostats, though nearly half said they had a programmable thermostat (see Figure 7-12). The Evaluators 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.

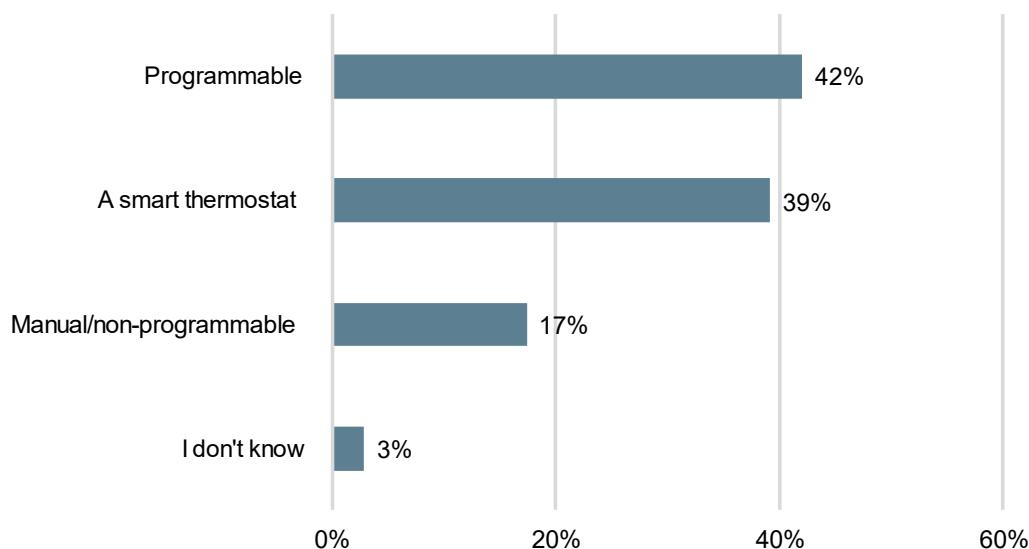
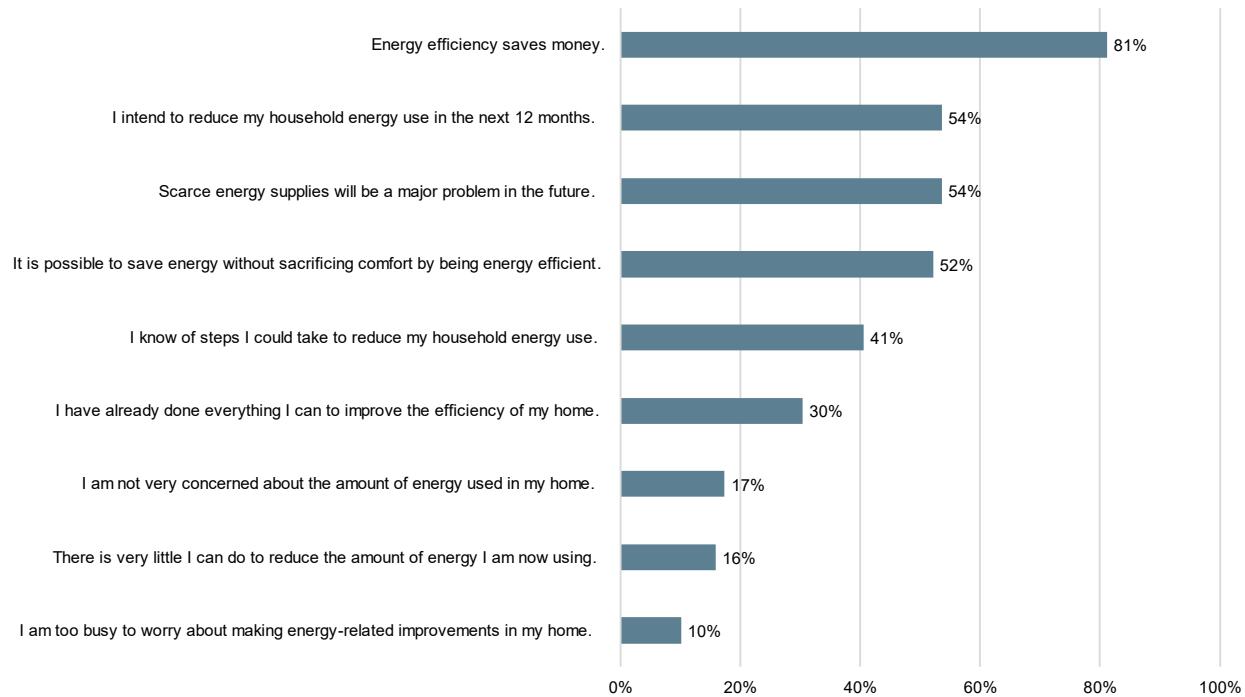


Figure 7-12: EEP Non-participant thermostat type (n=69)

**Survey respondents' attitudes indicate an opportunity to improve awareness and knowledge about energy efficiency.** Though 81% of respondents agreed with the statement that "Energy efficiency saves money", only 41% said they knew of steps they could take to reduce their energy use. Figure 7-13 displays non-participants' energy efficiency attitudes and beliefs.

**Non-participating customers generally are not too busy to worry about making energy-efficiency related improvements to their homes, but less than half said they knew of steps they could take to save energy.** Ten percent of non-participants agreed that they were too busy to worry about making energy-related improvements to their home, while 41% agreed they knew of steps to take to reduce household energy use.



*Figure 7-13: Energy Efficiency Beliefs and Attitudes (n=69)<sup>60</sup>*

## 7.5 Conclusions and Recommendations

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**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 SJG's customer base. Over half of survey respondents said their income said their income was more than 400% of the Federal Poverty Level (FPL).

**Recommendation:** Use targeted bill inserts and marketing emails to promote SJG's programs to specific customer groups. Customers noted SJG emails and bill inserts as well as internet searches as the primary sources of information for energy efficiency.

**Conclusion:** Contractors are driving awareness and participation in the Downstream program. Ninety percent of EEP Downstream survey respondents worked with a contractor. Sixty-one percent of respondents worked with a service provider to apply for the rebate. Most smart thermostats rebated through the Downstream program were installed by contractors.

**Recommendation:** Consider working with contractors to bolster outreach and enrollment efforts for the EEP Downstream program. Downstream participants tend to learn about the program most frequently from contractors and typically work with their

<sup>60</sup> Figure displays agreement as defined with a rating of 7 or higher on scale from 0 (strongly disagree) to 10 (strongly agree).

service provider to apply for their rebate. This may suggest an opportunity for SJG to increase program awareness and participation by holding an in-person training or webinar or through distributing additional outreach materials for the contractors to use during their service calls.

**Conclusion:** **Direct outreach from SJG 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 SJG, 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 SJG to continue to build awareness and engagement with its EEP programs.

**Conclusion:** **About three-quarters of Marketplace smart thermostat recipients have not noticed savings since installing them.** Seventy-three 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 provide documentation on how to utilize a smart thermostat's energy savings features to the Online Marketplace purchases.** Since most smart thermostat customers installed and learned about their new thermostat independently, providing them guided materials on proper installation and set-up for optimizing energy savings may support program goals.

**Conclusion:** **Sixty-one percent of non-participant survey respondents were unaware that South Jersey Gas offered rebates; awareness was highest for SJG's appliance rebate and HPwES programs.** Bill inserts/mailers and emails from SJG are driving awareness and customers noted SJG emails and bill inserts as well as conversations with friends, family and colleagues as the primary sources of information about energy efficiency.

**Recommendation:** **Consider focused marketing or outreach events that highlight 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 inserts and emails could foster increased interest and participation. Additionally, since many customers reported learning about energy efficiency through word of mouth, educational events could further drive interest and support community discussion.

**Conclusion:** Non-participant survey respondents' attitudes indicate an opportunity to improve awareness and knowledge about energy efficiency and that customers were interested in various SJG offerings. Though 81% of respondents agreed with the statement that "Energy efficiency saves money", only 41% said they knew of steps they could take to reduce their energy use. More than one-third of respondents stated they were interested in programs that offered incented high efficiency showerheads, LED lightbulbs, faucet aerators, advanced power strips, ENERGY STAR clothes washers, and ENERGY STAR clothes dryers.

**Recommendation:** Consider marketing campaigns that advertise specific measures that are popular with SJG customers and include messaging that describes how those measures will save on natural gas usage in the home.

## **7.6 Barriers to Participation**

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**Customer awareness is a barrier to participation.** Sixty-one percent of respondents were unaware that South Jersey Gas offered rebates for energy efficient equipment and home improvements. The Evaluators compared the manner in which customers learned about the program across age groups and found that older customers tended to be aware of SJG's offerings at a higher rate, compared to younger customers. Fifty-nine percent of respondents over 55 years old were aware of SJG's offerings, compared to 33% between 35-55 years old and 4% of respondents that identified as under 35 years old.

**Non-participants that were aware of SJG's programs said they were unsure why they had not participated, or their home was already efficient.** Survey respondents' attitudes regarding energy efficiency and uncertainty regarding the reasons they had not participated may indicate an opportunity to improve awareness and knowledge about energy efficiency.

**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. 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**

**Improve record keeping for measure AHRI numbers in the tracking data.** 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.

**Include all measure specifications and baseline conditions necessary to follow TRM guidelines for calculating savings.** Program tracking data was missing baseline conditions for water heaters and was missing key variables for water conservation measures, boiler reset controls, and clothes washers. Including this data will not only enable more accurate ex-post savings calculations but will also expose differences between the reported and verified savings for each measure.

## **7.8 Research Questions for PY2**

The Evaluators noted additional data collection in PY2 would be required to continue to develop understanding of program design and barriers to program success. Specifically, the Evaluators 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 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:* the Evaluators investigated these questions by considering the uptake of measures and if engagement with any measure was dominating program activity. To further research these questions the Evaluators asked survey respondents free ridership questions approved by the SWE, which will be analyzed by the Evaluators.

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. Alternatively, the Evaluators can compare findings to either service territory or regional demographics, as available.

- Is the program adequately serving different types of customers (e.g., based on homeownership, income level, education level, geographic area, ethnicity)?

*Partially answered:* the Evaluators 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**

The program survey instruments are combined into the report on the following pages.

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	Description of measure selected for free ridership assessment, excluding smart thermostats.(e.g., clothes washer, clothes dryer, water heater)
MEASURE_NAME2	Description of measure selected for free ridership assessment, excluding smart thermostats.(e.g., clothes washer, clothes dryer, water heater)
MEASURE1_QTY	Number of each measure purchased selected for free ridership assessment
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](mailto: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=MODERATELY 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=MODERATELY 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/minи-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 qualify  
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-ENDDED]**
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-ENDDED]**

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-ENDDED]**
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	Description of measure selected for free ridership assessment, excluding smart thermostats.(e.g., bathroom aerator, kitchen aerator, showerhead)
MEASURE_NAME2	Description of measure selected for free ridership assessment, excluding smart thermostats.(e.g., bathroom aerator, kitchen aerator, showerhead)
MEASURE1_QTY	Number of each measure purchased selected for free ridership assessment
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](mailto:adm-surveys@admenergy.com).

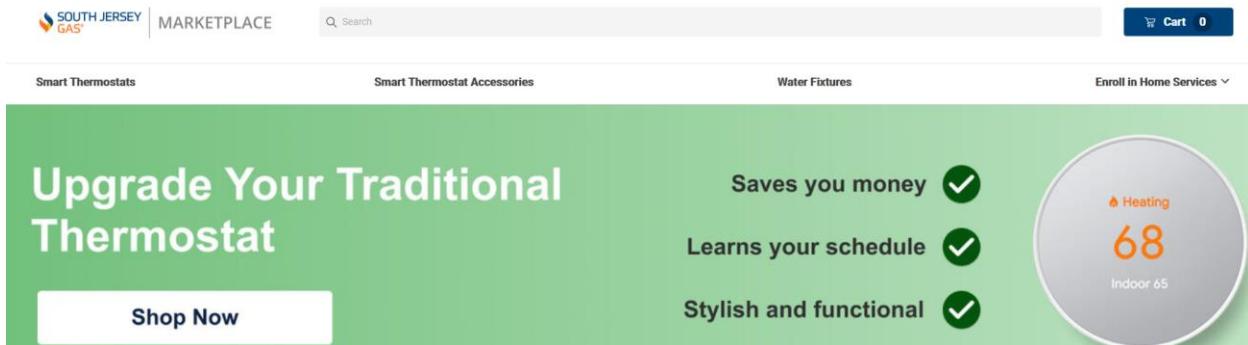
If you wish to no longer receive emails about this survey, please click on the "Unsubscribe" link below. Thank you in advance for your time!

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-ENDDED]**
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=MDEERATELY 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]**

## **SPILOVER**

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/minи-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-ENDDED]**

**[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)						
[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	1	2	3	4	5	98
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-ENDDED]**
  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](mailto: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 QError! Reference source not fo und.=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

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### 8.1 Introduction

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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<sup>61</sup>. 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% of total energy consumption. Each percentage point above 5% receives an additional \$150, up to 25%, for a total maximum rebate of up to \$5,000 for the participant<sup>62</sup>. 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% 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 (primarily Atlantic City Electric) may bring customers into the program. SJG is considered the lead utility if a customer applies through SJG’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.

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<sup>61</sup> QHEC provides direct installation of LED lights, faucet aerators, showerheads, pipe insulation, and advanced power strip at no cost to the participant.

<sup>62</sup> 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=235) exceeded the projected number of projects (N=200). The reported savings per home (284 therms) was lower than projected savings of 330 therms per home. The evaluation found ex-post gross savings of **67,652.07 therms** for a **101%** realization rate (RR), **113,663 kWh**, **41.37 kW**, with lifetime savings of **1,425,720 therms** and **2,073,338 kWh**.

*Table 8-1: 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	<b>235</b>	<b>235</b>	200	260	360
Net Annual Natural Gas Savings (therms)	<b>66,827.38</b>	<b>67,652.07</b>	65,981	85,775	118,766
Net Lifetime Natural Gas Savings (therms)	<b>1,365,348</b>	<b>1,425,720</b>	1,121,678	1,458,182	2,019,021
Net Lifetime Natural Gas Savings from Qualifying Low-Income Customers (therms)	<b>0</b>	<b>0</b>	0	0	0
Net Annual Electric Savings (kWh)	<b>162,536</b>	<b>113,633</b>	195,457	254,094	351,823
Net Lifetime Electric Savings (kWh)	<b>2,800,544</b>	<b>2,073,338</b>	3,322,774	4,319,606	5,980,993
Net Lifetime Electric Savings from Qualifying Low-Income Customers (kWh)	<b>0</b>	<b>0</b>	0	0	0
Net Annual Peak Demand Savings (kW)	<b>0</b>	<b>41</b>	7	9	12

## 8.2 Methodology

The evaluation of the PY1 HPwES program included impact and process evaluation components. The Evaluators acquired program tracking data, tax assessors' data, participant survey data, and conducted interviews with program stakeholders and participants to support the evaluation. This section describes the methodology the Evaluators 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 Evaluators 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 use Snugg Pro home energy modeling software, which meets the RESNET standard (see pg. 80 in the 2020 NJ TRM). However, sufficient post-period utility consumption data was not available for the Evaluators to complete the preferred evaluation method (a pre/post utility billing analysis). Therefore, the Evaluators calculated savings using 2020 NJ TRM algorithms and conducted participant surveys for additional verification . Table 8-2 lists the measures and applicable TRM reference.

*Table 8-2: HPwES 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)

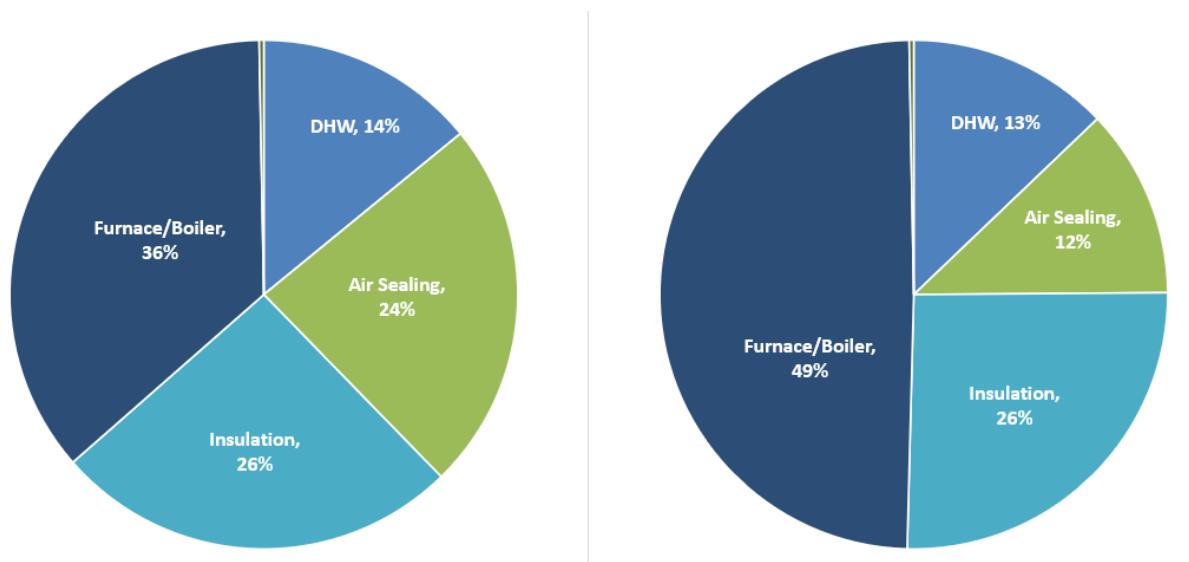
Table 8-3 provides a breakdown of weatherization and equipment upgrade measures implemented for each home and the associated savings per home for each measure category. The table also includes the total contribution of MMBtu savings for each measure, based on therms and kWh converted to MMBtu<sup>63</sup>. The reported therms savings account for 92% of the total MMBtu (i.e. the kWh contribution, most of which is attributed to Central AC replacements, is relatively insignificant).

<sup>63</sup> MMBtu estimated using: therms x 10; and kWh x 0.003412

*Table 8-3: HPwES Reported Ex-Ante Gross Savings by Measure*

<b>Measure Category</b>	<b>Number of Homes with Measure</b>	<b>Total therms</b>	<b>therms per Home</b>	<b>kWh per Home</b>	<b>% Total MMBtu</b>
Air Sealing	234	15,772.83	67.41	2.0	21.8%
Insulation	221	17,274.31	78.16	110.6	25.0%
Furnace	187	22,162.02	118.51	(3.7)	30.6%
Boiler	5	668.84	133.77	0.8	0.9%
Boiler Combi	11	1,336.33	121.48	(0.2)	1.8%
Storage DHW (less than 55gal)	134	6,932.76	51.74	7.7	9.6%
Storage DHW (greater than 55gal)	4	227.00	56.75	5.2	0.3%
Tankless DHW	31	2,258.63	72.86	11.2	3.1%
CAC	170	-	-	798.2	6.4%
Heat Pump	2	83.73	41.87	332.8	0.1%
Duct Sealing	1	110.93	110.93	530.5	0.2%
<b>Total</b>	<b>235</b>	<b>66,827.38</b>	<b>284.37</b>	<b>691.6</b>	<b>100.0%</b>

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 at least half of the total therms savings. The sections below detail the impact analysis methodologies for each measure included in the program.



*Figure 8-1: HPwES Reported (Left) vs. Evaluated (Right) Gas Savings*

#### *Residential Existing Homes Program – Insulation Upgrades*

One of the highest impact measures in the program was insulation upgrades, with most homes (221 of 235) completing some type of insulation improvement with average savings of 72 therms per home (see Table 8-3).

At minimum, the 2020 NJ TRM protocol requires baseline and installed R-values and ft<sup>2</sup> of the area treated. Because the baseline R-values were not reported, the Evaluators did not calculate savings using the R-values and ft<sup>2</sup> insulation added but reviewed the savings to ensure the reported estimates were reasonable and within range of expected savings.

Survey questions asked participants to verify that the insulation was installed and remained in place in their home at the time of the survey. The Evaluators reviewed responses to determine the ISR. If the measure was not currently installed, participants were asked why they removed or had not installed the measure.

#### *Residential Existing Homes Program – Air Sealing*

The 2020 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 ft<sup>2</sup> of Conditioned Space*

Climate Zone	Vintage	kWh / 1,000 ft <sup>2</sup>	therms / 1,000 ft <sup>2</sup>
4 SJG	Average	21	16

Survey questions asked participants to verify that air sealing was performed. The Evaluators reviewed responses to determine the in-service rate (ISR), or the percentage of respondents that verified the measure was installed and still in operation at their home. If air sealing was not performed, participants were asked a confirmation follow-up question.

#### *Residential Existing Homes Program – Duct Sealing and Repair*

The 2020 NJ 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)

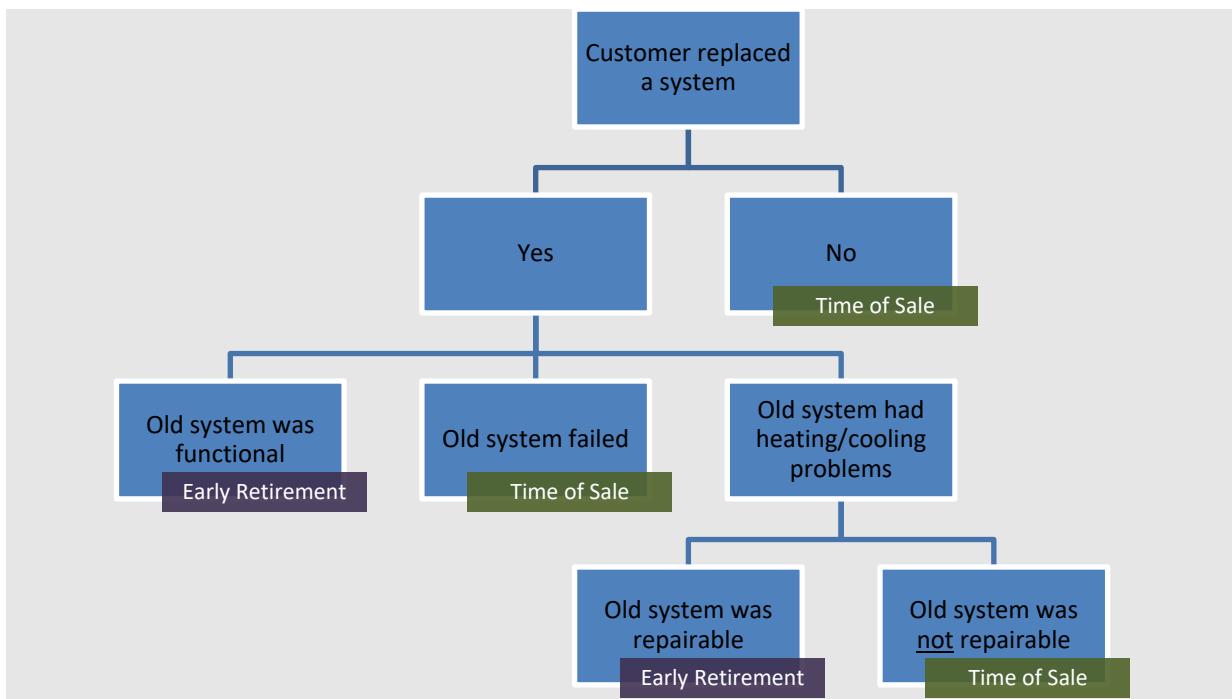
This information was not available in the tracking data, so the Evaluators compared the reported therms savings (111 therms, see Table 8-3) to various estimates using the 2020 NJ TRM method and typical HVAC efficiency assumptions. The average savings is comparable to ducts located in an attic, with insulation added to improve the R-value from R-2 to R-8. The 2020 NJ TRM uses subjective variables to address leakage (leaky, average, tight) which were not evaluated in PY1.

Survey questions asked participants to verify that the ducts were repaired. The Evaluators reviewed responses to determine the ISR.

#### *Residential Existing Homes Program – HVAC Replacements*

Many participant homes (72%, 170 of 235) replaced their existing central air conditioner with a high efficiency air conditioner. The rate of replacement of heating systems was even higher – 86% of homes replaced either a boiler (n=16) or furnace (n=187).

Therefore, the Evaluators included questions in the participant survey to assess the rate of early retirement – if an HVAC system has failed, the savings should reflect a time of sale baseline, rather than in situ baseline. Survey responses provided disposition information about the replaced heating/cooling equipment, which allowed the Evaluators to label each respondent as an “early retirement” or “time of sale” customer.



*Figure 8-2: HPwES Early Retirement Decision Matrix*

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-condensing natural gas furnaces is unknown unless measured<sup>64</sup>. Furthermore, the Evaluators plan to conduct a billing analysis which will determine gross gas savings of all participant homes. However, electric billing analysis is not planned so the Evaluators focused efforts on air conditioner replacements.

#### *Water Heater Replacements*

The 2020 NJ TRM algorithm for storage and instantaneous water heaters is:

$$\text{Fuel Savings (MMBtu/yr)} = \left(1 - \left(\frac{\text{UEF}_b}{\text{UEF}_q}\right)\right) \times \text{Baseline Water Heater Usage}$$

*Equation 30*

Where:

- UEF<sub>b</sub> = 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

<sup>64</sup> One method of measurement is flue gas combustion analyzer.

= 0.7897 – (0.0004 $\times$  Storage Volume) if larger than 55-gallon first hour rating

= 0.81 for instantaneous water heaters

UEF<sub>q</sub> = Uniform energy factor of the qualifying energy efficient water heater

Baseline Water Heater Usage

= 23.6 MMBtu/yr

There were 138 homes with storage water heater replacements and 31 homes with tankless gas water heater replacements. The Evaluators 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. Nearly all (134 of 138) storage water heaters were reported: "Storage DHW (less than 55gal)".

Also of note is that 8 of 138 storage water heaters were for fuel switching customers and were reported with baseline fuel types of "oil", "electricity", or "propane". Reported gas savings for these measures was 45 therms on average.

Survey questions asked participants to verify that the existing water heater was replaced with a new water heater and whether the new water heater was operating in their home at the time of the survey. The Evaluators reviewed responses to determine the ISR. If the measure was not currently installed, participants were asked why they removed the measure.

### **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 Evaluators reviewed program documents, interviewed program staff, and conducted online surveys with program participants.

#### *Program Design and Implementation*

As an initial step in the process evaluation, the Evaluators 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 Evaluators 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 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?
  - E.g., can SJG use Home Energy Report (HER) information to target customers with 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 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 Evaluators 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?
- 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?
- What are the main reasons customers received an energy audit but ultimately choose not to participate?

### *Outcomes*

To assess program outcomes, the Evaluators 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 any 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 Evaluators invited a census of participants with a valid email address ( $n=130$ ) to take an online survey. For a relatively small population ( $N=145$ ) a sample size sufficient to determine savings with relative precision of  $\pm 10\%$  at the 90% confidence interval is 47. A sample size sufficient to determine savings with relative precision of  $\pm 15\%$  at the 85% confidence interval at the measure level is 20.

The impact evaluation activities were limited because a pre/post billing analysis is planned for the subsequent evaluation. 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 Evaluators attempted to maximize the number of respondents by offering a \$10 Amazon eCard for any who completed the survey. A total of 15 respondents completed the survey, a response rate of 12%.

### **8.3 Impact Evaluation Results**

The Evaluators 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<sup>65</sup>.

Program annual and lifetime savings are summarized in Table 8-5 though Table 8-8 and discussed in detail by measure category in the following sections.

<sup>65</sup> The Evaluators conducted interim database reviews and noted one duplicate project entry, which the implementation contractor subsequently removed from the final database.

*Table 8-5: HPwES Gross Annual Gas Savings*

<b>Measure Category</b>	<b>Quantity (Count of Homes w/ Measure)</b>	<b>Ex-Ante Savings (therms)</b>	<b>Ex-Post Savings (therms)</b>	<b>therms RR</b>
Air Sealing	234	15,772.83	8,128.22	52%
Insulation	221	17,274.31	17,274.31	100%
Furnace	187	22,162.02	30,583.59	138%
Boiler	5	668.84	923.00	138%
Boiler Combi	11	1,336.33	1,844.14	138%
Storage DHW (less than 55gal)	134	6,932.76	6,580.00	95%
Storage DHW (greater than 55gal)	4	227.00	(48.58)	NA
Tankless DHW	31	2,258.63	2,172.73	96%
CAC	170	-	-	100%
Heat Pump	2	83.73	83.73	100%
Duct Sealing	1	110.93	110.93	100%
<b>Total</b>	<b>235</b>	<b>66,827.38</b>	<b>67,652.07</b>	<b>101%</b>

*Table 8-6: HPwES Gross Annual Electric Savings*

<b>Measure Category</b>	<b>Quantity (Count of Homes w/ Measure)</b>	<b>Ex-Ante Savings (kWh)</b>	<b>Ex-Post Savings (kWh)</b>	<b>kWh RR</b>
Air Sealing	234	473	10,668	2257%
Insulation	221	24,453	24,453	100%
Furnace	187	(683)	-	0%
Boiler	5	4	-	0%
Boiler Combi	11	(2)	-	0%
Storage DHW (less than 55gal)	134	1,033	-	0%
Storage DHW (greater than 55gal)	4	21	-	0%
Tankless DHW	31	347	-	0%
CAC	170	135,695	77,346	57%
Heat Pump	2	666	666	100%
Duct Sealing	1	530	530	100%
<b>Total</b>	<b>235</b>	<b>162,536</b>	<b>113,663</b>	<b>70%</b>

SJG 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 Evaluators 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 conservative<sup>66</sup> estimate of demand savings.

*Table 8-7: HPwES Gross Demand Reduction (kW)*

Measure Category	Quantity (Count of Homes w/ Measure)	Ex-Ante Demand Reduction (kW)	Ex-Post Demand Reduction (kW)	kW RR
Air Sealing	234	0	4	NA
Insulation	221	0	9	NA
Furnace	187	0	-	NA
Boiler	5	0	-	NA
Boiler Combi	11	0	-	
Storage DHW (less than 55gal)	134	0	-	
Storage DHW (greater than 55gal)	4	0	-	
Tankless DHW	31	0	-	
CAC	170	0	28	
Heat Pump	2	0	0	
Duct Sealing	1	0	0	NA
<b>Total</b>	<b>235</b>	<b>0</b>	<b>41</b>	<b>NA</b>

\*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.

<sup>66</sup> This estimates average summer demand savings, not critical peak hour. The factor for peak hour is 0.000747 kW/kWh.

*Table 8-8. HPwES Gross Lifetime Savings*

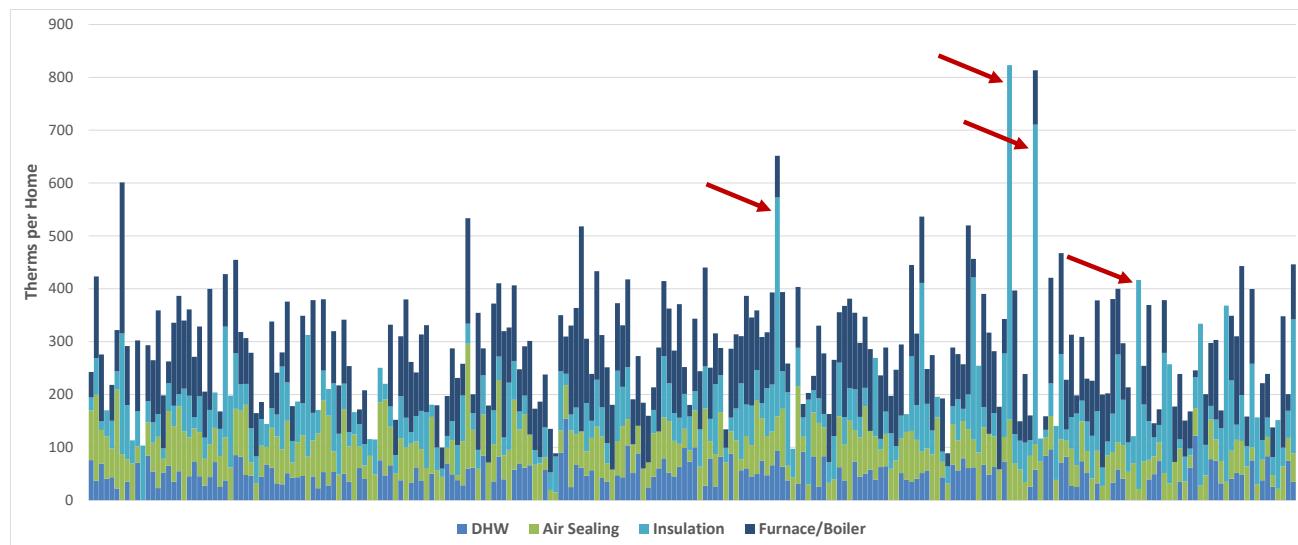
Measure Category	Quantity (Count of Homes w/ Measure)	EUL	Lifetime Savings (therms)	Lifetime Savings (kWh)
Air Sealing	234	15	121,923.36	160,024
Insulation	221	30	518,229.19	733,590
Furnace	187	20	611,671.75	-
Boiler	5	20	18,459.98	-
Boiler Combi	11	20	36,882.71	-
Storage DHW (less than 55gal)	134	11	72,379.96	-
Storage DHW (greater than 55gal)	4	11	(534.36)	-
Tankless DHW	31	20	43,454.68	-
CAC	170	15	-	1,160,190
Heat Pump	2	15	1,255.95	9,985
Duct Sealing	1	18	1,996.74	9,549
<b>Total</b>	<b>235</b>	<b>21.1*</b>	<b>1,425,719.96</b>	<b>2,073,338</b>

\*Based on lifetime/annual therms. EUL based on kWh savings is 18.2 years.

*The following sections address the measures that contributed a significant percentage of program savings. Heat pumps (n=2) and duct sealing (n=1) are not included.*

#### *Residential Existing Homes Program – Insulation Upgrades*

Most homes (221 of 235) completed some type of insulation improvement resulting in average modeled savings of 72 therms per home. The 2020 NJ TRM protocol requires baseline and installed R-values and ft<sup>2</sup> of the area treated. Because the baseline R-values were not reported, the Evaluators did not calculate savings using the R-values and ft<sup>2</sup> insulation added but reviewed the savings to ensure the reported estimates were reasonable and within range of expected savings. They chose to apply a realization rate of 1.0 in the interim, for this measure, though a small number of projects had reported savings that may be unrealistic. The light blue lines in Figure 8-3 represent therms savings attributed to insulation measures; a few examples of projects with very high reported insulation savings (ranging from 300 to 600+ therms) are called out.



*Figure 8-3: Reported Gas Savings by Measure Category for all HPwES Homes*

Survey questions asked participants to verify that the insulation was installed and remained in place in their home at the time of the survey. The Evaluators reviewed responses to determine the ISR. All respondents confirmed insulation measures were performed and remained installed for an ISR of 100%.

#### *Residential Existing Homes Program – 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 resources<sup>67</sup> to determine average area for a sample of homes.

*Table 8-9: NJ TRM Air Sealing Savings per 1,000 ft<sup>2</sup> of Conditioned Space*

Savings Type	NJ TRM Estimate: Savings / 1,000 ft <sup>2</sup>	Sample ft <sup>2</sup>	Ex ante per home	Ex Post per home	RR
kWh	21	2,171 (n=8)	2.0	45.6	22.6
therms	16		67.4	34.7	0.52

The modeled savings and 2020 NJ TRM estimates are quite different. Modeled savings from air sealing average only 2 kWh per home whereas the 2020 NJ TRM estimate is 45.6 kWh. Average modeled therms savings was about two times higher than the 2020 NJ TRM estimate.

Survey questions asked participants to verify that air sealing was performed. The Evaluators reviewed responses to determine the in-service rate (ISR), or the percentage

<sup>67</sup> <https://njpropertyrecords.com/> and <https://zillow.com>

of respondents that verified the measure was installed and still in operation at their home. All respondents confirmed air sealing measures were performed for an ISR of 100%.

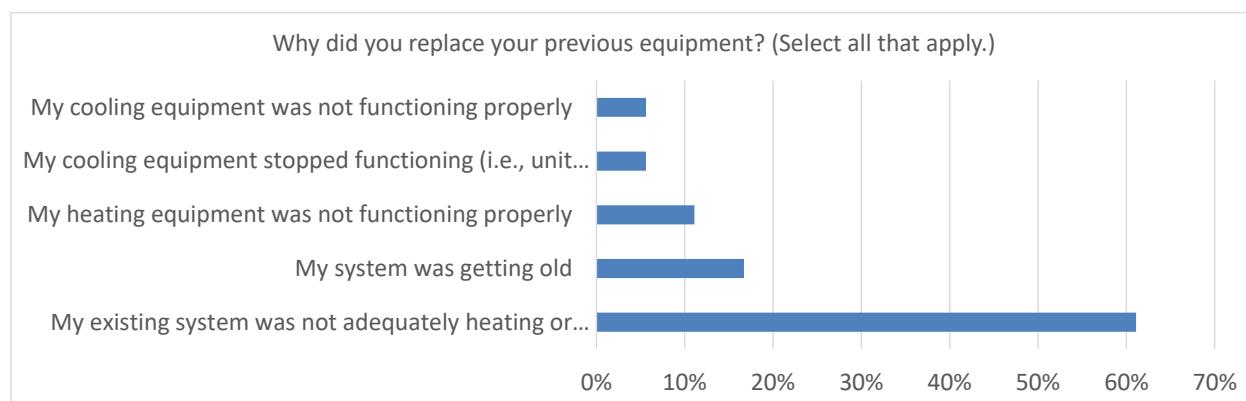
#### *Residential Existing Homes Program – HVAC Replacements*

Many participant homes (72%, 170 of 235) replaced their existing central air conditioner with a high efficiency air conditioner. The rate of replacement of heating systems was even higher – 86% of homes replaced either a boiler (n=16) or furnace (n=187).

Therefore, the Evaluators included questions in the participant survey to assess the rate of early retirement – if an HVAC system has failed, the savings should reflect a time of sale baseline, rather than in situ baseline. Survey responses provided disposition information about the replaced heating/cooling equipment, which allowed the Evaluators to label each respondent as an “early retirement” or “time of sale” customer.

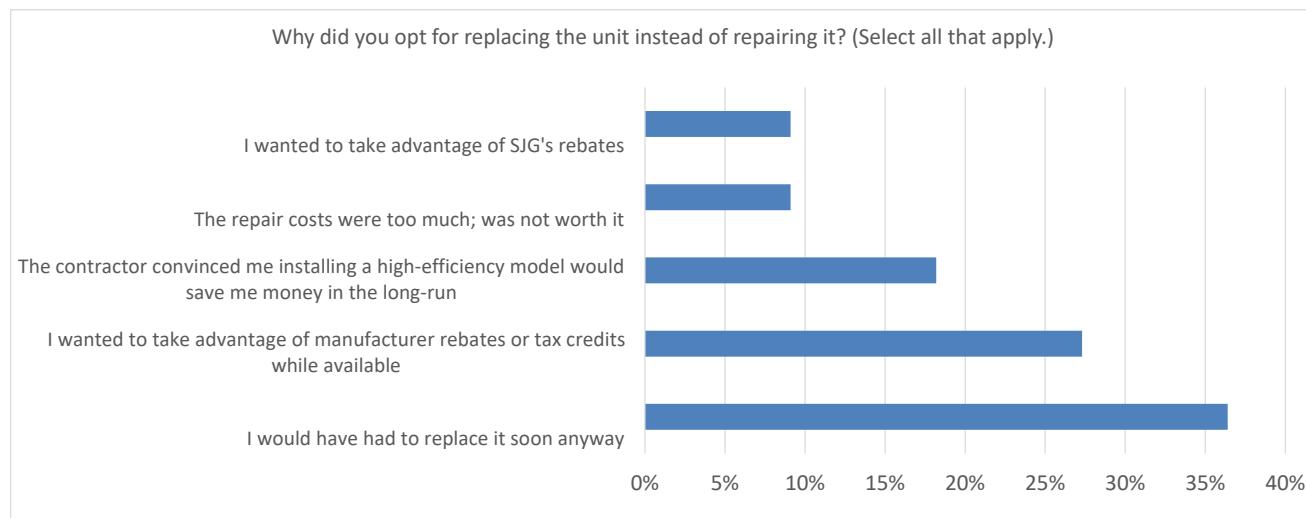
#### Heating System Replacements

Twelve of 15 survey respondents replaced their existing heating system, providing the responses in Figure 8-4.



*Figure 8-4: HPwES Survey Responses – Reasons for Heating System Replacement*

None of the respondents said their equipment had failed (failed equipment would not be eligible). A majority (61%) did say their system was not adequately heating the home, but because the program includes weatherization measures which should reduce the home's heat loss, we cannot conclude the unit had to be replaced due to its inability to adequately heat respondents' homes. All respondents reporting their heating system was not adequately heating the home (61%) provided the primary reason for their decision to replace their existing heating system, rather than repairing (Figure 8-5).



*Figure 8-5: HPwES Participants' primary reasons for replacing their heating system*

Some noteworthy comments from participants, explaining the reason they chose to replace their heating system include:

- The cooling system failed so I decided to replace both.
- A/C unit too small for home. Heater was 20 years old.
- System is over 30 years old.
- It was old and inefficient (n=4).
- Boiler was barely hanging on and from 1980.

The system efficiency baseline standards of non-condensing natural gas heating systems have not materially changed over the last 20 years<sup>68</sup>. 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.

#### Central Air Conditioners

Approximately 72% (170 of 235) of participants replaced their air conditioner. The tracking database included the cooling capacity and SEER of new air conditioners for some projects, so the Evaluators used those inputs and the modeled savings to back-calculate the baseline SEER value that would be necessary to generate the reported savings. Table 8-10 shows the 2020 NJ TRM input assumptions and unknown (calculated) values in bold text.

<sup>68</sup> E.g., 78% AFUE to 81% for furnaces

*Table 8-10: Review of Average HPwES Central Air Conditioner Possible Savings*

NJ TRM Algorithm Inputs	kWh Saved	SEER
Modeled Savings = 770 kWh EFLH = 600 Cooling capacity = 33,673 Btu/h New System SEER = 16.04 <b>Baseline SEER = unknown</b>	770	9.963
<b>Savings = unknown</b> EFLH = 600 Cooling capacity = 33,673 Btu/h New System SEER = 16.04 <b>Baseline SEER = 11.9</b> (evaluator derived)	440	11.9
<b>NJ TRM Time of Sale Savings = unknown</b> EFLH = 600 Cooling capacity = 33,673 Btu/h New System SEER = 16.04 <b>Baseline SEER = 13</b>	296	13*

\* Increases to 14 SEER in 2023

The modeled savings (average of 770 kWh per air conditioner) are reasonable if air conditioner operation is 600 equivalent full load hours (EFLH) and baseline SEER is 9.936. In situ SEER is difficult to accurately estimate, so the Evaluators used the calculation methodology cited in the Mid-Atlantic TRM<sup>69</sup> 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). The Evaluators chose to use the savings based on 11.9 SEER baseline estimate (440 kWh saved) because this is based on a reasonable estimate of baseline efficiency and the TRM's cooling EFLH of 600 hours.

The result is a **0.57 realization rate** for central air conditioner kWh savings.

<sup>69</sup> 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](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>).

### *Water Heater Replacements*

The 2020 NJ TRM algorithm for storage and instantaneous water heaters is:

$$\text{Fuel Savings (MMBtu/yr)} = \left(1 - \left(\frac{\text{UEF}_b}{\text{UEF}_q}\right)\right) \times \text{Baseline Water Heater Usage}$$

*Equation 31*

Where:

$\text{UEF}_b$       = Uniform energy factor of the baseline water heater  
                 =  $0.6483 - (0.0017 \times \text{Storage Volume})$  if less than or equal to 55-gallon first hour rating  
                 =  $0.7897 - (0.0004 \times \text{Storage Volume})$  if larger than 55-gallon first hour rating  
                 = 0.81 for instantaneous water heaters

$\text{UEF}_q$       = Uniform energy factor of the qualifying energy efficient water heater

Baseline Water Heater Usage

= 23.6 MMBtu/yr

Table 8-11 summarizes findings from the Evaluators' review of domestic hot water (DHW) replacements. There were 138 homes with storage water heater replacements and 31 homes with tankless gas water heater replacements. The Evaluators used reported UEF values to calculate savings and relied on the reported measure description (see left column, Table 8-11) to estimate storage capacity because water heater model numbers and actual storage capacity was not included in the tracking database.

*Table 8-11: HPwES Gas Savings by Water Heater Type*

Reported Measure Description	Count	Modeled Gas Savings (therms)	NJ TRM Gas Savings (therms)	UEF <sub>b</sub>	UEF <sub>q</sub>	RR
Storage DHW (less than 55gal)	140*	51.0	48.5	0.5718	0.7247	0.95
Storage DHW (greater than 55gal)	5	48.0	(10.3)**	0.7577	0.7320	-0.21
Tankless DHW	32***	71.1	68.4	0.6570	0.9266	0.96

\*Seven homes had two water heaters; \*\* Negative because installed UEF reported was less than baseline; \*\*\*One home had 2 tankless water heaters

Survey questions asked participants to verify that the existing water heater was replaced with a new water heater and whether the new water heater was operating in their home

at the time of the survey. The Evaluators reviewed responses and determined an ISR of 100%.

Six percent (8 of 140) natural gas fired storage water heaters had the baseline fuel type reported as “oil”, “electricity” or “propane”. The Evaluators were unable to assess the actual baseline fuel type because none of those homeowners completed a survey.

## **8.4 Process Evaluation Results**

The process-related data collection activities for the HPwES program evaluation included facilitated discussions led by the Evaluators, with utility management and program implementation staff. The Evaluators also conducted online surveys of program participants. Results are summarized by key themes and findings.

### *Participation Barriers*

SJG staff provided thoughts on the program launch and design. The number of planned participants in PY1 – PY3 is 820 homes, with a target of 200 homes in PY1. The program exceeded the PY1 target, with 235 homes participating. The program implementer shifted some funds within the budget for the Existing Homes Program<sup>70</sup> to include the additional projects. SJG staff said:

*“One contractor [completed a lot of jobs] in the first month of the program and we had to scramble and put targets in place for contractors. Otherwise, we would have used three years of budget in the first year... getting participation is not a challenge... we met with 16 participating contractors [to explain the situation] and ultimately where we landed was each gets one job per month.”*

Despite the obvious participation barrier, the Evaluators addressed some of the questions listed in Table 8-12. These questions were initially intended to identify participation barriers and actionable recommendations.

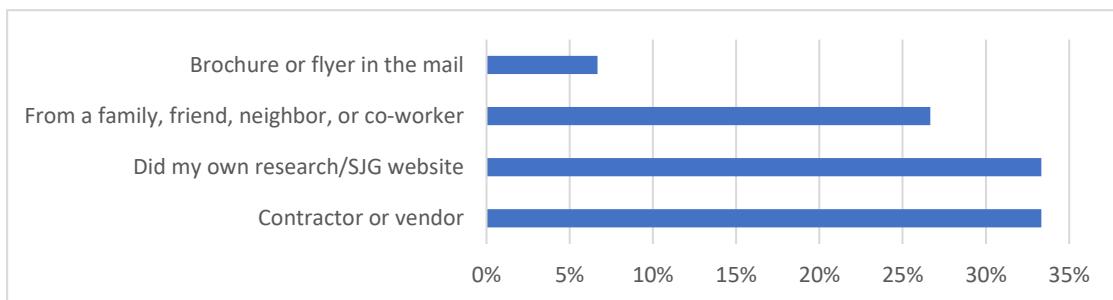
<sup>70</sup> The Existing Homes program budget includes HPwES as a subprogram.

*Table 8-12: HPwES Research Questions to Address Potential Participation Barriers*

<b>Question</b>	<b>Evaluator's findings or insights</b>
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?	The Evaluators did not ask this question. Address with participating contractors in next evaluation.
What are the obstacles to getting partially interested customers involved with the program?  Are there ways that those obstacles could be mitigated?	The QHEC program is not generating significant HPwES interest. According to tracking data, 6% of HPwES participants first participated in the QHEC program. SGJ staff have discussed how they might implement more seamless participation experience, using a “one stop shop contractor”.
Have there been challenges with marketing?	Not relevant regarding participation, but this has been a challenge for contractors. According to SJG Staff: <i>Marketing “is probably the biggest challenge for a contractor trying to zero in on one customer per month. If they're out there sort of promoting the program, that's...a challenge”</i>  SJG mentioned having 16 participating contractors. Eight contractors had at least 12 projects and the rest had only 4 or fewer.  If just one of multiple interested potential participants is selected by a contractor per month, how are contractors choosing the project home each month? Could they select homes with highest savings potential, or lowest free-rider potential?
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?	Though the number of surveyed participants was small (n=15) all respondents said they elected to do all recommended measures. See next section for additional information.
What percentage of completed audits do not go on to install weatherization measures?	The Evaluators did not request information to assess this.
What are the main reasons customers receive an energy audit but ultimately choose not to participate?	Considering the participation constraint of one home per contractor per month, this may not be an evaluation priority.

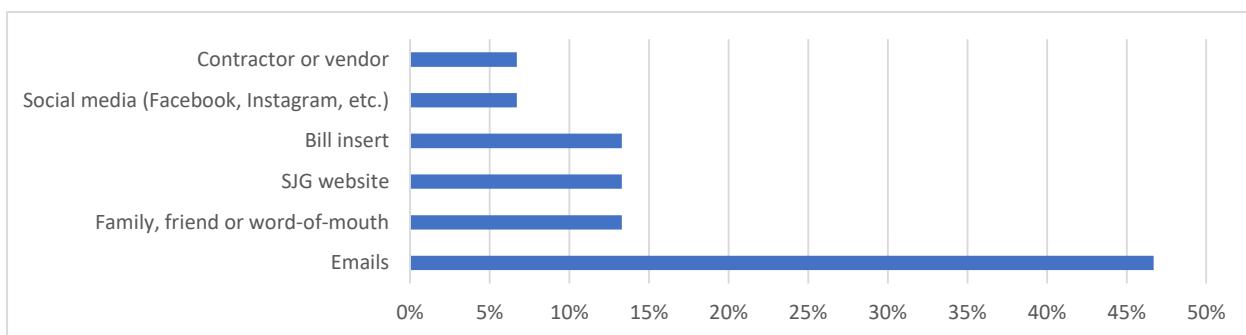
### *Participant Experience*

SJG and implementation staff suggested canvassing has been the most effective method of marketing similar programs (e.g., Comfort Partners) but this was not necessary due to participation volume. The Evaluators asked participants how they first heard about the program (see Figure 8-6).



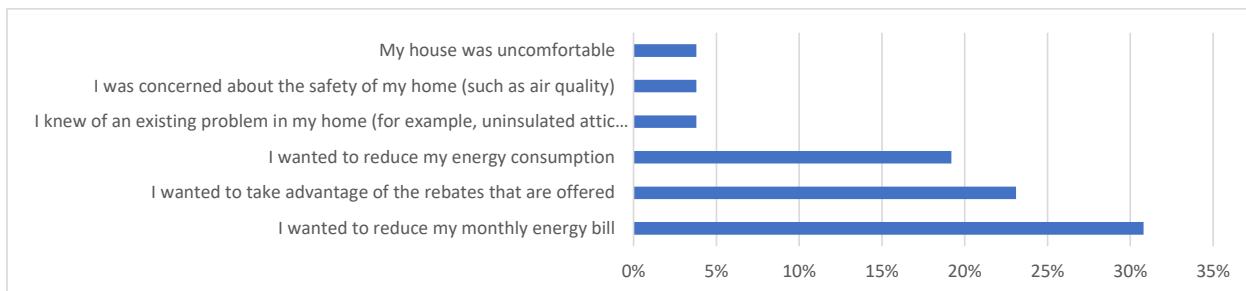
*Figure 8-6: HPwES Participant Survey: How did you first hear about the Home Performance with ENERGY STAR Program?*

The most common preferred method of other energy efficiency opportunities, according to participants, is by email.

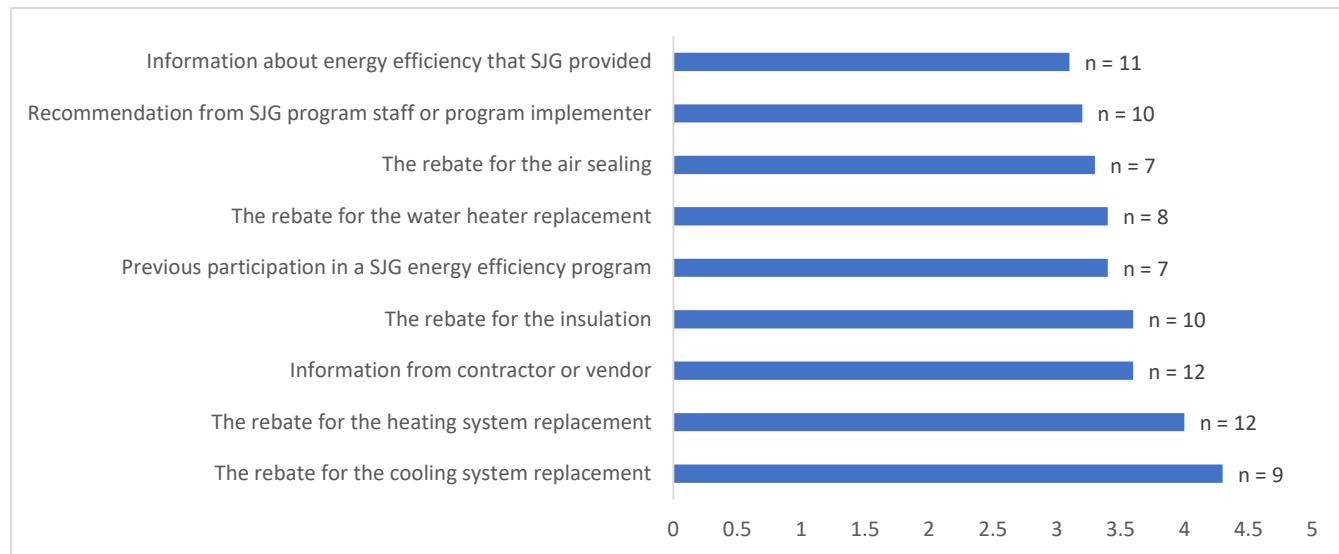


*Figure 8-7: HPwES Participant Survey: In the future, what is the best way to inform you about other energy efficiency programs and rebates offered by SJG?*

Figure 8-8 lists participants' reasons for their interest in the HPwES program.



*Figure 8-8: Which of the following factors were most important in your decision to participate in the Home Performance with ENERGY STAR Program?*



*Figure 8-9: HPwES Participant ratings (0-5): Importance of factors on decision to participate.*

When asked if they elected to make all the energy efficiency improvements that were recommended in the audit, 86% of participants indicated that they did and the rest could not recall, meaning all participants surveyed likely<sup>71</sup> elected to have contractors do all of the measures recommended in the audit.

The project cost before incentives was \$17,311 and after incentives (which averaged \$4,380, not including \$500 contractor incentive), 84% of the projects had 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.

### *Participant Satisfaction*

The Evaluators asked participants to explain in their own words, what they liked most and least about the program. Program components participants liked most, (similar comments combined) were:

- Ease of use/ simple to apply and participate (n=4)
- Rebate and the zero financing (n=3)
- The rebate (n=2)
- The 0% 10-year financing (n=2)
- The overall price of the project (n=1)
- Getting a new system (n=1)
- Installed before the coldest days on the calendar (n=1)
- That we didn't have to figure it out ourselves (n=1)

<sup>71</sup> This statement presumes one would be more likely to recall specifying measures that they elected not to install.

Program components participants liked least:

- No issue to report (n=12)
- Waiting time for install was 7 months (n=1)
- Delays in funding (n=1)

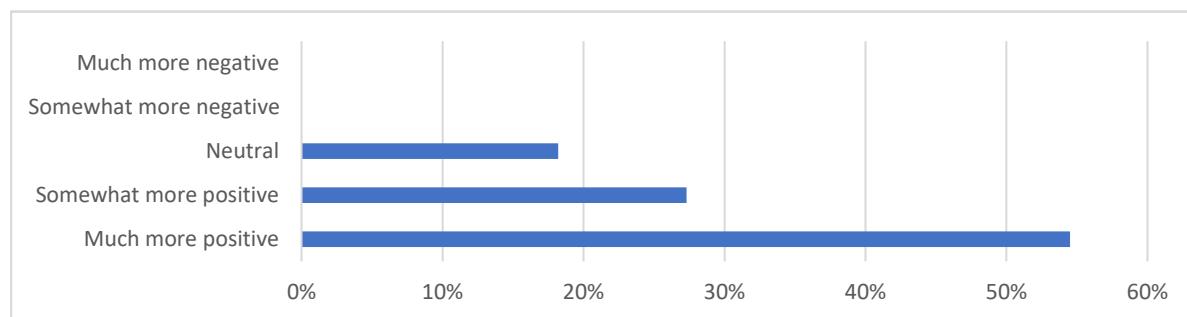
On a scale of 1 to 10 where 1 is very dissatisfied and 10 is very satisfied, how satisfied are you with each of the following regarding the certified energy efficiency professional who completed the assessment?

- 9.2 of 10: The certified energy efficiency professional who completed the assessment overall.
- 9.2 of 10: The professionalism of the certified energy efficiency professional who completed the assessment.
- 8.9 of 10: Finding a certified energy efficiency professional to complete the assessment.

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 contractor who installed the energy-efficient items?

- 9.6 of 10: The certified energy efficiency professional who completed the installation overall.
- 9.4 of 10: The professionalism of the certified energy efficiency professional who completed the installation.
- 9.4 of 10: Finding a certified energy efficiency professional to complete the installation.

Nearly all participants' opinion of SJG improved as a result of participating in the HPwES program (see Figure 8-10)



*Figure 8-10: How did your participation in the Home Performance with ENERGY STAR program make you feel about SJG?*

### *Other Insights and Observations*

The stakeholder interviews and participant surveys provided a wealth of insights and perspectives. This list summarizes those which the Evaluators found noteworthy:

- The average project cost for the HPwES program (~\$17,000 before incentives) is significantly higher than the incentive cap for the Moderate Income Weatherization program (\$6,000 for weatherization measures, \$1,500 for health and safety expenses).
- A QA/QC process was recently established. SJG hired a 3<sup>rd</sup> party contractor, PSD, to inspect quality of work, verify the work on the invoice matches work performed, and identify missed opportunities.
- The Evaluators selected the top 10 highest-saving projects and found pictures and information on zillow.com for 8 of the homes. One noteworthy observation was that 3 of those 8 homes was recently sold (sale dates listed in either 2020 or 2021).

Also of note is the Inflation Reduction Act<sup>72</sup>, which 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 Evaluators 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.

<sup>72</sup> [https://www.aceee.org/sites/default/files/pdfs/home\\_energy\\_upgrade\\_incentives\\_9-27-22.pdf](https://www.aceee.org/sites/default/files/pdfs/home_energy_upgrade_incentives_9-27-22.pdf)

*Table 8-13: HPwES 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	234	67.4	\$1,950
Insulation	221	78.2	\$2,613
Furnace	187	118.5	\$7,061
Boiler	5	133.8	\$10,671
Boiler Combi	11	121.5	\$6,415
Storage DHW (less than 55gal)	134	51.7	\$2,697
Storage DHW (greater than 55gal)	4	56.8	\$2,332
Tankless DHW	31	72.9	\$3,208
CAC	170	-	\$6,428
Heat Pump	2	41.9	\$3,750
Duct Sealing	1	110.9	\$2,112
<b>Total</b>	<b>235</b>	<b>284</b>	<b>\$17,311</b>

## 8.5 Conclusions and Recommendations

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**Conclusion:** The average savings per home (284 therms, around 25% 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 (1.01 for therms savings) is subject to change.

**Recommendation:** The Evaluators should conduct a pre/post billing analysis shortly after the 2022/2023 winter. The results of that analysis will provide a different and more accurate estimate of actual program impacts<sup>73</sup>.

**Conclusion:** The primary participation barrier is inherent in the program design and allocated budget (\$500 contractor incentive, \$5,000 per home, plus 0% interest OBR loans of up to \$15,000)<sup>74</sup>. SJG suggested they would have expended the entire 3-year budget in the first year if they had not imposed participation constraints of one project per

<sup>73</sup> The Evaluators found 3 of 8 homes were recently sold. This may be an anomalous observation, but should be considered at the time of billing data request.

<sup>74</sup> The Evaluators did not assess the cost of OBR interest, but most participants took advantage of the OBR option.

contractor per month. Consequently, an unknown number of interested potential participations are precluded due to program budget constraints.

**Recommendation:** **The forthcoming Inflation Reduction Act (IRA) incentives for home weatherization and efficiency measures may substantively change the home weatherization market.** The IRA incentives may also impact HPwES program attribution. SJG should consider program optimization options. For example, SJG could limit projects with furnace or boiler replacements to reduce program budget allocated to heating system replacements, which may allow them to increase the number of projects (i.e. lower the average incentive per home and increase the number of participant homes).

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

**Recommendation:** **Evaluators should leverage QA/QC data collected by PSD to inform the second, enhanced rigor evaluation.**

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

## **8.6 Barriers to Participation**

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**The lack of program recognition by SJG 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**

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**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

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### 9.1 Introduction

The Quick Home Energy Check-Up (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 1,288 customers with 3,178 measures with a total of 5,674.79 therms of gas savings, 136,405 kWh electricity savings, and 9.92 kW demand reduction.

The program design is illustrated as a logic map in Figure 9-1, 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 the Evaluators to understand the program's underlying operations.

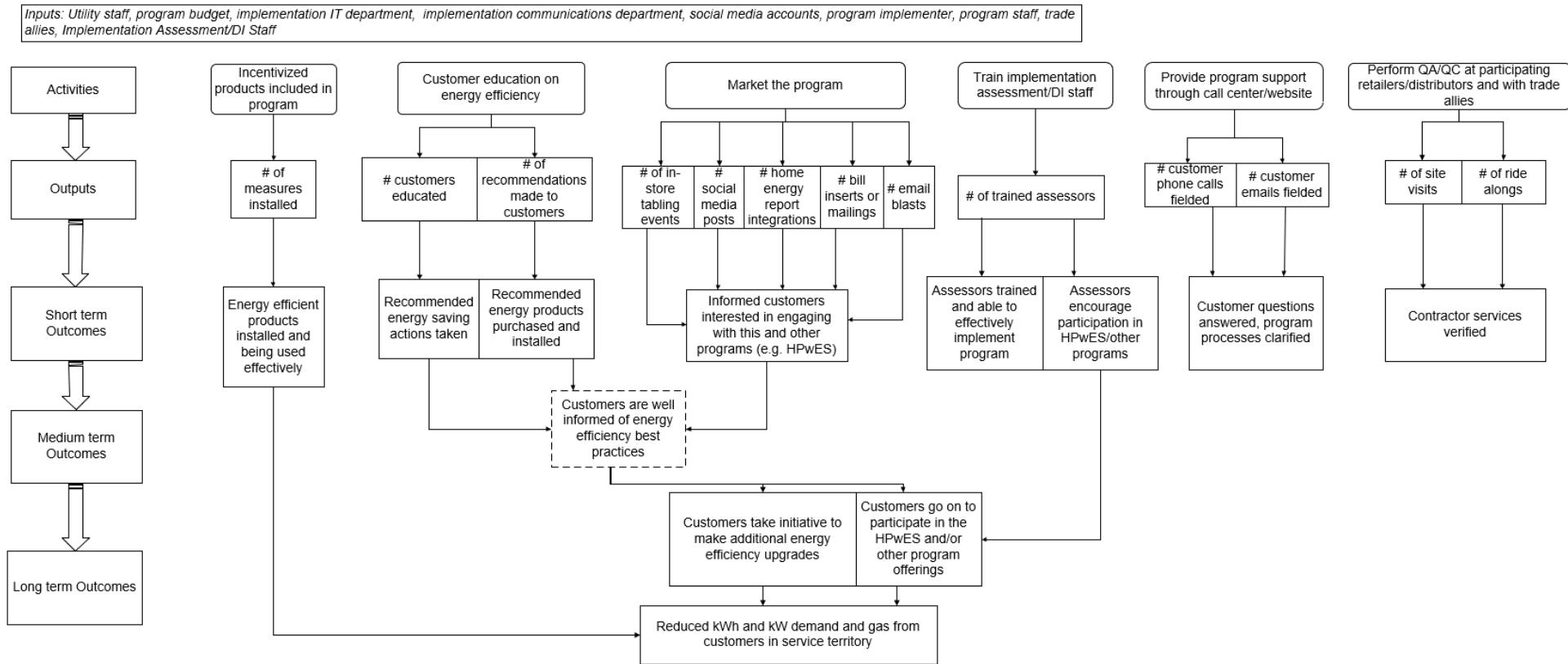


Figure 9-1: QHEC Program Logic Model

## 9.2 Methodology

This section describes the methodology the Evaluators 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 savings attributable to the program both gas (therms) and electric (kWh)

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 Evaluators 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: QHEC 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 Evaluators calculated the energy savings of LED bulbs using Equation 32, Equation 33, and Equation 34 (2020 NJ TRM, pg. 64 and 2022 NJ TRM Addendum). SJG provided LED baseline wattages included in Table 9-2.

$$\text{Energy Savings (kWh/yr)} = \left( \frac{(Watts_b * Qty_b) - (Watts_q * Qty_q)}{1000 \frac{Watts}{kW}} \right) * Hrs * (1 + HVAC_e)$$

Equation 32

$$\text{Peak Demand Savings (kW)} = \left( \frac{(Watts_b * Qty_b) - (Watts_q * Qty_q)}{1000 \frac{Watts}{kW}} \right) * CF * (1 + HVAC_d)$$

Equation 33

$$\begin{aligned} \text{Fuel Penalty } & \left( \frac{\text{therms}}{\text{yr}} \right) \\ &= \left( \left( \frac{(Watts_b * Qty_b) - (Watts_q * Qty_q)}{1000 \frac{Watts}{kW}} \right) * Hrs * HF * \left( \frac{0.003412}{nHEAT} \right) * \%FH \right) * 10 \end{aligned}$$

Equation 34

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

= interior, 0.051

= exterior, 0.00

$HVAC_d$  = HVAC interaction factor for peak demand reduction

= interior, 0.155

= exterior, 0.00

<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

*Table 9-2: QHEC LED Baseline Wattage Equivalency*<sup>75</sup>

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
	75	11

The following variable values were used from the 2022 NJ TRM Addendum.

<i>HVACe</i>	= HVAC interaction factor for electric energy savings
	= interior, 0.023
	= exterior, 0.00
<i>Hrs</i>	= Annual lighting operating hours
	= Interior, 679 hours
	= Exterior, 1,643 hours

<sup>75</sup> SJG provided a wattage equivalency table with the LED measure descriptions in the QHEC program.

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)

#### *Tier 1 and Tier 2 Advanced Power Strips*

The Evaluators calculated the energy savings of advanced power strips using deemed values from the 2020 NJ TRM (pg. 53) included in Table 7-4.

*Table 9-3: QHEC 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, electric and demand savings are deemed and did not require variables from the program tracking data other than the quantity of power strips installed.

#### *Faucet Aerators*

The Evaluators calculated gas (therms) and electric (kWh) savings of low-flow faucet aerators using Equation 35 (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.

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

*Equation 35*

Where:

- $N$  = Number of fixtures
- $M$  = minutes per day of device usage  
= Aerators, 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 or bathroom)
<i>Heat content of water</i>	= 8.33 (Btu/gal/°F)
$DT$	= Difference in temperature (°F) between cold intake and output
	= 25°F
$EFF$	= Efficiency of water heating equipment
	= 80% natural gas
	= 97% electric
$C$	= 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 Evaluators calculated gas and electric savings of low-flow showerheads using Equation 36, Equation 37, and Equation 38 (2021 NJ TRM, pg. 53).

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

Equation 36

### Therms Annual Savings

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

Equation 37

$$\begin{aligned} \text{Water Savings} &\left( \frac{\text{gals}}{\text{year}} \right) \\ &= (GPM_{\text{baseline}} - GPM_{\text{ee}}) \times \text{Throttle}_{\text{factor}} \times \frac{\text{minutes}}{\text{shower}} \times \frac{\text{showers}}{\text{day}} \times 365 \times \frac{\text{days}}{\text{year}} \end{aligned}$$

Equation 38

Where:

$T_{\text{Shower}}$	= 105°F
$T_{\text{main}}$	= 60.6°F
$UEF_{\text{elec}}$	= Uniform Energy Factor for electric water heaters
	= 0.9197
$UEF_{\text{gas}}$	= 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
$GPM_{\text{baseline}}$	= 2.5
$GPM_{\text{ee}}$	= 2.0
$\text{Throttle}_{\text{factor}}$	= 0.9
$\text{minutes/shower}$	= 8.2
$\text{showers/day}$	= 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 electric (kWh) savings calculations for low flow aerators and showerheads from the 2022 NJ TRM addendum are shown in Equation 39 and Equation 40 below.

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

*Equation 39*

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

*Equation 40*

Where:

$\% \text{Electric DHW}$	= proportion of water heating supplied by electricity = 2.3% (from participant survey)
$\text{GPM}_\text{base}$	= Flow rate of the baseline showerhead (gallons per minute) = showerheads, 2.5 = aerators, 2.2
$\text{GPM}_\text{ee}$	= Flow rate of the efficient showerhead (gallons per minute) = showerheads, 2.0 = kitchen aerators, 1.8 = bathroom aerators, 1.5
$\text{kWh}/\Delta\text{GPM}$	= Electric energy savings of efficient showerhead per gallon per minute (GPM) = showerheads, 390.1 = aerators, 63.7
$\% \text{Gas DHW}$	= proportion of water heating supplied by natural gas = 95.5% (from participant survey)
$\text{therm}/\Delta\text{GPM}$	= natural gas energy savings of efficient showerhead per gallon per minute (GPM) = showerheads, 16.8 = aerators, 5.0

#### *Pipe Insulation*

The Evaluators calculated energy savings of hot water pipe insulation using Equation 41 and Equation 42 (2020 NJ TRM, pg. 186) with a unit correction.<sup>76</sup> The North American

<sup>76</sup> The gas savings (therms) equation in the 2020 NJ TRM omitted dividing by 100,000 to convert Btu to therms/year.

Insulation Manufacturers Association 3E Plus Version 4.1 heat loss calculation tool was also used to support the calculation of Savings Factors (SF).<sup>77</sup>

$$\text{Fuel Savings } \left( \frac{\text{therms}}{\text{yr}} \right) = \frac{SF * L * \left( \frac{\text{Oper Hrs}}{\text{EFF}} \right)}{1,000,000} * M$$

*Equation 41*

$$\text{Electric Energy Savings (kWh/yr)} = SF * L * \text{Oper Hrs} / \text{EFF/C}$$

*Equation 42*

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
- $\text{Oper Hrs}$  = hours per year fluid flows in pipe, hours  
= 4,282 hrs/year
- $\text{EFF}$  = Efficiency of equipment providing heat to the fluid  
= Natural gas, 80%  
= Electric, 97%
- $M$  = 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

*Table 9-4: QHEC 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

<sup>77</sup>The Evaluators added 0.75" insulation to Table 9-4

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 Evaluators 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 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 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 any 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 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 out additional program offerings based on their experience with the QHEC?

#### *Barriers to Participation*

The Evaluators used the 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 to 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 any 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**

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### **9.3.1 Sampling Results**

The Evaluators 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% 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  $\pm 10\%$  at the 90% confidence interval at the program

level and  $\pm 15\%$  at the 85% confidence interval at the measure level.<sup>78</sup> As an example, the sample size calculation for achieving 90% confidence with 10% precision is shown in Equation 43.

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

*Equation 43*

Where:

$n_0$	= Minimum sample size
$N$	= Population size
$Z_{\alpha/2}$	= Z value at 90% 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 Evaluators 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.

<sup>78</sup> 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  $\pm 15\%$  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 Received	Final Confidence Interval
Showerheads	117	136	4,569.68	73.5%	21	23	85/13.5
Aerators	101	143	783.36	12.6%	21	28	85/11.6
Pipe Insulation	240	741	860.45	13.8%	22	44	85/9.8
Advanced Power Strips	213	213	N/A	N/A	N/A	47	85/9.3
LEDs	617	1,945	N/A	N/A	N/A	35	85/11.8
<b>Total</b>	<b>1,288</b>	<b>3,178</b>	<b>6,213.49</b>	<b>100%</b>	<b>64</b>	<b>177</b>	<b>85/5</b>

### 9.3.2 Gross Impact Evaluation Results

The Evaluators 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 Evaluators calculated 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: QHEC Gross Annual Gas Savings*

Measure Category	Quantity	Ex-Ante Savings (therms)	Ex-Post Savings (therms)	RR therms
Advanced Power Strips	213	N/A	N/A	N/A
Faucet Aerators	143	783.36	1,819.27	232%
LEDs	1,945	N/A	N/A	N/A
Pipe Insulation	741	860.45	1,789.93	208%
Showerheads	136	4,569.68	2,065.59	45%
<b>Total</b>	<b>3,178</b>	<b>6,213.49</b>	<b>5,674.79</b>	<b>91%</b>

*Table 9-7: QHEC Gross Annual Electric Savings*

Measure Category	Quantity	Ex-Ante Savings (kWh)	Ex-Ante Demand	Ex-Post Savings (kWh)	Ex-Post Demand	RR kWh	RR kW

			<b>Reduction (kW)</b>		<b>Reduction (kW)</b>		
Advanced Power Strips	213	21,896	2.56	19,926	2.33	91%	91%
Faucet Aerators	143	998	N/A	5,152	N/A	516%	N/A
LEDs	1,945	40,296	4.02	106,221	7.60	264%	189%
Pipe Insulation	741	291	N/A	1,210	N/A	417%	N/A
Showerheads	136	8,348	N/A	3,896	N/A	47%	N/A
<b>Total</b>	<b>3,178</b>	<b>71,830</b>	<b>6.58</b>	<b>136,405</b>	<b>9.92</b>	<b>190%</b>	<b>151%</b>

### *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 1,945 bulbs were installed for 617 customers resulting in a total annual energy savings of 106,221 kWh and 7.60 kW. Savings were calculated in accordance with the 2020 NJ TRM.

*Table 9-8: QHEC LED Bulb Annual Gross 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
LED Specialty Candelabra 25w Equivalent	241	3,348	0.33	6,040.29	0.44	180%	130%
LED Specialty Downlight 55w Equivalent	4	128	0.01	233.33	0.02	183%	133%
LED Specialty Downlight 65w Equivalent	179	4,600	0.46	12,870.04	0.92	280%	201%
LED Specialty Downlight 75w Equivalent	4	117	0.01	317.73	0.02	272%	199%
LED Specialty Downlight 90w Equivalent	24	850	0.08	2,405.93	0.15	283%	179%
LED Specialty Globe 25w Equivalent	98	1,361	0.14	2,324.77	0.17	171%	124%
LED Specialty Globe 40w Equivalent	568	8,680	0.87	24,092.00	1.75	278%	202%
LED Standard 100w Equivalent	77	3,049	0.30	8,554.98	0.59	281%	192%
LED Standard 60w Equivalent	669	15,800	1.58	42,716.10	3.08	270%	196%
LED Standard 75w Equivalent	81	2,363	0.24	6,666.23	0.47	282%	197%
<b>Total</b>	<b>1,945</b>	<b>40,296</b>	<b>4.02</b>	<b>106,221</b>	<b>7.60</b>	<b>264%</b>	<b>189%</b>

### Discussion of Realization Rates

Realization rates for kWh savings ranged from 171% to 283%. TRM equations for lighting measures changed in the Coordinated Measure List during the evaluation period, affecting ex-ante HOU values. The Evaluators 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%. A survey-derived in-service rate of 98% 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. The 2020 NJ TRM was used to calculate energy savings for advanced power strips. Table 9-9 reports annual savings for advanced power strips.

*Table 9-9: QHEC 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	213	21,896	2.56	19,926	2.33	91%	91%
<b>Total</b>	<b>213</b>	<b>21,896</b>	<b>2.56</b>	<b>19,926</b>	<b>2.33</b>	<b>91%</b>	<b>91%</b>

### Discussion of Realization Rates

The Evaluators calculated the savings generated from advanced power strips using deemed savings in the 2020 TRM. A survey-derived in-service rate of 91% was applied to advanced power strip savings, resulting in a realization rate of 91%.

### *Faucet Aerators*

Faucet aerators were available to participants in two different installation categories, bathroom faucet aerators and kitchen faucet aerators. The 2020 NJ TRM was used to calculate 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 gross annual savings for faucet aerators.

*Table 9-10: QHEC Faucet Aerator Gross Annual Gas Savings*

Measure Name	Quantity	Ex-Ante Savings (therms)	Ex-Post Savings (therms)	RR therms
Bathroom Faucet Aerator	116	702.72	1,478.16	210%
Kitchen Faucet Aerator	27	80.64	341.11	423%
<b>Total</b>	<b>143</b>	<b>783.36</b>	<b>1,819.27</b>	<b>232%</b>

*Table 9-11: QHEC Faucet Aerator Gross Annual Electric Savings*

Measure Name	Quantity	Ex-Ante Savings (kWh)	Ex-Post Savings (kWh)	RR kWh
Bathroom Faucet Aerator	116	871	4,121	473%
Kitchen Faucet Aerator	27	127	1,030	811%
<b>Total</b>	<b>143</b>	<b>998</b>	<b>5,152</b>	<b>516%</b>

### Discussion of Realization Rates

The Evaluators calculated the savings generated from low flow faucet 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 lower savings per aerator. The survey-derived in-service rate was 100% for bathroom and kitchen faucet aerators.

### *Showerheads*

Showerheads were available to participants in two different installation categories, handheld efficient flow showerheads and standard efficient flow showerheads. The 2021 NJ TRM was used to calculate energy savings for low-flow showerheads. Table 9-12 and Table 9-13 report gross annual savings for showerheads.

*Table 9-12: QHEC Showerhead Gross Annual Gas Savings*

Measure Name	Quantity	Ex-Ante Savings (therms)	Ex-Post Savings (therms)	RR therms
Handheld Efficient Flow Showerhead	47	1,655.30	738.91	45%
Std Efficient Flow Showerhead	89	2,914.38	1,326.68	46%
<b>Total</b>	<b>136</b>	<b>4,569.68</b>	<b>2,065.59</b>	<b>45%</b>

*Table 9-13: QHEC Showerhead Gross Annual Electric Savings*

Measure Name	Quantity	Ex-Ante Savings (kWh)	Ex-Post Savings (kWh)	RR kWh
Handheld Efficient Flow Showerhead	47	1,927	899	47%
Standard Efficient Flow Showerhead	89	6,422	2,997	47%
<b>Total</b>	<b>136</b>	<b>8,348</b>	<b>3,896</b>	<b>47%</b>

### Discussion of Realization Rates

The Evaluators calculated the savings generated from efficient showerhead measures using variables in the 2021 TRM as specified in the coordinated measure list. The Evaluators used the default efficient flow rate of 2.0 gallons per minute since the actual flowrate of the showerheads installed was not available. The Evaluators were unable to verify ex-ante per unit savings. The survey-derived in-service rate applied to showerheads was 93%.

### *Pipe Insulation*

Pipe insulation was available to participants in  $\frac{1}{2}$ " and  $\frac{3}{4}$ " thickness for  $\frac{1}{2}$ " pipes. Table 9-14 and Table 9-15 report annual savings for pipe insulation.

*Table 9-14: QHEC Pipe Insulation Gross Annual Gas Savings*

Measure Name	Quantity <sup>79</sup>	Ex-Ante Savings (therms)	Ex-Post Savings (therms)	RR therms
Pipe Insulation $\frac{1}{2}$ in (per linear ft.)	288*	178.75	676.34	378%
Pipe Insulation $\frac{3}{4}$ in (per linear ft.)	453*	681.70	1,113.59	163%
<b>Total</b>	<b>741</b>	<b>860.45</b>	<b>1,789.93</b>	<b>208%</b>

*Table 9-15: QHEC Pipe Insulation Gross Annual Electric Savings*

Measure Name	Quantity <sup>9</sup>	Ex-Ante Savings (kWh)	Ex-Post Savings (kWh)	RR kWh
Pipe Insulation $\frac{1}{2}$ in (per linear ft.)	288	52	289	555%
Pipe Insulation $\frac{3}{4}$ in (per linear ft.)	453	239	922	386%
<b>Total</b>	<b>741</b>	<b>291</b>	<b>1,210</b>	<b>417%</b>

### Discussion of Realization Rates

The Evaluators 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 in-service rate of 95%.

### **9.3.3 Net Savings**

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

<sup>79</sup> Quantity is length (feet) of installation installed

- 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.

### 9.3.1 Lifetime savings

Lifetime savings were calculated using expected useful lifetime (EUL) values from the 2020 NJ TRM. Gross annual savings were multiplied by the EUL to obtain lifetime savings, shown in Table 9-16 and Table 9-17.

*Table 9-16: QHEC Lifetime Gas Savings*

Measure Category	Quantity	Ex-Post Savings (therms)	Measure Life	Lifetime Savings (therms)
Advanced Power Strips	213	N/A	8	N/A
Faucet Aerators	143	1,819.27	10	18,192.72
LEDs	1,945	N/A	15	N/A
Pipe Insulation	741	1,789.93	11	19,689.20
Showerheads	136	2,065.59	7.5	15,491.89
<b>Total</b>	<b>3,178</b>	<b>5,674.79</b>	<b>N/A</b>	<b>53,373.81</b>

*Table 9-17: QHEC Lifetime Electric Savings*

Measure Category	Quantity	Ex-Post Savings (kWh)	Measure Life	Lifetime Savings (kWh)
Advanced Power Strips	213	19,926	8	159,406
Faucet Aerators	143	5,152	10	51,518
LEDs	1,945	106,221	15	1,593,321
Pipe Insulation	741	1,210	11	13,313
Showerheads	136	3,896	7.5	29,220
<b>Total</b>	<b>3,178</b>	<b>136,405</b>	<b>N/A</b>	<b>1,846,778</b>

### 9.3.1 Data Review

The Evaluators reviewed program tracking data for all measures included in Program Year 1. The Evaluators provide the following findings as part of its review of program tracking data.

**Missing quantity field.** During the first months of the program, 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. SJG added the quantity data element mid-cycle.

### 9.3.2 Opportunities to Improve Realization Rates

Realization rates reflect the ratio of forecasted savings to verified savings. Realization rates close to 100% reflect an accurate forecast of program performance. The Evaluators provide 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 specified values for each product.

**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

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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 Evaluators conducted four discussions with SJG, SJI, Uplight, and Honeywell staff to investigate the design and implementation of SJG'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:

- SJG staff (August 2022): South Jersey Gas' energy efficiency manager, SJG residential program analyst
- 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.

The Evaluators also held a call with South Jersey Gas staff; that discussion helped build understanding of SJG'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 EM&V manager attended each call, and SJI's director of energy efficiency attended the SJG staff call. The Evaluators received additional follow-up information from SJI's financial planning analyst, program staff, and marketing manager via email.

**SJG has strong working relationships with the residential program implementation vendors, though there were some initial challenges.** SJG'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 SJG has provided, the program manager had recently started requiring implementation program managers and SJG'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 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. SJG 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 had been completed.

- **Utility staff shared an example QC inspection report and customer survey report that the third-party inspector completed for an SJG 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.** SJG, 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 SJG’s marketing team and SJG 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 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 SJG's residential programs. All the programs are featured on the SJG 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. SJG 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 SJG'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 SJG'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 SJG energy efficiency manager noted that in SJG'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, SJG 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 SJG 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.

#### **9.4.1 QHEC Survey Results**

The Evaluators 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 438 customers participated in the QHEC program through June 2022 and 355 (81%) had email addresses in program tracking data.

The Evaluators emailed an invitation to all participants with a valid email address. Customers received up to three reminders. Five customers were disqualified from taking the survey as they indicated they did not recall participating in the program. About three percent of email survey invitations bounced. Eighty-eight customers who participated in the QHEC Program completed the survey (16% response rate) and provided feedback regarding the sign-up process, visit, and measures installed.

All respondents were homeowners, and the majority reported living in small-to-moderate-sized single-family homes with gas home and water heating. Ninety-three 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*

<b>Question</b>	<b>Response</b>	<b>Percent (n=88)</b>
Do you own or rent your home?	Rent	0%
	Own	100%
Which of the following best describes your home type?	Single-family	85%
	Duplex	2%
	Apartment/condo in a 2-4 unit building	1%
	Single family townhouse or row house	7%
When was your home built?	Before 1960	23%
	1960 to 1979	20%
	1980 to 1999	27%
	2000 to 2009	16%
Including yourself, how many people currently live in your household?	1	26%
	2	42%
	3	13%
	4	13%
	5	3%
	6 or more	1%
	Prefer not to say	2%
About how many square feet is your home?	Less than 1,000 square feet	5%
	1,000-1,999 square feet	50%
	2,000-2,999 square feet	32%
	3,000-3,999 square feet	6%
	4,000 or more square feet	1%
	Don't know	7%
What is the main fuel used to heat your home?	Electricity	9%
	Natural gas	91%
What is the main fuel used to heat your water?	Electricity	11%
	Natural gas	88%
	Don't know	1%

QHEC is serving a range of SJG customers, though the distribution of QHEC participants skewed older and most identified as white and said that English was the primary language spoken in their home. Twenty-four percent of respondents noted that their income was below 250% of the Federal Poverty Level (FPL) and 23% said it was between 250% and

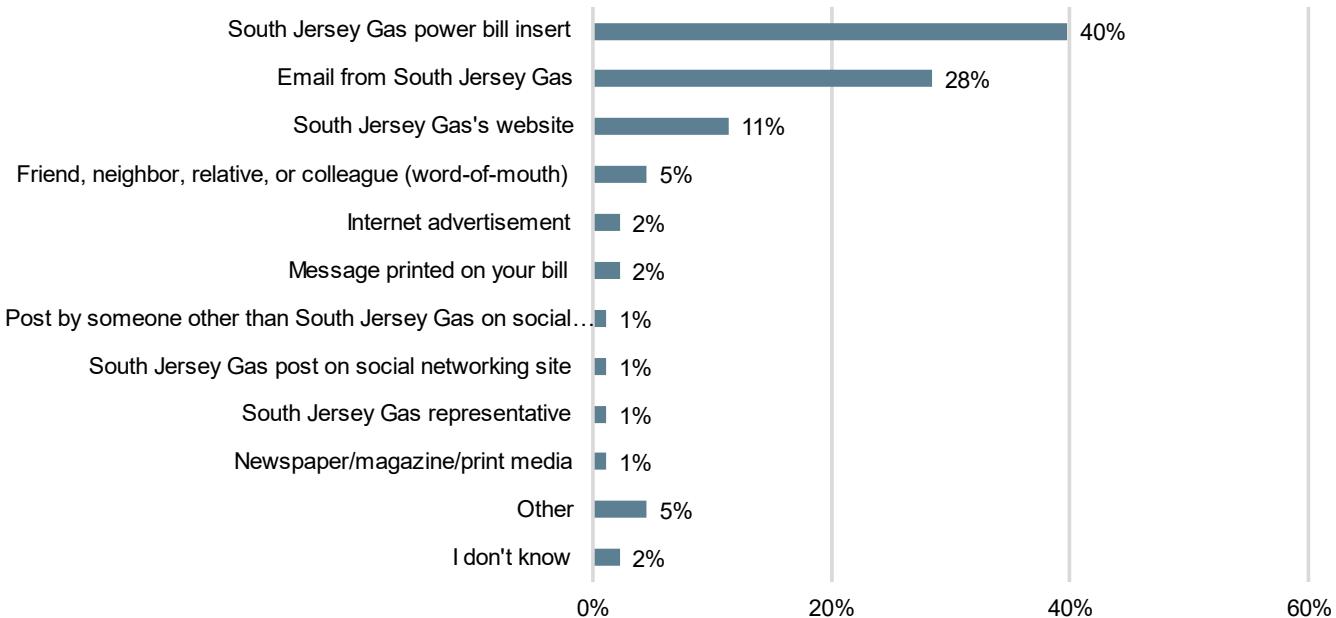
400% of FPL.<sup>80</sup> Table 9-19 provides additional self-reported survey-taker demographic information.

*Table 9-19: QHEC Respondent Demographics*

Question	Response	Percent (n=88)
What is your age?	Under 35 years old	7%
	35-55 years old	17%
	Over 55 years old	70%
	Prefer not to answer	6%
How would you identify your race or ethnicity?	Asian	3%
	Black/African American	7%
	Caucasian/White	77%
	Hispanic or Latino	3%
	Not Listed (not specified)	1%
	Prefer not to say	10%
What is the primary language spoken in your home?	English	97%
	Hindi	1%
	Prefer not to answer	2%

**Bill inserts and marketing emails to customers drive customer awareness for the QHEC program.** Over two-thirds of customers indicated they learned about the QHEC Program from a bill insert or an email from South Jersey Gas. Figure 9-2 displays customers' source of program awareness.

<sup>80</sup>Twenty-seven percent said their income was more than 400% of the FPL. Twenty-six percent of respondents either preferred not to state (20%) or did not know (6%) their household income.



*Figure 9-2: QHEC Participants' Sources of Program Awareness (n=88)*

**The QHEC sign-up process is easy to navigate.** Eighty percent of respondents said it was easy to sign up for the QHEC Program.<sup>81</sup> Customers who indicated the process was difficult were given an opportunity to provide open-ended feedback. Nine percent of respondents provided open-ended feedback related to long wait times or slow response times when inquiring about a home visit. The other customer comments suggested improving the scheduling system to ensure clear communication regarding appointment times and ensuring customer care staff were knowledgeable.

**Reasons for signing up varied, though learning about home energy use was a primary motivation.** Nineteen percent of QHEC participants noted that learning about their home's energy use was their only reason for signing up, while 11% 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.

*Table 9-20: Reasons Customers Signed Up for QHEC<sup>82</sup>*

<sup>81</sup> n=88. 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).

<sup>82</sup> Sums to more than 100% because respondents could select more than one reason.

Response	Percent (n=88)
To learn more about my home's energy use	56%
To reduce my gas use	49%
To reduce my electricity use	48%
To verify my home is already energy efficient	38%
To reduce my water use	8%
To get information about a particular piece of equipment	3%
To receive a free showerhead (write in response)	1%

**The QHEC program provides a consistent participation experience.** Seventy-six percent of customers said they had been given information about other SJG programs and an energy assessment report with recommendations. Eighty-six 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).

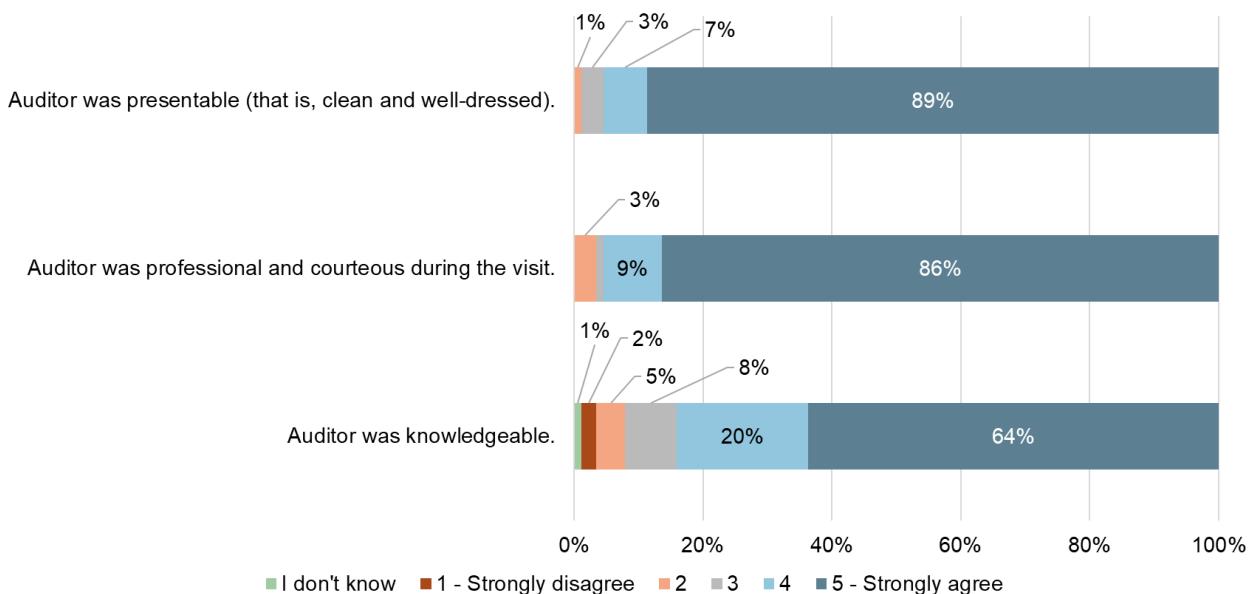
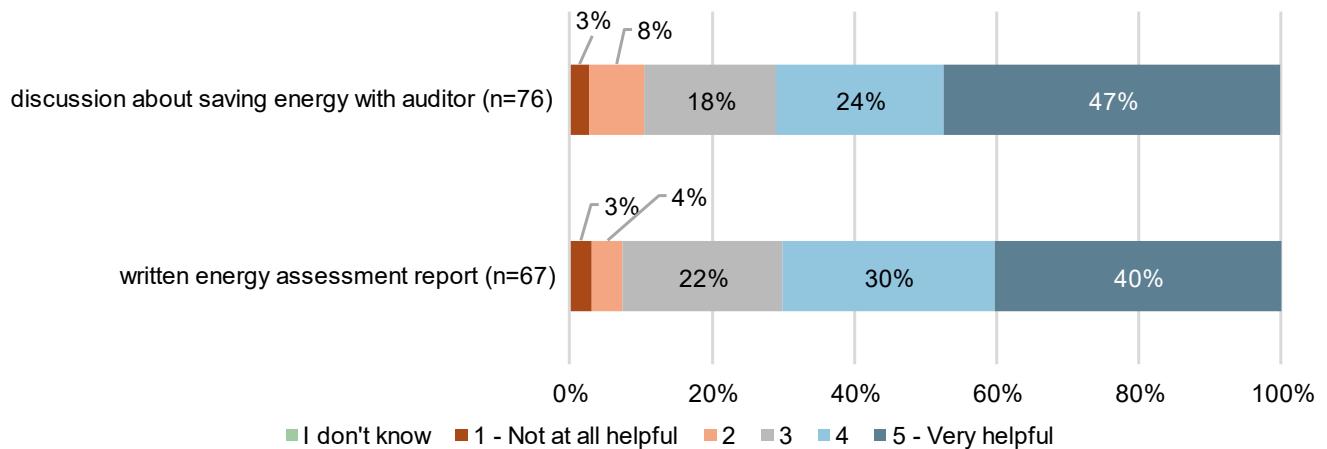


Figure 9-3: Level of Agreement with Statements Regarding QHEC Auditor (n=88)

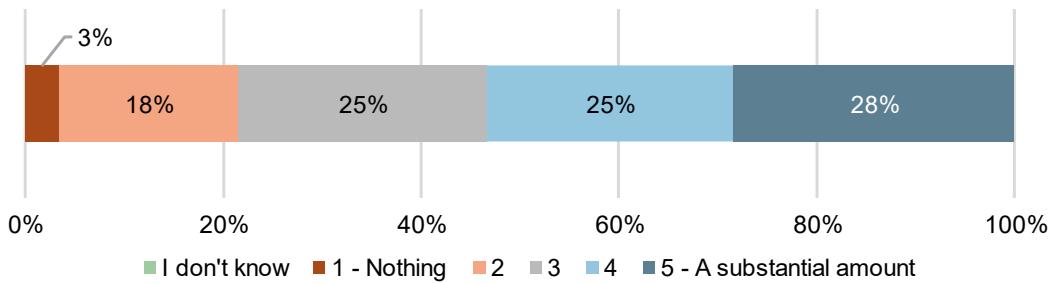
**Customers find the information provided during the home visit and within the summary report helpful.** Most customers that received the written energy assessment report found it helpful. Customers provided similar ratings for discussion with the home auditor about saving energy (see Figure 9-4). Most customers that received the written energy assessment report found it helpful. Customers provided similar ratings for discussion with the home auditor about saving energy (see Figure 9-5). Those that did not find the report or discussion with the auditor helpful were generally interested in more detailed, home-specific information to explain gas and electric usage. Write-in responses

also suggest customers are interested in receiving additional measures and recommendations to improve their home's efficiency.



*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% indicated they learned a substantial amount from their participation, 18% said they learned nothing. Figure 9-5 displays how much customers' reported learning about energy efficiency through the QHEC program. The customers that rated the amount they learned a 1 or 2 were given the opportunity to elaborate (n=19). Most of these customers were interested in a more in-depth audit that provided more actionable recommendations or additional no-cost measures (63%). Thirty-seven percent of write-in comments indicated interest in learning about their home envelope, with customers sharing interest in learning about whether their homes needed improved attic insulation or air sealing.

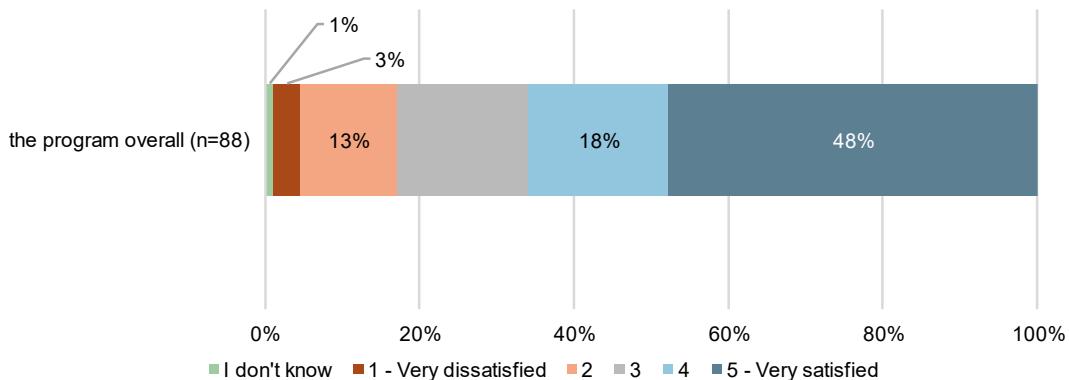


*Figure 9-5: How much did you learn about energy efficiency from your participation QHEC? (n=88)*

**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.<sup>83</sup> Ten percent indicated they were dissatisfied with one or more of the measures they received and were prompted to provide a comment. Customers indicated not receiving or desiring additional measures (aerators, LEDs, water heater pipe wrap), measures not functioning properly (aerators, advanced power strips), or wanting explanation of measure functionality (advanced power strips).

Fifty-nine percent of respondents said they had recommended the program to someone else and of those who had not recommended the program 36% said they would recommend it.<sup>84</sup> When asked what they would change about the QHEC program, 27% of respondents said they either would not change anything or did not know what they would change. Table 9-21 displays recommendations to improve the program. Several customers reiterated comments made earlier in the survey regarding their desire to learn more about their home's energy efficiency and to receive more improvements. Five percent of customers reiterated a desire for a more comprehensive audit, with one suggesting a thermal scan to identify areas with air leakage or in need of more insulation.



*Figure 9-6: QHEC Customer Satisfaction*

*Table 9-21: QHEC Respondent Recommendations to Improve Program<sup>85</sup>*

Response	Percent (n=88)
<b>Prompted Responses – Selected All That Apply</b>	
Provide additional energy saving improvements through the program	44%
Speed up audit scheduling process	24%

<sup>83</sup> Rated their satisfaction a 4 or 5 for each measure they received through the QHEC program.

<sup>84</sup> Rated their likelihood of recommending the program a 7 or higher on a scale from 0 (not at all likely) to 10 (extremely likely).

<sup>85</sup> Respondents could provide more than one recommendation.

South Jersey Gas could provide more info about how much I will save by making recommended changes	14%
Auditor could provide more information	13%
Improve the program application process	10%
South Jersey Gas should improve program marketing	6%
<b>Unprompted Responses – Open-end or “Other” Recommendations</b>	
More comprehensive audit (e.g., "Actually do an audit", "I expected it to be more comprehensive", "Add a thermal scan")	5%
Improve recommendations (e.g., "Provide companies to do recommendations", "Info provided is not current", "Follow thru procedures", "Address gas leak concerns and explain with customer what options are")	5%
Remove limit for number of LED light bulb installations	2%
Improve customer communication regarding available rebates: A customer indicated being informed of no-cost window offer. Comment indicated they sought out opportunity but was unable to connect with contractor	1%
Ensure technician carries correct wiring to install programmable thermostat purchased through the program	1%

**Customers that participate in the QHEC tend to go on to complete additional energy efficiency actions that are recommended during the visit.** The Evaluators asked respondents if they had completed actions from a list provided by SJG that is used by QHEC auditors. Seventy-three 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 (Figure 9-7).

*Table 9-22: Recommended Actions Taken By Customers After QHEC<sup>86</sup>*

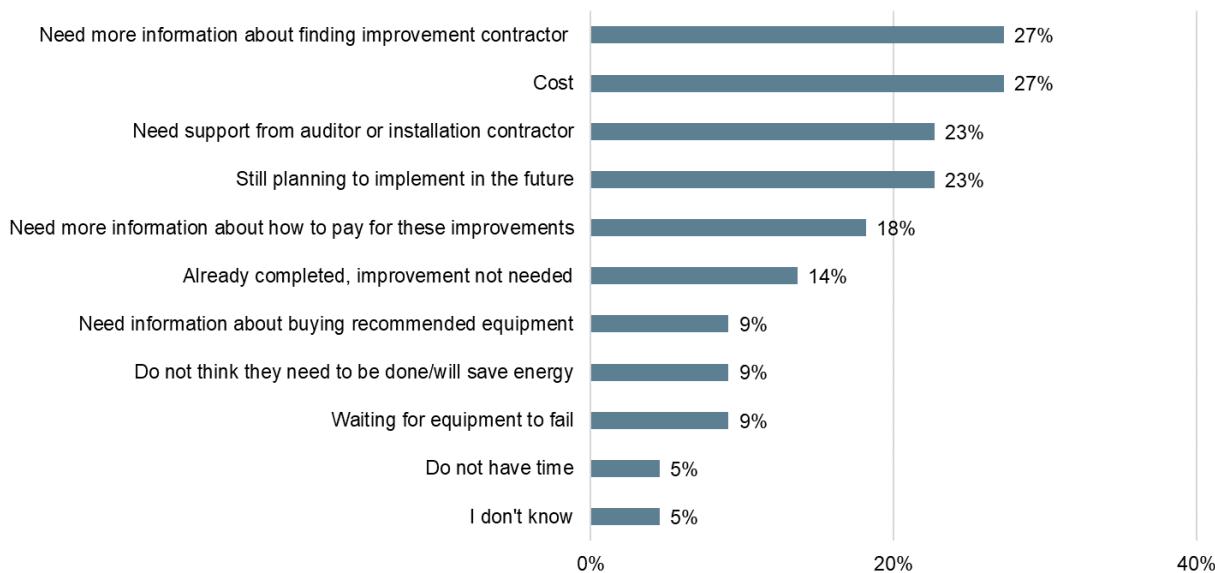
Response	Percent (n=88)
Replaced CFL light bulbs with LED bulbs	58%
Programmed existing thermostat for additional savings.	23%
Installed programmable thermostat	16%
Replaced HVAC unit(s) with new ENERGY STAR unit	11%
Purchased ENERGY STAR appliance(s)	8%
Added insulation in attic, basement, and crawlspace	7%

<sup>86</sup> 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.

Improved air sealing with foam in the attic, basement, and garage	2%
Installed new energy efficient windows*	2%
Replaced water heater(s) with new ENERGY STAR unit	1%
Upgraded to an ENERGY STAR tankless water heater.	1%

**Most QHEC participants do not go on to participate in other SJG residential programs.** Regarding participation in other programs, 66% said they had not participated in any additional SJG offerings after their QHEC participation. Of those that had participated in an additional offering (n=30), 70% indicated their experience with QHEC was important in their decision to participate in other offerings.<sup>87</sup> Table 9-23 displays the offerings SJG QHEC participants indicated they had participated in since QHEC.

Forty-four percent of respondents that indicated they had taken actions that are available through the HPwES program said they participated in that program. Seventy-three percent of these customers said that their participation in the QHEC program was important in their decision to participate in HPwES program.



*Figure 9-7: Reasons QHEC Participants Have Not Completed Recommendations (n=22)*

*Table 9-23: SJG Offerings taken advantage of by QHEC participants<sup>88</sup>*

<sup>87</sup> 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).

<sup>88</sup> Customers were asked what other SJG offerings they had taken advantage of since their participation in the QHEC program.

Response	Percent (n=23)
Discounted energy-saving products through the online South Jersey Gas Marketplace	43%
FREE home weatherization services for income-qualified customers	30%
Appliance Rebates	17%
HVAC and Water Heating Rebates	13%
Instant Home Energy Analysis survey on South Jersey Gas website to create home energy profile	13%
An on-site energy assessment and incentives for multi-family buildings	9%
0% APR financing for HVAC equipment through the On-Bill Repayment Program (OBRP)	4%

**There is an opportunity to better inform QHEC participants about SJG's other energy efficiency offerings.** Of the customers that had not participated in another program (n=51), 61% said they were unaware that SJG had other energy efficiency incentives or rebates programs. Of the customers who were not aware of other programs, 35% said the QHEC home auditor had not spoken with them about SJG's other energy efficiency programs or did not recall if their auditor had spoken about other programs.

The main reasons these customers did not participate were that available programs were not applicable to their homes or they currently did not need the measures offered (see Table 9-24).

*Table 9-24: Reasons QHEC Participants Did Not Participate in Other SJG Offerings<sup>89</sup>*

Response	Percent (n=20)
Available programs are not applicable to my home	30%
Equipment or appliances offered are not currently needed	20%
Participated in other SJG program before QHEC	20%
Did not have the time	10%
There are too many steps to participate	5%
I could not figure out how to apply or participate	5%
Cost of participation (write in response)	5%
I don't know	10%

## **9.5 Conclusions and Recommendations**

**Conclusion: There is an opportunity to better inform QHEC participants about SJG's other energy efficiency offerings.** Of the customers that had not participated in another

<sup>89</sup> 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.

program (n=51), 61% said they were unaware that SJG had other energy efficiency incentives or rebates programs.

**Recommendation:** **Ensure the QHEC program's auditor explains SJG'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.

**Additionally, consider different marketing approaches for QHEC.** Bill inserts and marketing emails spread customer understanding of the QHEC program as a first step and over two-thirds of customers indicated they learned about the QHEC Program from a bill insert or an email from SJG. However, 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 goals in PY1.** Honeywell's program manager confirmed that the SJG QHEC program will not meet its savings goals for PY1. The SJG energy efficiency manager said that they would meet savings goals in year two but was "not as confident" about meeting goals in year three. The program is enrolling a sufficient number of customers, but it is not finding enough measure installation opportunities per home.

**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, window treatments, and smart thermostats could provide additional savings opportunities for the program. **Specifically, consider the energy savings value of a professionally installed smart thermostat.** Though the QHEC program did not yield savings for smart thermostat installations, 5 thermostats were installed by QHEC auditors (4 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)<sup>89</sup> and added savings from the QHEC auditor's professional smart thermostat installation could support program savings goals.

**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

<sup>89</sup> E.g., Pennsylvania Technical Reference Manual, Volume 2: Residential Measures, page 47.

similar to other direct install/audit programs. Supply chain issues were noted during the call with SJG staff as having had minor effects on the QHEC program as well.

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

## **9.6 Barriers to Participation**

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**Most QHEC participants do not go on to participate in other SJG residential programs.** Regarding participation in other programs, 66% said they had not participated in any additional SJG offerings after their QHEC participation. Of customers who had not participated in another program (n=51), 39% said they were aware of other programs (n=51).

**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 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. 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 SJG 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**

**Improve program tracking data quality by adding product model numbers and variables required in the NJ TRM algorithms to tracking data.** Program tracking data did not include product model numbers to verify product specifications (e.g., flow rate of water conservation measures). In the absence of product specifications, ex-post savings were calculated with deemed average values that are less accurate than actual specification values.

**Improve reporting by incorporating quantity into tracking data savings calculations.** Program tracking data did not initially include a quantity column. As a result, the ex-ante savings in the tracking data were only reported at the unit level and the Evaluators were required to multiply the reported per unit savings by the quantity to tabulate the reported total ex-ante savings.

**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.

### **9.8 Research Questions for PY2**

The Evaluators noted additional data collection in PY2 would be required to continue to develop understanding of program design and barriers to program success. Specifically, the Evaluators did not investigate NTG for the QHEC Program. The Evaluators 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 Evaluators plan 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**

The program survey instrument is combined into the report on the following pages.

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](mailto: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 caulk 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

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### 10.1 Introduction

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The Moderate-Income Weatherization program provides an opportunity for moderate-income<sup>91</sup> customers to receive energy efficiency measures and upgrades at no additional cost. Customers with income between 250% and 400% 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.

Moderate-Income Weatherization projects typically save electric energy and natural gas, so electric utilities (primarily Atlantic City Electric) may bring customers to the program. SJG is considered the lead utility if a customer applies through SJG'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=117) was about one-third the projected number of projects (N=350). The reported savings per home (261 therms) was higher than projected savings of 164 therms per home. This resulted in ex-post gross savings of **27,723.21 therms** for a **91%** realization rate (RR), **33,080 kWh**, **12.05 kW**, with lifetime savings of **792,359.51 therms** and **835,420 kWh**.

<sup>91</sup> 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: MI Weatherization Participation and Savings for PY1 Ex-Ante and Filed Plan Values*

Metric	PY1 Reported	PY1 Projected	PY2 Projected	PY3 Projected
Number of Participants	117*	350	400	700
Net Annual Natural Gas Savings (therms)	30,583	57,536	65,755	115,072
Net Lifetime Natural Gas Savings (therms)	792,401	1,056,388	1,207,301	2,112,777
Net Lifetime Natural Gas Savings from Qualifying Low-Income Customers (therms)	792,401	1,056,388	1,207,301	2,112,777
Net Annual Electric Savings (kWh)	38,029	319,231	364,835	638,462
Net Lifetime Electric Savings (kWh)	909,714	4,257,989	4,866,273	8,515,978
Net Lifetime Electric Savings from Qualifying Low-Income Customers (kWh)	909,714	4,257,989	4,866,273	8,515,978
Net Annual Peak Demand Savings (kW)	0	8	10	17

\*143 projects reported in tracking data, 117 were completed projects (26 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 Evaluators 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 Evaluators used to review and calculate electricity and fuel savings that resulted from the program.

### 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 NJ 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: MI Weatherization TRM Measure Summary*

<b>Measure</b>	<b>TRM</b>
Residential Existing Homes Program – Air Sealing	2020 NJ TRM (pg. 70-71)
Residential Existing Homes Program – Duct Sealing and Repair	2020 NJ TRM (pg.71-72)
Residential Existing Homes Program – Insulation Upgrades	2020 NJ TRM (pg. 75-77)
Residential Existing Homes Program – HVAC Replacements*	2020 NJ TRM (pg. 23-24).
Gas Storage Tank Water Heater*	2020 NJ TRM (pg. 29)
LEDs	2020 NJ TRM (pg. 64)
Smart Strips	2020 NJ TRM (pg. 53)
Faucet Aerators*	2020 NJ TRM (pg. 182)
Low Flow Showerheads**	2021 NJ TRM (pg. 84)
Boiler Reset Controls	2020 NJ TRM (pg. 28)
HVAC Tune-Up	None

\*Also referred to the 2021 TRM for formula error correction (pg 84)

\*\*Potential priority measure however only one reported 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<sup>92</sup>. The reported gas savings account for 96% of the total MMBtu (i.e. the kWh contribution is relatively insignificant).

*Table 10-3: MI Weatherization Reported Ex-Ante Gross Savings by Measure*

<b>Measure Category</b>	<b>Number of Homes with Measure</b>	<b>Total therms</b>	<b>therms per Home</b>	<b>kWh per Home</b>	<b>% Total MMBtu</b>
Insulation	116	21,711.07	187.2	182.5	70.4%
Air Sealing	115	5,880.07	51.1	81.0	19.4%
Duct Sealing	27	2,915.27	108.0	277.4	9.9%
Tune-up	1	35.16	35.2	-	0.1%
<b>Total</b>	<b>117</b>	<b>30,541.57</b>	<b>261.4</b>	<b>325.0</b>	<b>100.0%</b>

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

<sup>92</sup> MMBtu estimated using: therms x 10; and kWh x 0.003412

### *Residential Existing Homes Program – Air Sealing*

The 2020 NJ 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: 2020 NJ TRM Air Sealing Savings per 1,000 ft<sup>2</sup> of Conditioned Space*

Climate Zone	Vintage	kWh / 1,000 ft <sup>2</sup>	therms / 1,000 ft <sup>2</sup>
4 SJG	Average	21	16
5 ETG	Average	12	19

### *Residential Existing Homes Program – Duct Sealing and Repair*

The 2020 NJ 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 Evaluators compared the reported therms savings (108 therms/home, see Table 10-3) to various estimates using the 2020 NJ 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 187 therms per home (see Table 10-3).

At minimum, the 2020 NJ TRM protocol requires baseline and installed R-values and ft<sup>2</sup> of the area treated. Because the baseline R-values were not reported, the Evaluators did not calculate savings using the R-values and ft<sup>2</sup> 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. SJG staff indicated these measures will be offered in PY2 and PY3.

### *HVAC Tune-Up*

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% reduction in annual heating energy if outdoor temperature reset controls are implemented. The Evaluators assumed the 5% estimate is a reasonable proxy value for a heating system tune-up.

## **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 Evaluators 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 Evaluators 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 Evaluators 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 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 SJG use Home Energy Report (HER) information to target customers with 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 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 Evaluators 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 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 Evaluators 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 any 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<sup>93</sup>, which require a sample size sufficient to determine savings with relative precision of  $\pm 10\%$  at the 90% confidence interval at the program level and  $\pm 15\%$  at the 85% 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 Evaluators 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).

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### **10.3 Impact Evaluation Results**

The Evaluators 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 through Table 10-8 and discussed in detail by measure category in the following sections.

<sup>93</sup> 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.

*Table 10-5: MI Weatherization Gross Annual Gas Savings*

Measure Category	Quantity (Count of Homes w/ Measure)	Ex-Ante Savings (therms)	Ex-Post Savings (therms)	therms RR
Insulation	116	21,711.07	21,711.07	100%
Air Sealing	115	5,880.07	3,020.63	51%
Duct Sealing	27	2,915.27	2,915.27	100%
Tune-up	1	35.16	35.16	100%
<b>Total</b>	<b>117</b>	<b>30,541.57</b>	<b>27,682.13</b>	<b>91%</b>

*Table 10-6: MI Weatherization Gross Annual Electric Savings*

Measure Category	Quantity (Count of Homes w/ Measure)	Ex-Ante Savings (kWh)	Ex-Post Savings (kWh)	kWh RR
Insulation	116	21,171	21,171	100%
Air Sealing	115	9,315	4,366	47%
Duct Sealing	27	7,489	7,489	100%
Tune-up	1	-	-	NA
<b>Total</b>	<b>117</b>	<b>37,975</b>	<b>33,026</b>	<b>87%</b>

The “Residential Existing Homes Program” section of the protocol does not include demand savings algorithms for other measures. SJG reported 0 demand savings. The 2020 NJ TRM includes the following demand savings algorithm for the duct sealing measure, based on annual cooling savings:

$$\text{Peak Demand Savings (kW)} = \frac{\Delta kWh_{cooling}}{EFLH_c} \times CF$$

*Equation 44*

The Evaluators 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 conservative<sup>94</sup> estimate of demand savings.

<sup>94</sup> This estimates average summer demand savings, not critical peak hour. The factor for peak hour is 0.000747 kW/kWh.

*Table 10-7: MI Weatherization Gross Demand Reduction (kW)*

Measure Category	Quantity (Count of Homes w/ Measure)	Ex-Ante Demand Reduction (kW)	Ex-Post Demand Reduction (kW)	kW RR
Insulation	116	0	7.71	NA
Air Sealing	115	0	1.59	NA
Duct Sealing	27	0	2.73	NA
Tune-up	1	0	0.00	NA
<b>Total</b>	<b>117</b>	<b>0</b>	<b>12.03</b>	<b>NA</b>

\*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 8.6 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	116	30	651,332.11	635,139
Air Sealing	115	15	88,201.03	65,488
Duct Sealing	27	18	52,474.80	134,793
Tune-up	1	10	351.57	-
<b>Total</b>	<b>117</b>	<b>28.6*</b>	<b>792,359.51</b>	<b>835,420</b>

\*Based on lifetime/annual therms. EUL based on kWh savings is 25.3 years.

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 NJ TRM, a 2,000 ft<sup>2</sup> home in SJG service territory (climate zone 4) receiving a comprehensive package of air sealing measures would save 42 kWh and 32 therms annually (see Table 10-4). Building square footage was not included in the tracking data so the Evaluators used publicly available tax records (see example in Figure 10-1) to estimate building conditioned square footage for a sample of participants (n=52).

Enter an address, neighborhood, city or ZIP code		Share Feedback		Help																																																			
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<a href="#">Property Stats</a>		<a href="#">Parcel Geometry</a>		<a href="#">Census Data</a>		<a href="#">Municipal Info</a>																																																	

Figure 10-1: Example Tax Record Excerpt Showing Conditioned Area (Sq Ft)<sup>95</sup>

Average size of homes receiving some type of air sealing measure was 1,648 ft<sup>2</sup>. Following the 2020 NJ TRM protocol, this results in average savings of 26.4 therms. Some projects appear to use the 2020 NJ TRM protocol to estimate savings and some do not. About one-third of the projects use the protocol; savings assume that comprehensive air sealing in Climate Zone 4 saves 16 therms per 1,000 ft<sup>2</sup> per year. Figure 10-2 represents the savings distribution of SJG homes receiving air sealing measures. The chart also includes the home square footage that would be necessary to achieve the reported therms savings. The Evaluators confirmed all homes were smaller than 3,000 ft<sup>2</sup>.

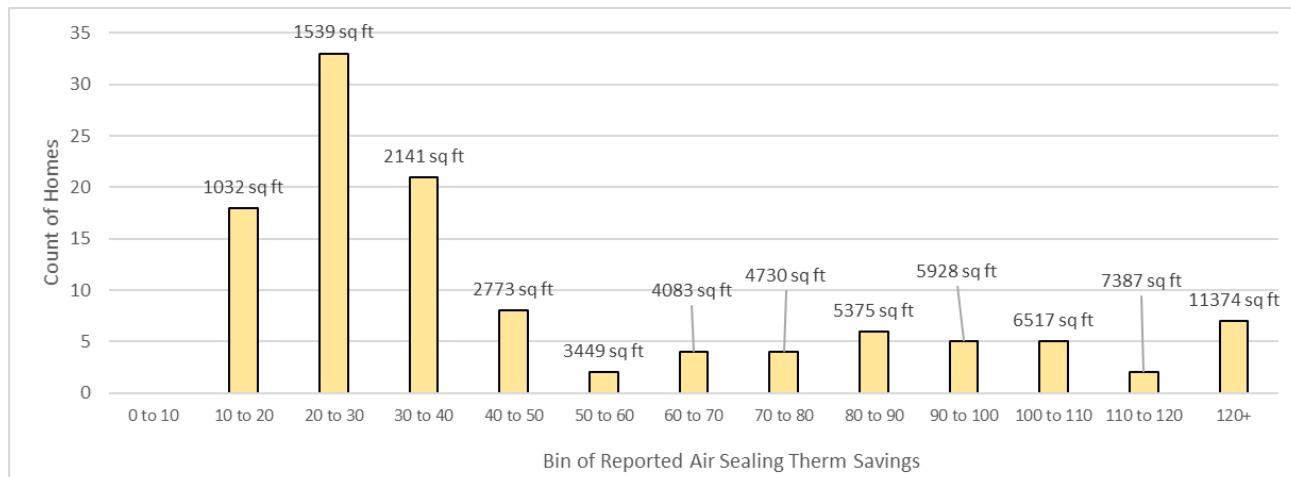


Figure 10-2: Histogram of Total Air Sealing Savings for MI Weatherization Homes

<sup>95</sup> Available from: <https://njpropertyrecords.com/>

### *Duct Sealing and Repair*

The information needed to use the 2020 NJ TRM protocols to calculate duct sealing savings was not available in the tracking data. The 2020 NJ 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 Evaluators compared the reported therms savings (108 therms/home, see Table 10-3) 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. The TRM uses subjective variables to address leakage (leaky, average, tight) which were not evaluated in PY1.

Duct sealing savings (108 therms per project) may be approximately 10% of annual heating therms consumption. In the Evaluators' 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 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 TRM.

### *Insulation*

The "quantity" field in tracking data includes treated area (in ft<sup>2</sup>) or linear footage, the R-value of insulation added, and savings estimates by measure. The baseline R-values required to calculate insulation savings using the 2020 NJ TRM protocol were not included in the tracking data. Figure 10-3 provides an example of the measure-level detailed tracking data for one of the participants interviewed.

Measure Category	Description	Quantity	therm savings (per quantity)	kWhsavings (per quantity)	Incentive (per quantity)	Gross Annual Therm Savings	Gross Annual kWh Savings	Incentive
Air Sealing	AEROSOL FOAM SEALANT (do not provide price per can)	268	0.0788	0.103	\$ 1	21.1	27.7	\$ 362
Air Sealing	DUCT SEALING	4	5.1241	30.769	\$ 125	20.5	123.1	\$ 500
Air Sealing	PREP OR FOLLOW-UP TO AIR SEAL	4	0.0000	-	\$ 125	0.0	-	\$ 500
Air Sealing	PREP OR FOLLOW-UP TO AIR SEAL	3	0.0000	-	\$ 125	0.0	-	\$ 375
Audit	CUSTOMER ENERGY EDUCATION-PRE-WEATHERIZATION	2	0.0000	-	\$ 90	0.0	-	\$ 180
Audit	AUDIT - SINGLE FAM. ELECTRIC & GAS	1	0.0000	-	\$ 290	0.0	-	\$ 290
Health & Safety	Health and Safety - Moisture BOXING/DAMMING FIXTUR	1	0.0000	-	\$ 78	0.0	-	\$ 78
Health & Safety	Gas Leak Repair by Sub	1	0.0000	-	\$ 441	0.0	-	\$ 441
HVAC	Furnace Cement (1/2 gallon bucket)	0	0.0000	-	\$ 50	0.0	-	\$ -
HVAC	MAGNETIC FILTER SLOT COVER	22	0.0000	-	\$ 19	0.0	-	\$ 418
Insulation	ATTIC TENT OR EQUIVALENT (when Pre-Fab unit doesn't fit)	1	0.0000	-	\$ 270	0.0	-	\$ 270
Insulation	EAVE OR SOFFIT CHUTES OR BAFFLES	30	0.0000	-	\$ 5	0.0	-	\$ 162
Insulation	BLOWN CELLULOSE UNFLOORED ATTIC INSULATION R23	350	0.0555	0.054	\$ 3	19.4	18.9	\$ 942
<b>Total</b>						<b>61.0</b>	<b>169.7</b>	<b>\$ 4,517</b>

*Figure 10-3: Example of Detailed MI Weatherization Tracking Data*

Because the baseline R-values were not available, the Evaluators was unable to estimate savings using the 2020 NJ TRM protocol. The Evaluators reviewed the savings to ensure the reported estimates were reasonable and within range of expected savings. Homes had an average of 1,252 ft<sup>2</sup> of insulation added, saving 186 therms per home, 0.15 therms/ ft<sup>2</sup> of insulated area. This is comparable to the savings estimated using the TRM methodology for improving R-5 insulation to R-30. This value (0.15 therms/ ft<sup>2</sup>) is relatively high – it cannot be achieved<sup>96</sup>, for example, by improving insulation having existing R-value greater than about R-8. The last line item in Figure 10-3 shows savings of 0.0555 therms per ft<sup>2</sup> and 350 ft<sup>2</sup> added. The Evaluators used the 2020 NJ TRM protocol to back-calculate the baseline R-value required to achieve savings and estimated a baseline R-value of R-12, which supports the participants explanation of the work performed:

*“they pulled out a lot of old pieces of fiberglass insulation from the attic and did something with foam sealing... then used a machine to add new insulation”*

When asked if the area treated was around 350 ft<sup>2</sup> the participant confirmed that sounded about right.

### Tune-Ups

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% reduction in annual heating energy if outdoor temperature reset controls are implemented.

<sup>96</sup> 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 SJG climate zone, is about 0.1 therms/ft<sup>2</sup>

Only one SJG MI Weatherization participant received a tune-up. The measure description was “gas furnace tune-up” and the reported savings was 35 therms. This may be conservative (if annual heating consumption is 700 therms, a 5% reduction would save 35 therms).

## 10.4 Process Evaluation Results

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The process-related data collection activities for the MI Weatherization Program evaluation included facilitated discussions led by the Evaluators, with utility management and program implementation staff. The Evaluators also conducted five in-depth interviews with program participants. Results are summarized by key themes and findings.

### *Participation Barriers*

SJG staff described the program logic and provided thoughts on the program launch and design. SJG marketed the QHEC program to moderate income census tracks, hoping to use the QHEC program to identify and recruit MI Weatherization program participants. Nine QHEC participants went on to participate in the MI Weatherization program. The number of planned participants in PY1 – PY3 is 1,450 homes, with a target of 350 homes in PY1. SJG staff acknowledged the program fell short of expectations in PY1 (143 homes, 117 with therms savings) and that they were somewhat surprised by this outcome because of their experience with the Comfort Partners program. In their experience, Comfort Programs has exceeded expectations and expended budget ahead of schedule. SJG suggested the following reasons for relatively low participation levels in PY1:

- Eligible homeowners are not aware of the program.
- One of best tactics for recruiting in Comfort Partners program was door to door canvassing. Given issues with permissions required by some municipalities, SJG has not been able to promote the program by canvassing.
- More cross-program marketing is needed. QHEC contractors have an opportunity to promote either HPwES or Moderate Income Weatherization programs.

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

- Lack of trust in effectiveness of a government-funded program. For example, one participant mentioned the program to a friend who responded with skepticism because they are not confident a contractor has incentive to do quality work if the homeowner is not paying for it.
- Some people may not be comfortable with an unknown contractor in their home

Participants talked about the weatherization measures they received, and they offered some perspective on **additional weatherization opportunities not addressed by the program**. All five participants thought there were other weatherization improvement opportunities not addressed by the program. The most common measures mentioned

were old inefficient windows and doors. One participant felt as though their furnace was nearing end of life but understood the scope of work is limited by the budget cap.

**The level of effort required to participate was not an issue for the participants interviewed.** The Evaluators 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.

**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 (~\$17,000 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 Evaluators 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.

Three participants could not recall, and two participants were reasonably sure the program staff (auditor or installation contractors) that they interacted with did not encourage them to participate in any of the other SJG 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 work<sup>97</sup> 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 Evaluators 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 helps 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 SJG energy efficiency program opportunities.
- Participants were impressed with the knowledge and professionalism of the auditor and installation contractors, and all were very satisfied with the program overall.

<sup>97</sup> The Evaluators chose not to discuss the cost participants would be willing to contribute.

- The QA/QC process was recently established. SJG hired a 3<sup>rd</sup> 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 grants<sup>98</sup> 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 (primarily heat pumps)
- Electric panel upgrades

#### *Tracking Data*

The Evaluators identified and selected a sample of projects for review and in-depth participant interview and reviewed the measures reported in the tracking database with each participant. Participants generally confirmed the measures reported aligned with the work completed. One participant insisted the contractor did not do anything with the ducts but after further discussion acknowledged<sup>99</sup> they did.

## **10.5 Conclusions and Recommendations**

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**Conclusion: The ex-post savings estimates and realization rates are not based on empirical data.** The average savings per home (261 therms) is not unreasonable but may be high<sup>100</sup>. The evaluation team independently calculated savings for air sealing, which impacted the realization rate, but accepted savings for other measure (assumed ex-ante = ex-post) because the tracking data did not include information required by the 2020 TRM protocols. Consequently, the realization rate does not reflect actual program impacts. Savings of 261 therms per home equates to a heat loss reduction or efficiency improvement of at least 20%.

<sup>98</sup> 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.

<sup>99</sup> During the interview, the participant offered to look at areas treated; which jogged their memory about the duct work improvement.

<sup>100</sup> SJG's MI Weatherization program had larger homes (1,965 ft<sup>2</sup> versus 1,648 ft<sup>2</sup>) but lower savings per home (ETG: 208 therms. SJG: 261 therms per home).

Many of the reported insulation savings estimates (on average insulation savings was ~0.15 therm/ft<sup>2</sup> area treated) can only be achieved<sup>101</sup> if in situ R-value is less than R-3.5.

The average reported savings for duct improvement (108 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:** **SJG should improve the program tracking data in support of accurate M&V.** For a complete list, please see section 10.7.

**Conclusion:** **The results of pre/post monthly therm consumption billing analysis will provide a different estimate of actual program impacts per home.** However, the number of MI Weatherization projects is too low<sup>102</sup> 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 SJG 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.

<sup>101</sup> 2020 TRM Insulation Protocol, pg 75: 
$$\frac{\left(\frac{1}{R_b} - \frac{1}{R_q}\right) \times 5,160 \text{ HDD} \times 24 \times \text{Area}}{100,000 \frac{\text{Btu}}{\text{therm}} \times 80\% \text{ AFUE}}$$

<sup>102</sup> Typically, a sample of 500+ homes would be necessary to determine weather-related therm reduction of ~10%.

**Conclusion:** The average HPwES project cost (\$17,000) was nearly 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 SJG cannot increase the per-home incentive limit, participants may have more energy savings opportunities. Therefore, other programs (HPwES, Energy Efficient Products) may be of interest to participants.

**Recommendation:** SJG should work with the implementer, 3<sup>rd</sup>-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 (117 completed projects by July 1, 2022) was lower than target (350 homes). This was due to program start-up delays and inability to do door-to-door marketing.

**Recommendation:** SJG should continue to use HER and bill inserts to target homes with the highest energy use. They should closely monitor interest, especially in 2023 when the Inflation Reduction Act efficiency tax credits are available and as cost of heating is of increasing interest. SJG should also 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.

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

**Recommendation:** Evaluators should leverage QA/QC data collected by PSD to inform the second, enhanced rigor evaluation.

**Conclusion:** 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.

**Recommendation:** For the PY2 evaluation, the evaluators should conduct auditor interviews, contractor interviews, and contractor ride-alongs. If participation exceeds ~300 homes<sup>103</sup>, 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?
- 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 SJG use Home Energy Report (HER) information to target customers with 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?

## **10.6 Barriers to Participation**

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

- Lack of trust in effectiveness of a government-funded program. For example, one participant mentioned the program to a friend who responded with skepticism because they are not confident a contractor has incentive to do quality work if the homeowner is not paying for it.
- Some people may not be comfortable with an unknown contractor in their home.

## **10.7 Evaluability Recommendations**

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**SJG should implement the following list of tracking data improvements:**

- Include conditioned square footage of each home
- Include blower door test results

<sup>103</sup> Assuming 15% response rate, approximately 300 participants would be needed to establish NTG and other key parameters with 10% precision at the 90% confidence level.

- 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 % for supply and return
  - Duct leakage assessment (leaky, average, tight) or actual leakage measurements (at 25 Pa, or preferably normal static operation pressure "NSOP")
  - Duct insulation (existing R-value, final R-value if insulation is added)

**Include an estimate of building square footage for homes with Air Sealing.** Building square footage was not included in the tracking data so the Evaluators used publicly available tax records to estimate building conditioned square footage. Average size of homes receiving some type of air sealing measure was 1,648 ft<sup>2</sup>. Following the NJCEP, this results in average savings of 26.4 therms (significantly lower than the average reported savings of 51.1 therms per home with air sealing).

**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 ft<sup>2</sup>) 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 1,252 ft<sup>2</sup> of insulation added, saving 186 therms per home, 0.15 therms/ ft<sup>2</sup>. This is comparable to the savings estimated using the TRM methodology for improving R-5 insulation to R-30. This value (0.15 therms/ ft<sup>2</sup>) 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% of annual heating therms use.

**Include location of Ducts that were improved.** The average reported savings for duct improvement (108 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 QA/QC process was recently established. SJG hired a 3<sup>rd</sup> party contractor, PSD, to inspect quality of work, verify the work on the invoice matches work performed, and identify missed opportunities. Although the Evaluators reviewed a sample of projects via in-depth participant interviews and participants generally confirmed the measures reported aligned with the work completed, the QA/QC process may be a valuable step in improving data collection methods.

## **10.8 Surveys**

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The program survey instrument is combined into the report on the following pages.

## 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"> <li>How did customers learn about the program?</li> <li>What are customers' communication preferences?</li> <li>What are motivating factors for participating?</li> </ul>	Section B
Assess measure installation and experience with installation	<ul style="list-style-type: none"> <li>Verify measure was installed and if not, assess reasons</li> <li>What issues did customers encounter with the energy-efficient equipment?</li> </ul>	Section C
Assess experience with measure(s) installed through program	<ul style="list-style-type: none"> <li>What issues did customers encounter with the energy-efficient equipment?</li> </ul>	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"> <li>How satisfied are participants with the Sub-Program?</li> <li>What elements of the Sub-Program worked well to enhance customer satisfaction?</li> <li>How likely would customers be to recommend SJG and the Sub-Program to others?</li> </ul>	Section D
Identify areas of desired Sub-Program improvement	<ul style="list-style-type: none"> <li>Which features of the Sub-Programs may cause customer dissatisfaction, or could be improved?</li> </ul>	Section D
Identify drivers of customer satisfaction/dissatisfaction	<ul style="list-style-type: none"> <li>What elements of the Sub-Program drove customer satisfaction or dissatisfaction?</li> </ul>	Section D and regression analysis <sup>1</sup>
Demographics		Section E

<sup>1</sup>Note: 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](mailto: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](mailto:Athena.Dodd@cadmusgroup.com).

We hope to hear from you!

Follow the link to opt out of future emails:

[\\${I://OptOutLink?d=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	Don't know
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.)			

Duct Improvement [IF <b>DUCT_SEAL=TRUE</b> ]	Duct sealing or duct insulation		
Water Heater [IF <b>WH_REPLACE=TRUE</b> ]	Install new water heater		
Insulation upgrades [IF <b>INSULATION=TRUE</b> ]	Add insulation to: Ceilings walls Floors Basement/crawl space Attic other		
Pipe insulation [IF <b>PIPE_INSULATION=TRUE</b> ]	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?

<b>Not at All Likely</b>											<b>Not sure</b>
<b>Extremely Likely</b>											
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?

<b>Not at All Likely</b>											<b>Not sure</b>
<b>Extremely Likely</b>											
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?

<b>Not at All Likely</b>											<b>Extremely Likely</b>	<b>Not sure</b>
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

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## 11.1 Introduction

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The Home Energy Report (HER) program 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

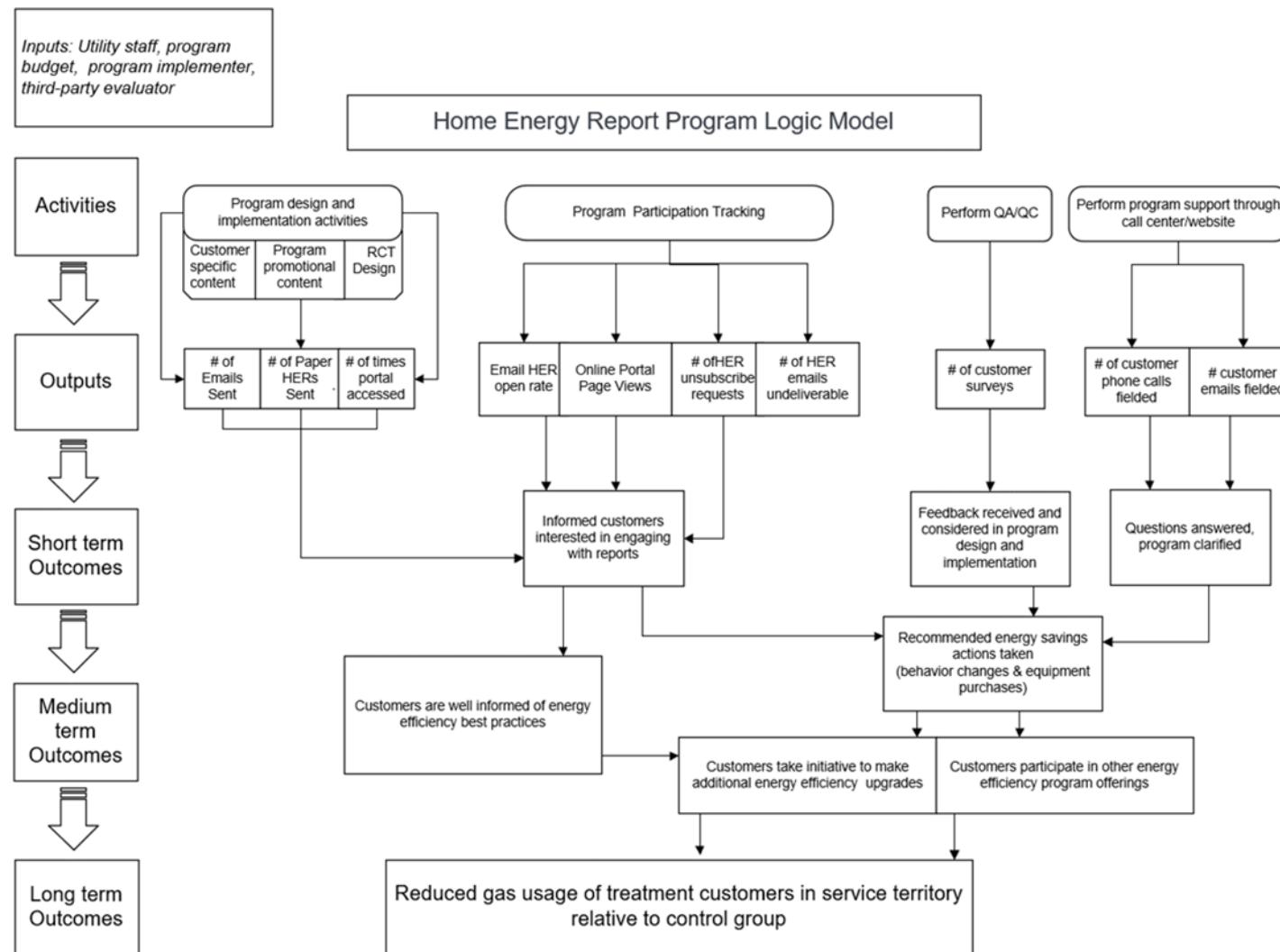
HERs are provided to customers at no cost through multiple channels including direct mail and email. This information is provided to customers to gain better insights into their own energy use as well as inform them how they compare to their peers, which can be a significant driver of behavior change 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 SJG's energy efficiency programs.

### 11.1.1 Program Design

To facilitate understanding of the HERs program design, the Evaluators developed a draft logic model (see Figure 11-1). This draft was synthesized from the Evaluators' experience with similar programs, conversations with program and implementation staff, and a review of program documentation. the Evaluators 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: HER Program Logic Model



*Table 11-1: HER Estimated Participation and Savings*

Utility	Metric	PY1	PY2	PY3
South Jersey Gas	Estimated Participants	150,000	150,000	150,000
South Jersey Gas	Projected Annual Savings (therms)	634,197	556,939	466,642
South Jersey Gas	Projected Lifetime Savings (therms)	1,358,284	1,192,817	999,426

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 2016 to a portion of residential customers. Table 11-2 summarizes the cohorts implemented in the HER program within the SJG service area.

*Table 11-2: Summary of HER Cohorts*

Cohort	RCT Date	Treatment Group Size			Control Group Size	
		Number at Start PY1	Number at End PY1	Weighted Treatment Customers	Number at Start PY1	Number at End PY1
Legacy Wave 1	June 2016	130,073	122,476	125,541	22,931	21,624
Legacy Wave 2	Oct 2017	15,024	14,108	14,436	8,992	8,402
Legacy Wave 3	Mar 2019	38,047	35,146	36,184	8,719	8,061
<b>Total</b>		<b>183,144</b>	<b>171,730</b>	<b>176,160</b>	<b>40,642</b>	<b>38,088</b>

The Evaluators estimated savings for HER Program using non-participant residences in SJG's service territory selected from the Randomized Control Trial (RCT) and analyzed each cohort treated during PY1. Table 11-3 describes the evaluation period for each wave and reporting period.

*Table 11-3: Summary of HER Cohort Organization*

Cohort	RCT Date	Pre-Period	Post-Period
Legacy Wave 1	June 2016	3/1/2015-2/28/2016	PY1: 7/1/2021-6/30/2022
Legacy Wave 2	Oct 2017	10/1/2016-9/30/2017	PY1: 7/1/2021-6/30/2022
Legacy Wave 3	Mar 2019	3/1/2018-2/28/2019	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 on November 2014 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 Evaluators identified the following Impact research objectives for evaluating SJG's HER program:

- Estimate annual and per customer gross gas savings (therms) to gain insight on program performance.
- Validity testing of treatment and control cohorts.
- Calculate lift from other SJG 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 Evaluators identified the following Process research objectives for evaluating SJG's HER program:

- Review implementation of prior program recommendations by the HER program team (SJG and Uplight).
- How does the program design and performance compare to other, similar programs as well as to industry best practices?
- How well did 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 any 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**

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This section describes the evaluation approach of the HER program. The Evaluators analyzed each of the cohorts treated during PY1.

### **11.2.1 Glossary of Terminology**

The following terms are used throughout this report.

- 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: HER 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 (SJG)	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: HER 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 Evaluators followed an industry standard impact evaluation approach that conforms with the accepted level of rigor for all HERs program evaluations.

The Evaluators 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 Laboratory<sup>104</sup>. In addition, the Evaluators estimated joint savings from other downstream and upstream energy efficiency programs offered to SJG's residential customers.

<sup>104</sup> <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 Evaluators 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 PPR model with weather controls 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.

Savings estimates are presented 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<sup>105</sup>.

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 Evaluators examined data for outliers using multiple accepted identification techniques. These include standard deviation, Bonferroni Outlier Test, and Grubbs Test for Outliers (G-test). The Evaluators 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 Evaluators 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 Evaluators 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:

<sup>105</sup> <https://www.energy.gov/sites/prod/files/2015/02/f19/UMPChapter17-residential-behavior.pdf>

$$\text{Adjusted Usage} = \sum_i^n \text{Billed usage}_i \times \frac{\text{Billing days}_m}{\sum_i^n \text{Billing days}_i}$$

*Equation 45*

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
- $\text{Billed usage}_i$  = The total billed usage in a month (monthly bills) or consumed in a month (AMI interval data).
- $\text{Billing days}_i$  = 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 Evaluators 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 proportionated 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:

$$\text{Monthly usage}_m = \sum_i^n \left( \text{Adjusted usage}_i \times \frac{\text{Month days}_i}{\text{Billing days}_i} \right)$$

*Equation 46*

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.

$$\text{Billed days}_m = \sum_i^n \text{Month days}_i$$

*Equation 47*

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 Evaluators 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 Evaluators 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 Evaluators 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 Evaluators 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 SJG's service territory.

The PPR model is specified in Equation 48 below:

$$\begin{aligned} Usage_{imy} = & \beta_0 + \sum_{m=1}^{12} \sum_{y=1}^n I_{my} * \beta_{mys} * (AvgPre_i + AvePreSummer_i + AvePreWinter_i) \\ & + \sum_{m=1}^{12} \sum_{y=1}^n I_{my} * \tau_{my} * treatment_{imy} + \beta_1 * HDD_{im} + \varepsilon_{imy} \end{aligned}$$

*Equation 48*

Where:

- $Usage_{imy}$  = Customer  $i$ 's average daily energy usage in bill month  $m$  in year  $y$
- $\beta_0$  = Intercept of the regression equation
- $I_{my}$  = An indicator variable equal to one for each monthly bill month  $m$ , year  $y$ , and zero otherwise
- $\beta_{mys}$  = The coefficient on the bill month  $m$ , year  $y$  indicator variable interacted with season  $s$
- $\beta_1$  = 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  $m$
- $\tau_{my}$  = The estimated treatment effect in Usage per day per customer; the main parameter of interest
- $\varepsilon_{imy}$  = The error term

The Evaluators 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 Evaluators 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:

$$\begin{aligned} Usage_{imy} = & \beta_0 + \sum_{m=1}^{12} \sum_{y=1}^n I_{my} * \beta_{my} + Pre - Period\ Usage_{i,m,y-n} * \beta_{m,y-n} \\ & + \sum_{m=1}^{12} \sum_{y=1}^n I_{my} * \tau_{my} * treatment_{imy} + \beta_1 * HDD_{im} + \varepsilon_{imy} \end{aligned}$$

Equation 49

Where:

- $Usage_{imy}$  = Customer  $i$ 's average daily energy usage in bill month  $m$  in year  $y$
- $\beta_0$  = Intercept of the regression equation
- $I_{my}$  = An indicator variable equal to one for each monthly bill month  $m$ , year  $y$ , and zero otherwise

$\beta_{my}$	= The coefficient on the bill month $m$ , year $y$ indicator variable
$\beta_1$	= 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 $m$
$\tau_{my}$	= The estimated treatment effect in Usage per day per customer; the main parameter of interest
$\varepsilon_{imy}$	= The error term

The D-in-D regression model is specified in Equation 50 below:

$$\text{Usage}_{imy} = \beta_i + \sum_{m=1}^{12} \sum_{y=1}^n I_{my} * \beta_{my} + \tau_{my} * \sum_{m=1}^{12} \sum_{y=1}^n I_{my} * treatment_{imy} * Post_{my} + \beta_1 \\ * HDD_{im} + \sum_{i=1}^n Customer_i * \theta_i + \varepsilon_{imy}$$

*Equation 50*

Where:

$Usage_{imy}$	= Customer $i$ 's average daily energy usage in bill month $m$ in year $y$
$\beta_i$	= 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.
$\beta_{my}$	= The coefficient on the bill month $m$ , year $y$ indicator variable

$\beta_1$	= 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 $m$
$\tau_{my}$	= The estimated treatment effect in Usage per day per customer; the main parameter of interest
$\theta_i$	= The estimated fixed effects for customer $i$
$Customer_i$	= An indicator variable equal to one for customer $i$ and zero otherwise.
$\varepsilon_{imy}$	= 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 Evaluators 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 Evaluators 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 Evaluators 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 Evaluators 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 Evaluators 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 Evaluators conducted program staff and implementor interviews. During the interviews, the Evaluators clarified the program activities, including what customer engagement tools the program uses in addition to the HERs, if any, to influence customer behavior. The Evaluators also probed the program manager's perspective on the opportunities for and barriers to a successful program. Additionally, the Evaluators 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 Evaluators 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 the following:

- 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 Evaluators 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 Evaluators 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 was 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 Gas Savings*

Projected Annual Savings (therms)	Ex-Ante Savings (therms)	Gross Annual Savings (therms)	RR therms
634,197.00	1,425,920.00	1,494,014.00	105%

### **11.3.1 Data Preparation and Cleaning**

The Evaluators prepared and cleaned billing data provided by SJG prior to running regressions. Table 11-7 represents the unique number of customers per wave and treatment group throughout the billing cleaning stages.

The Evaluators performed a true-up of customer bills to adjust for estimated reads made 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 Evaluators validity tested all waves evaluated. The details of this step are provided in the next section.

*Table 11-7: HER Treatment and Control Customers After Restrictions*

Wave	Restriction Detail	Treatment Customers	Control Customers
Legacy Wave 1	Start	161,271	28,443
Legacy Wave 1	Keep first wave assignment	161,269	28,443
Legacy Wave 1	Remove outliers using Grubbs/Bonferroni tests (anything over 99.9th percentile (15 therms/day))	161,269	28,443
Legacy Wave 1	Remove bills with less than 10 or more than 90 days duration	161,269	28,443
Legacy Wave 1	After removing bills that occur before pre-period	161,267	28,443
Legacy Wave 1	Only keep pre-period and post-period in program year	161,267	28,443
Legacy Wave 1	Only keep customer with at least 9 months pre and 6 months post <sup>106</sup>	126,633	22,359
Legacy Wave 2	Start	19,777	11,864
Legacy Wave 2	Keep first wave assignment	19,773	11,864
Legacy Wave 2	Remove outliers using Grubbs/Bonferroni tests (anything over 99.9th percentile (15 therms/day))	19,773	11,864
Legacy Wave 2	Remove bills with less than 10 or more than 90 days duration	19,773	11,864
Legacy Wave 2	After removing bills that occur before pre-period	19,773	11,864
Legacy Wave 2	Only keep pre-period and post-period in program year	19,770	11,864
Legacy Wave 2	Only keep customer with at least 9 months pre and 6 months post <sup>106</sup>	14,602	8,691
Legacy Wave 3	Start	47,791	11,000
Legacy Wave 3	After removing bills that occur after inactive date	47,790	11,000
Legacy Wave 3	Remove outliers using Grubbs/Bonferroni tests (anything over 99.9th percentile (15 therms/day))	47,790	11,000
Legacy Wave 3	Remove bills with less than 10 or more than 90 days duration	47,789	11,000
Legacy Wave 3	After removing bills that occur before pre-period	47,789	11,000
Legacy Wave 3	Only keep pre-period and post-period in program year	47,784	11,000
Legacy Wave 3	Only keep customer with at least 9 months pre and 6 months post <sup>106</sup>	36,470	8,371

<sup>106</sup> The Evaluators 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.

### 11.3.2 Validity Testing Results

The remaining customers after billing preparation and cleaning 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.

Below, Table 11-8 through Table 11-10 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: HER 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	4.92	4.91	0.00	0.811	-
Feb	5.17	5.17	0.00	0.834	-
Mar	4.84	4.83	0.01	0.585	-
Apr	2.29	2.28	0.01	0.240	-
May	0.96	0.95	0.00	0.407	-
Jun	0.68	0.68	0.00	0.710	-
Jul	0.60	0.60	0.00	0.734	-
Aug	0.59	0.58	0.00	0.699	-
Sep	0.67	0.67	0.00	0.326	-
Oct	1.25	1.25	0.00	0.407	-
Nov	2.23	2.23	0.00	0.743	-
Dec	3.13	3.13	0.00	0.981	-

*Table 11-9: HER 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	3.54	3.55	-0.01	0.720	-
Feb	3.14	3.15	-0.01	0.754	-
Mar	2.71	2.73	-0.02	0.328	-
Apr	1.29	1.28	0.00	0.911	-
May	0.69	0.70	-0.01	0.191	-
Jun	0.49	0.50	-0.01	0.408	-
Jul	0.43	0.44	-0.01	0.134	-
Aug	0.43	0.44	-0.01	0.483	-
Sep	0.42	0.43	0.00	0.621	-
Oct	0.83	0.82	0.01	0.520	-
Nov	1.98	1.98	0.01	0.719	-
Dec	3.29	3.31	-0.01	0.600	-

*Table 11-10: HER Legacy Wave 3 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	4.43	4.39	0.03	0.306	-
Feb	4.38	4.35	0.02	0.570	-
Mar	3.42	3.41	0.02	0.520	-
Apr	2.12	2.11	0.01	0.602	-
May	0.77	0.76	0.01	0.419	-
Jun	0.52	0.51	0.01	0.100	-
Jul	0.45	0.45	0.01	0.273	-
Aug	0.44	0.44	0.00	0.941	-
Sep	0.49	0.49	0.00	0.680	-
Oct	1.19	1.19	0.00	0.888	-
Nov	2.82	2.81	0.01	0.535	-
Dec	3.65	3.63	0.02	0.555	-

### 11.3.3 Dual Participation Analysis Results

Participants in both the treatment and control groups participate in other SJG 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.

SJG 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,<sup>107</sup> Moderate Income Weatherization Program, and Quick Home Energy Check-Up Program.

The Evaluators identified and summarized the average treatment customer, average control customer, and average incremental savings attributed to the residential programs for each wave.

Table 11-11 displays the verified double counting savings to be subtracted from each group's annual program savings for each program year.

*Table 11-11: HER 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	0.483	0.472	0.010	125,541	1,314	0.1%
Legacy Wave 2	0.392	0.251	0.141	14,436	2,034	1.9%
Legacy Wave 3	0.384	0.253	0.132	36,184	4,762	0.3%
<b>Total</b>	<b>0.455</b>	<b>0.409</b>	<b>0.046</b>	<b>176,160</b>	<b>8,110</b>	<b>0.5%</b>

The results are separated by wave. PY1 displays a total of 8,110 therms in double counted savings. The downstream double counting values are subtracted from the regression model results for each wave.

#### 11.3.4 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.

<sup>107</sup> 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  $\tau_{my}$ , which is defined again in Table 11-12.

*Table 11-12: HER Regression Parameters*

Variable	Parameter	Interpretation
Treatment	$\tau_{my}$	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 SJG upstream and downstream programs were calculated and removed to avoid double counting.

All waves had positive, statistically significant savings and each model portrayed a sufficient fitness to the data.

#### *Legacy Wave 1 Results*

Table 11-13 displays the annual gas savings per treatment customer for Legacy Wave 1, prior to any double counting adjustments. The savings are positive and statistically significant at the 95% level.

*Table 11-13: HER Legacy Wave 1 Annual Savings per Household*

Wave	Program Year	Estimate	5% CI	95% CI
Legacy Wave 1	PY1	9.64	8.20	11.09

Table 11-14 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 11-14: HER Legacy Wave 1 PY1 Regression Results*

Coefficient	Estimate	Std Error	P Value	5% CI	95% CI
(Intercept)	-4.71	0.08	0.00	-4.84	-4.57
Treatment	-0.0264	0.00	0.00	-0.03	-0.02
Feb	0.99	0.02	0.00	0.95	1.02
Mar	1.96	0.04	0.00	1.90	2.03
Apr	2.73	0.05	0.00	2.64	2.82
May	3.53	0.07	0.00	3.42	3.63
Jun	4.62	0.08	0.00	4.48	4.75
Jul	4.79	0.08	0.00	4.65	4.93
Aug	4.79	0.08	0.00	4.66	4.93
Sep	4.54	0.08	0.00	4.41	4.68
Oct	4.05	0.07	0.00	3.93	4.18
Nov	1.50	0.04	0.00	1.45	1.56
Dec	1.71	0.03	0.00	1.65	1.76
Pre-period Usage	0.79	0.01	0.00	0.77	0.80
Pre-period Summer Usage	-0.19	0.01	0.00	-0.20	-0.18
Pre-period Winter Usage	0.59	0.01	0.00	0.59	0.60
HDD	0.18	0.00	0.00	0.17	0.18

The Evaluators ran three 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 11-15.

*Table 11-15: HER Legacy Wave 1 Model Fit*

Wave	Model	Adjusted R2	F Statistic	Number of Observations	Number of Weighted Treatment Customers
Legacy Wave 1	PPR	0.806	144,139	1,699,302	125,541

The ex-post gross gas savings of the 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 11-16: HER Legacy Wave 1 Gross Annual Gas Savings, PY1*

Annual Unadjusted Savings Per Home (therms/yr)	5% CI Annual Unadjusted Savings Per Home (therms/yr)	95% CI Annual Unadjusted Savings Per Home (therms/yr)	Annual Double Counted Savings Per Home (therms/yr)	Annual Adjusted Savings Per Home (therms/yr)	Annual Control Group Usage Per Home (therms/yr)	Annual Percent Savings Per Home
9.64	8.20	11.09	0.01	9.63	831	1.16%

Legacy Wave 1 displayed 1.16% annual household savings for PY1. Average annual household savings for treated customers for Legacy Wave 1 was 9.63 therms in PY1. Household savings estimates were extrapolated using the number of weighted treatment customers active in the post-period. Legacy Wave 1 displayed 1,209,338 therms in savings for the PY1 evaluation period. In addition, the 95% confidence intervals are summarized for PY1.

*Table 11-17: HER 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	9.63	125,541	1,209,338	1,028,065	1,390,611

### *Legacy Wave 2 Results*

Table 11-18 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% level.

Table 11-19 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: HER Legacy Wave 2 PY1 Regression Results*

Wave	Program Year	Estimate	5% CI	95% CI
Legacy Wave 2	PY1	7.24	4.82	9.67

*Table 11-19: HER Legacy Wave 2 PY1 Regression Results*

Coefficient	Estimate	Std Error	P Value	5% CI	95% CI
(Intercept)	-2.86	0.19	0.00	-3.17	-2.54
Treatment	-0.01982	0.00	0.00	-0.03	-0.01
Feb	0.60	0.04	0.00	0.54	0.67
Mar	1.17	0.08	0.00	1.03	1.31
Apr	1.66	0.12	0.00	1.47	1.86
May	2.12	0.15	0.00	1.87	2.36
Jun	2.79	0.19	0.00	2.48	3.09
Jul	2.91	0.19	0.00	2.60	3.22
Aug	2.90	0.19	0.00	2.59	3.22
Sep	2.72	0.18	0.00	2.42	3.02
Oct	2.45	0.17	0.00	2.18	2.72
Nov	0.89	0.08	0.00	0.76	1.02
Dec	1.05	0.07	0.00	0.93	1.17
Pre-period Usage	0.92	0.04	0.00	0.86	0.98
Pre-period Summer Usage	-0.23	0.02	0.00	-0.26	-0.20
Pre-period Winter Usage	0.56	0.02	0.00	0.53	0.59
HDD	0.11	0.01	0.00	0.10	0.12

The Evaluators ran three 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 11-20.

*Table 11-20: HER Legacy Wave 2 Model Fit*

Wave	Model	Adjusted R2	F Statistic	Number of Observations	Number of Weighted Treatment Customers
Legacy Wave 2	PPR	0.793	20,780	265,627	14,436

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 11-21: HER Legacy Wave 2 Gross Annual Gas Savings, PY1*

Annual Unadjusted Savings Per Home (therms/yr)	5% CI Annual Unadjusted Savings Per Home (therms/yr)	95% CI Annual Unadjusted Savings Per Home (therms/yr)	Annual Double Counted Savings Per Home (therms/yr)	Annual Adjusted Savings Per Home (therms/yr)	Annual Control Group Usage Per Home (therms/y)	Annual Percent Savings Per Home
7.24	4.82	9.67	0.14	7.10	583	1.22%

Legacy Wave 2 displayed 1.22% annual household savings for PY1. Average annual household savings for treated customers for Legacy Wave 2 was 7.10 therms in PY1. Household savings estimates were extrapolated using the number of weighted treatment customers active in the post-period. Legacy Wave 2 displayed 102,491 therms in savings for the PY1 evaluation period. In addition, the 95% confidence intervals are summarized for PY1.

*Table 11-22: HER Legacy Wave 2 Total Gross Annual Gas Savings, PY1*

Wave	Annual Adjusted Savings Per Home (therms)	Number of Weighted Treatment Customers	Program Savings (therms) 5% CI	Program Savings (therms) 95% CI
Legacy Wave 2	7.10	14,436	102,491	67,484

### *Legacy Wave 3 Results*

Table 11-23 displays the annual gas savings per treatment customer for Legacy Wave 3, prior to any double counting adjustments. The savings are positive and statistically significant at the 95% level.

*Table 11-23: HER Legacy Wave 3 Annual Savings per Household*

Wave	Program Year	Estimate	5% CI	95% CI
Legacy Wave 3	PY1	5.17	3.02	7.31

Table 11-24 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 11-24: HER Legacy Wave 3 PY1 Regression Results*

Coefficient	Estimate	Std Error	P Value	5% CI	95% CI
(Intercept)	-4.14	0.14	0.00	-4.37	-3.92
Treatment	-0.01415	0.00	0.00	-0.02	-0.01
Feb	0.85	0.03	0.00	0.80	0.90
Mar	1.75	0.06	0.00	1.65	1.85
Apr	2.48	0.08	0.00	2.34	2.62
May	3.17	0.11	0.00	3.00	3.34
Jun	4.05	0.13	0.00	3.83	4.27
Jul	4.17	0.14	0.00	3.95	4.40
Aug	4.17	0.14	0.00	3.95	4.40
Sep	3.99	0.13	0.00	3.77	4.20
Oct	3.59	0.12	0.00	3.40	3.79
Nov	1.46	0.06	0.00	1.36	1.55
Dec	1.53	0.05	0.00	1.44	1.62
Pre-period Usage	0.64	0.02	0.00	0.61	0.67
Pre-period Summer Usage	-0.18	0.01	0.00	-0.20	-0.16
Pre-period Winter Usage	0.63	0.01	0.00	0.61	0.64
HDD	0.14	0.00	0.00	0.14	0.15

The Evaluators 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 11-25.

*Table 11-25: HER Legacy Wave 3 Model Fit*

Wave	Model	Adjusted R2	F Statistic	Number of Observations	Number of Weighted Treatment Customers
Legacy Wave 3	PPR	0.830	50,690	509,219	36,184

The ex-post gross gas savings of HER program for Legacy Wave 3 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 11-26: HER Legacy Wave 3 Gross Annual Gas Savings, PY1*

Annual Unadjusted Savings Per Home (therms/yr)	5% CI Annual Unadjusted Savings Per Home (therms/yr)	95% CI Annual Unadjusted Savings Per Home (therms/yr)	Annual Double Counted Savings Per Home (therms/yr)	Annual Adjusted Savings Per Home (therms/yr)	Annual Control Group Usage Per Home (therms/yr)	Annual Percent Savings Per Home
5.17	3.02	7.31	0.13	5.04	746	0.68%

Legacy Wave 3 displayed 1.22% annual household savings for PY1. Average annual household savings for treated customers for Legacy Wave 3 was 5.04 therms in PY1. Household savings estimates were extrapolated using the number of weighted treatment customers active in the post-period. Legacy Wave 3 displayed 182,185 therms in savings for the PY1 evaluation period. In addition, the 95% confidence intervals are summarized for PY1.

*Table 11-27: HER Legacy Wave 3 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 3	5.04	36,184	182,185	104,653	259,718

#### *Other Regression Model Results*

Table 11-28 provides additional regression model estimates from the other two models run by the Evaluators: 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 1.15% to 1.19% for Legacy Wave 1, 1.22% to 1.37% for Legacy Wave 2, and 0.61% to 0.72% for Legacy Wave 3.

*Table 11-28: Other HER Regression Model Estimates*

Wave	Model	Annual Unadjusted Savings Per Home (therms/yr)	5% CI Annual Unadjusted Savings Per Home (therms/yr)	95% CI Annual Unadjusted Savings Per Home (therms/yr)	Adjusted R2	Number of Observations	Annual Percent Savings Per Home
Legacy Wave 1	D-in-D	9.89	7.70	12.08	0.771	3,418,613	1.19%
Legacy Wave 1	LDV	9.57	8.06	11.07	0.784	1,632,226	1.15%
Legacy Wave 2	D-in-D	7.36	3.51	11.20	0.720	538,488	1.26%
Legacy Wave 2	LDV	7.97	5.36	10.58	0.768	259,025	1.37%
Legacy Wave 3	D-in-D	5.38	1.50	9.26	0.735	1,028,933	0.72%
Legacy Wave 3	LDV	4.58	2.33	6.83	0.805	491,407	0.61%

*Aggregated Waves Results*

Positive, statistically significant savings were found for all waves evaluated. The Evaluators adjusted regression results with double counted savings in both downstream and upstream programs to arrive at the final program savings estimate. Table 11-29 summarizes each wave's annual household energy savings impact with 95% confidence intervals.

*Table 11-29: HER 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	125,541	9.63	8.19	11.08	1,209,338	1,028,065	1,390,611
Legacy Wave 2	14,436	7.10	4.67	9.52	102,491	67,484	137,498
Legacy Wave 3	36,184	5.04	2.89	7.18	182,185	104,653	259,718
<b>Total</b>	<b>176,161</b>	<b>8.48</b>	<b>6.81</b>	<b>10.15</b>	<b>1,494,014</b>	<b>1,200,201</b>	<b>1,787,826</b>

### 11.3.5 Attrition Analysis Results

Table 11-30 summarizes the moveout rates for each wave in PY1. The moveout rates for each wave range from 6% and 8%. In addition, the annual attrition rate in PY1 is roughly 6% across waves for the both the treatment and control groups.

*Table 11-30: HER 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	130,073	22,931	122,476	21,624	7,597	1,307	6%	6%
Legacy Wave 2	15,024	8,992	14,108	8,402	916	590	6%	7%
Legacy Wave 3	38,047	8,719	35,146	8,061	2,901	658	8%	8%
<b>Total</b>	<b>183,144</b>	<b>40,642</b>	<b>171,730</b>	<b>38,088</b>	<b>11,414</b>	<b>2,554</b>	<b>6%</b>	<b>6%</b>

The Evaluators 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%.

*Table 11-31: HER 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	June 2016	161,239	122,476	24%	28,439	21,624	24%
Legacy Wave 2	Oct 2017	19,744	14,108	29%	11,843	8,402	29%
Legacy Wave 3	Mar 2019	46,845	35,146	25%	10,802	8,061	25%
<b>Total</b>		<b>227,828</b>	<b>171,730</b>	<b>25%</b>	<b>51,084</b>	<b>38,088</b>	<b>25%</b>

### 11.3.6 HERs Report Delivery Type Summary

Table 11-32 summarizes HERs report delivery type for treatment customers in PY1 by wave. Customers with an inactive date in their bills were excluded at the outset since they no longer receive reports and are part of natural attrition. Ninety-eight percent of customers received paper HERs reports. In addition, 62% of customers received email reports, while 62% of customers received both email and paper reports, indicating that most customers receiving email reports also received paper reports. Lastly, 2% of customers did not receive any reports.

*Table 11-32: HER 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	98%	59%	59%	2%
Legacy Wave 2	97%	65%	65%	3%
Legacy Wave 3	99%	71%	71%	1%
<b>Total</b>	<b>98%</b>	<b>62%</b>	<b>62%</b>	<b>2%</b>

## 11.4 Process Evaluation Results

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### 11.4.1 Program Staff Facilitated Discussions

The Evaluators conducted discussions with SJG and Uplight staff to investigate the design and implementation of SJG's Behavioral program. The summary information presented here outlines key takeaways synthesized from discussions held with Uplight and SJG 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 South Jersey Gas' energy efficiency manager and residential program analyst as well as SJI's EM&V manager.

**The Behavioral program has a design that is consistent with industry standards.** The Uplight client solutions director observed that the overall design of the SJG 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.

**The Behavioral program provides cross-promotion for residential programs.** HERs highlight available programs and increase awareness of offerings available for SJG 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.** SJG offers its customers an online portal and assessment tool, where HERs treatment customers can input data that supports HERs that are more catered to their unique home profile. SJG staff provided summary reports related to the online assessment tool and email HERs report. Email HERs' unique click through rates and the portal logins followed similar patterns during the first program year, with generally stable usage throughout the year, and usage and logins spiking in winter months. 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.

#### **11.4.1 HER Participant and Control Group Survey Results**

The Evaluators surveyed SJG 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 Evaluators sent 3,123 customers that received HERs an email invitation. Seventy-three participants and 69 non-participants completed the survey. Five participants were screened-out from the survey. Three said they did not recall receiving reports, one 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 11-33 displays response rate information. The survey invite either offered no incentive or a \$5 gift certificate. The survey invite either offered no incentive or a \$5 gift certificate. Initially the survey did not offer an incentive; the Evaluators added a \$5 incentive to improve the response rate and meet survey quota requirements by the reporting deadline.

*Table 11-33: Summary of Email HER Survey Response*

Metric	Participants	Non-participants	Total
Initial Invite	3,123	2,993	6,116
<i>Incentive offered</i>	2,623	2,493	5,116
<i>No incentive offered</i>	500	500	1,000
Bounces	322	173	495
Complete	73	69	142
<i>Incentive offered</i>	70	63	133
<i>No incentive offered</i>	3	6	9
Response Rate	2%	2%	2%
<i>Incentive offered</i>	3%	3%	3%
<i>No incentive offered</i>	1%	1%	1%

The survey collected information about the program participants' experiences with the HERs and satisfaction with SJG. The survey also inquired about the participants' and non-participants' use of SJG's online energy portal and about energy-saving actions customer have taken (e.g., behavioral changes, or installing energy efficient appliances and equipment). The Evaluators compared responses from customers who received HERs and non-participants. Statistically significant differences are noted.<sup>108</sup>

**Most participants reported receiving paper reports and reading all or most of them.** Seventy-one percent of participants said they received paper reports, while 48% said they received email reports. Table 11-34 displays how often participants reported reading the HERs in the last 12 months.

*Table 11-34: How often did you read the HERs in the last 12 months?*<sup>109</sup>

Portion Read	Percent (n = 74)
All the Reports	70%
Most of the Reports	15%
About half of the Reports	1%
A few of the reports	14%
None of the Reports	1%

<sup>108</sup> The Evaluators compared results with two proportion z-tests. Reported differences that are statistically significant at p < 0.05 using a two-tailed test are marked with a single asterisk.

<sup>109</sup> Two respondents indicated they had not read any of the reports and were screened out.

**Typically, one person per household reads the HERs, though engaged households may have multiple readers.** Nineteen percent of survey respondents reported that someone else in their household had read the HERs. However, all 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 accuracy and value of information, as well as 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 11-35 displays the reasons participants cited for not reading more of the HERs.

*Table 11-35: Reasons Participants Have Not Read More HERs*

Answer <sup>110</sup>	Percent (n = 22)
<b>Prompted Responses – Selected All That Apply</b>	
Do not have the time	32%
I did not find the information in the report to be accurate	23%
I did not find the information on the report to be valuable	18%
The suggested tips were not applicable to my home	14%
Not interested	14%
I don't know (Exclusive)	18%

**Most survey respondents found the HER information on their home's energy use easy to understand.** Table 11-36 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, 96% reported the information was easy to understand compared to 18% who indicated they read only a couple reports.

*Table 11-36: Rated Ease of Understanding HER Information*

Answer	Percent (n = 73)
1 - Very difficult	0%
2	0%
3	4%
4	14%
5 - Very easy	82%

<sup>110</sup> Unprompted Responses – Open-end or “Other” Recommendations: Perceive the HERs to be a sales or marketing tool, 5%

**Survey respondents largely found the information on their home's energy use to be accurate.** Table 11-37 displays participants rated accuracy of the HERs. The eight 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=6). These respondents shared various feedback regarding their report accuracy. Four respondents suggested the reports were not accurate as they were not being compared to similar homes (e.g., home size, type). Two of these customers specified that they live in areas where they are year-round residents but are compared to seasonal residents. One customer perceived the reports to indicate high usage to promote purchases or energy saving actions. The remaining customer said that their reports rely on estimates, not meter readings.

*Table 11-37: Rated Accuracy of HER Information*

Answer	Percent (n = 72)
1 - Not at all accurate	3%
2	5%
3	18%
4	30%
5 - Very accurate	37%
I don't know	7%

**Most respondents were satisfied with the reports and their various components.** Figure 11-2 displays HERs participant satisfaction with the various components and the reports overall. Twenty-one percent of respondents indicated dissatisfaction with one or more aspect of their report (n=15), however 11% either did not elaborate when the survey offered these respondents an opportunity to provide recommendations (eight percent) or indicated they were satisfied the reports (three percent). Ten percent of respondents provided suggestions to improve the reports (n=7), with three of the respondents suggesting more accurate information and three requesting more details, tips, or information on rebates or ways to save energy. One respondent suggested sending the reports quarterly.

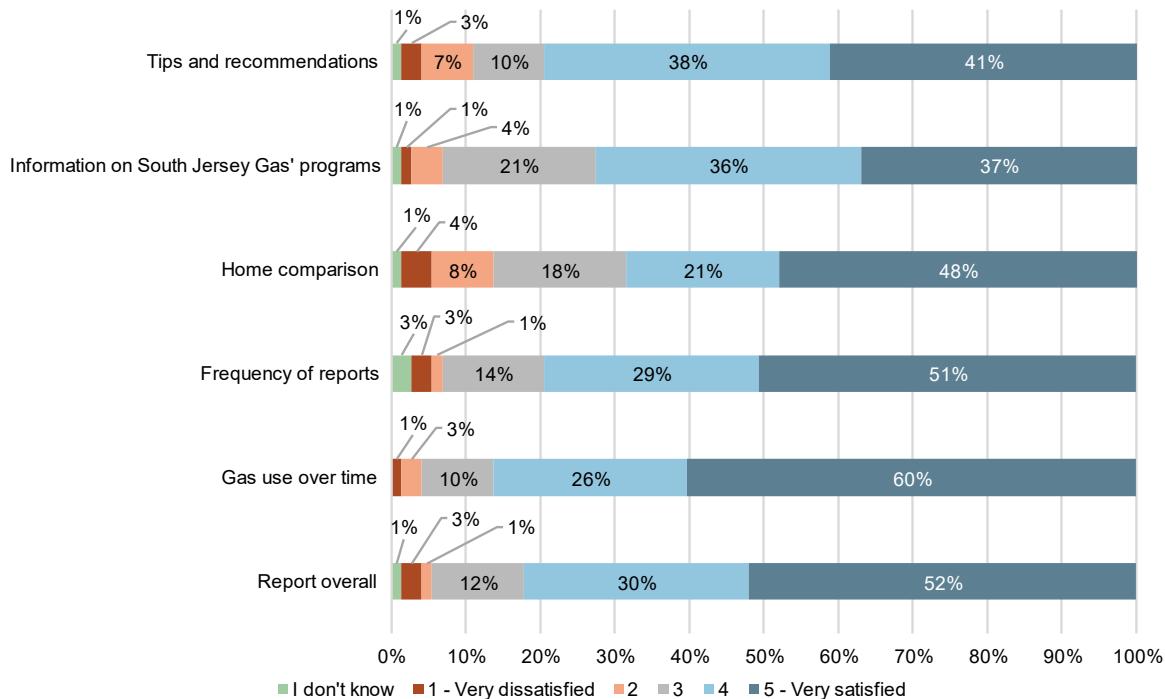


Figure 11-2: Satisfaction with HERs (n=73)

**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 11-3).<sup>111</sup>

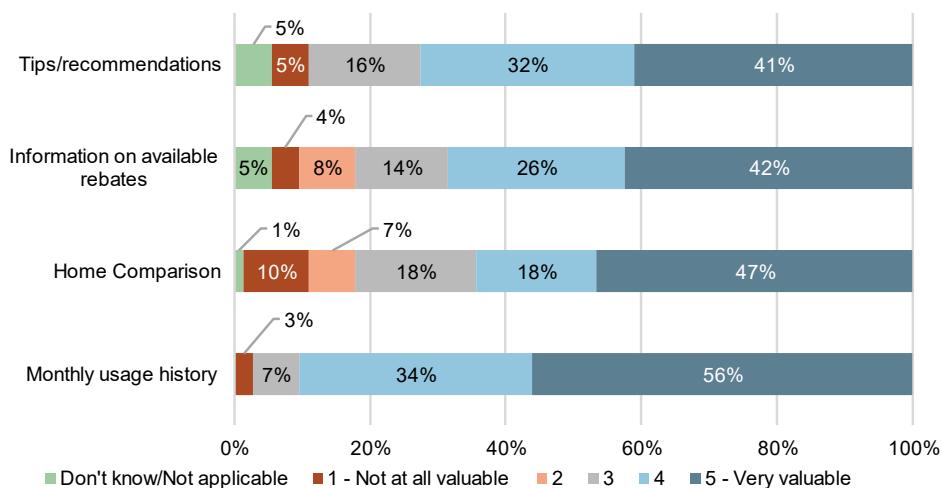
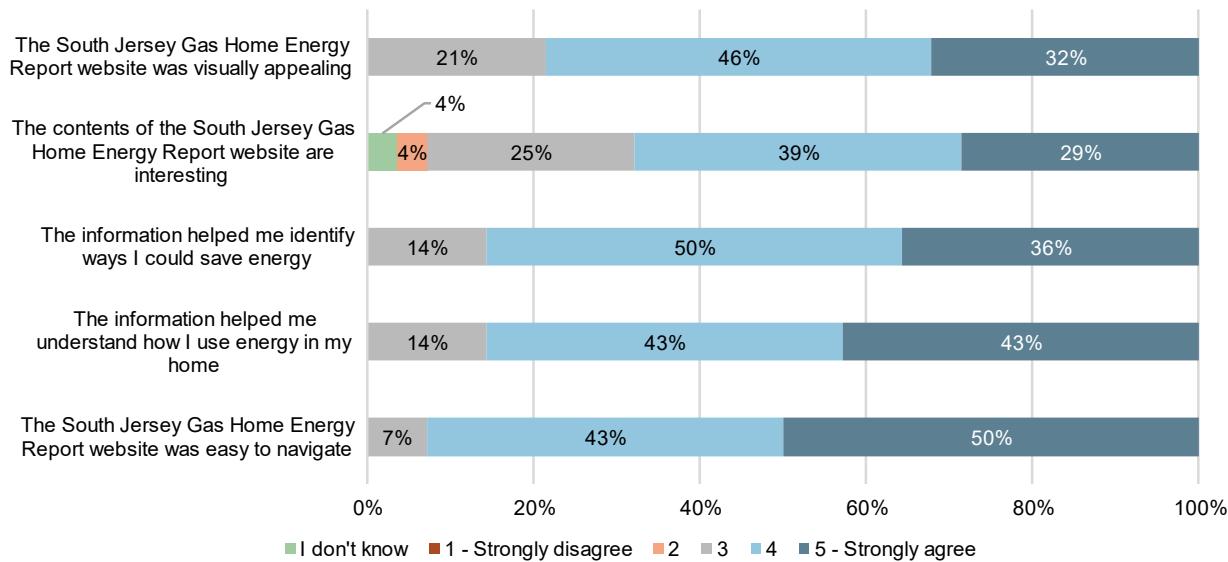


Figure 11-3: Perceived Value of HER Sections (n=73)

<sup>111</sup> Rated the value of the sections a 4 or 5 on a scale from 1 (not at all valuable) to 5 (very valuable).

**HERs participants generally have not visited the online portal, primarily because they are unaware of it.** Thirty-eight percent of participants recalled logging onto SJG'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 (see Figure 11-4). Table 11-38 displays reasons customers noted for not having logged onto the portal.



*Figure 11-4: HER Participant Level of Agreement with Statements About Online Portal Experience (n=28)*

*Table 11-38: Primary Reason Why HER Customers Had Not Logged onto Portal*

Reason	Percentage of Respondents (n = 45)
<b>Prompted Responses – Selected All That Apply</b>	
Was not aware of the portal	60%
Not interested in my energy use	2%
Did not know how to access the portal	11%
Did not think the portal would provide useful information	11%
Did not have the time to use the portal	13%
Experienced technical difficulties trying to access the portal	2%
I don't know (Exclusive)	7%
<b>Unprompted Responses – Open-end or “Other” Recommendations</b>	
Not likely to view online unless looking for specific information	2%
Rely on the monthly HERs report / it meets my needs	7%

**Most customers have created an online account on the South Jersey Gas website.** Overall, 75% of customers said they had created an account on the SJG website. Engagement with the website was similar across the HERs participants and non-participants (77% participant, 74% control). Reasons customers had not created an online account varied, though about one-third of these customers said they did not know about it. The customer who indicated technical difficulties noted a general lack of “computer skills”. Table 11-39 displays the reasons customers have not created an online account.

*Table 11-39: Reasons HER Customers Had Not Created Online Account*

Reason	Participants (n = 35)
I didn't know about it	34%
I don't think it would provide valuable or interesting information	23%
I don't know how to	23%
I have concerns about internet privacy	20%
Other (reason not specified)	11%
Technical difficulties	3%
Prefer not to create online accounts (write-in)	3%
Other member of household has account (write-in)	3%

**Participants and non-participants had similar home characteristics** (see Table 11-40). Most participants and non-participants owned a single-family home, with gas home and water heating. About three-quarters lived with 1 or 2 other people in their home.

*Table 11-40: HER Survey Respondent Home Characteristics*

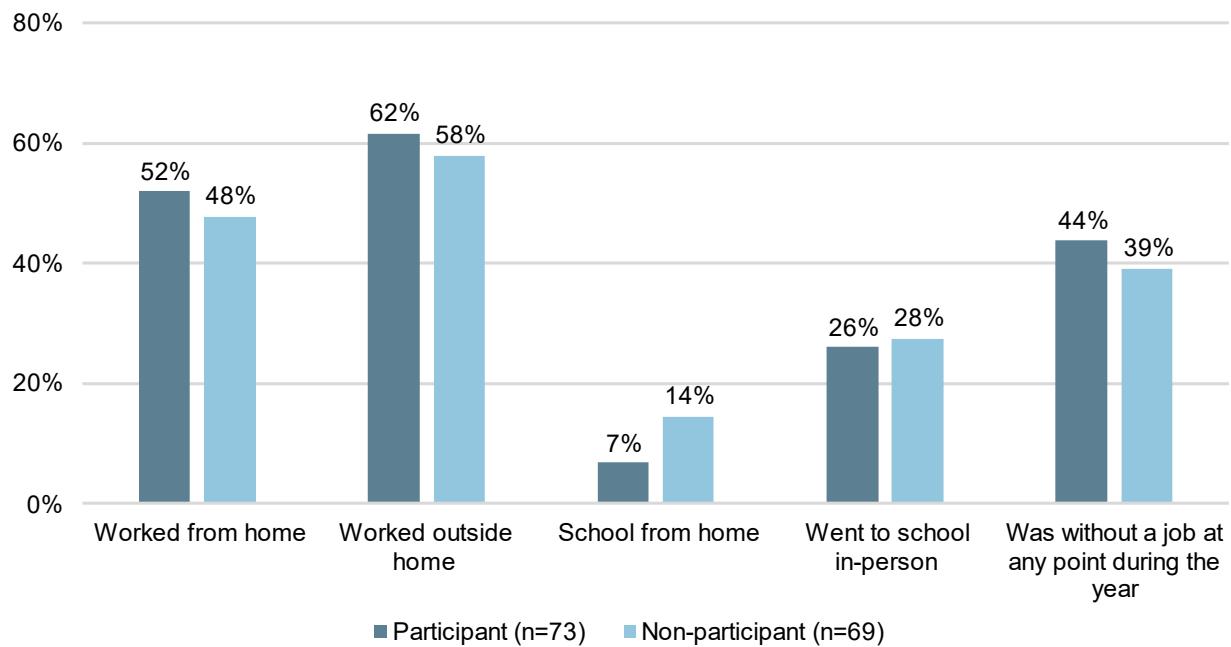
<b>Response</b>	<b>All Respondents (n = 142)</b>	<b>Participants (n = 73)</b>	<b>Non-participants (n = 69)</b>
<b>Home Ownership</b>			
Rent	2%	1%	3%
Own	98%	99%	97%
<b>Home Type</b>			
Single-family detached	85%	88%	83%
Duplex	1%	0%	3%
Apartment/condo in a 5+ unit building	1%	3%	0%
Townhouse or row house (adjacent walls to another house)	11%	10%	13%
Mobile home or trailer	1%	0%	1%
Don't know	0%	0%	0%
<b>Year Home Was Built</b>			
Before 1960	21%	18%	25%
1960 to 1979	29%	36%	22%
1980 to 1999	27%	25%	29%
2000 to 2009	12%	15%	9%
2010 or later	7%	4%	10%
Don't know	4%	3%	6%
<b>Number of members in household</b>			
1	36%	19%	16%
2	94%	51%	41%
3	30%	14%	16%
4	25%	8%	16%
5	10%	5%	4%
6	2%	1%	3%
Prefer not to say	3%	1%	4%
<b>Home size</b>			
Less than 1,000 square feet	6%	8%	4%
1,000-1,999 square feet	39%	37%	42%
2,000-2,999 square feet	32%	30%	33%
3,000-3,999 square feet	10%	11%	9%
4,000 or more square feet	1%	3%	0%
Don't know	2%	8%	10%
<b>Home heating type</b>			
Electricity	6%	4%	9%
Natural gas	92%	95%	90%
Propane	1%	0%	1%
Oil	1%	1%	0%
<b>Water heating type</b>			
Electricity	8%	5%	10%
Natural gas	92%	95%	88%
Don't know	1%	0%	1%

**Demographic characteristics were similar for the participants and non-participants.** Respondents tended to be older, speak English as their primary language, and identified as white (see Table 11-41). About 41% indicated their household income was more than 400% of the federal poverty level, while 14% said their household income was less than 250% of the FPL. In comparison, using Census Bureau data the Evaluators estimates that about 32% of households served by SJG have incomes under 250% of FPL.

*Table 11-41: HER Survey Respondent Demographics*

Response	All Respondents (n = 142)	Participants (n = 73)	Non-participants (n = 69)
<b>Age</b>			
Under 35 years old	4%	1%	6%
35-55 years old	31%	32%	30%
Over 55 years old	63%	64%	61%
Prefer not to answer	3%	3%	3%
<b>Primary Language</b>			
English	98%	97%	99%
Spanish	1%	1%	0%
Chinese	1%	0%	1%
Gujarathi	1%	1%	0%
<b>Race/Ethnicity</b>			
Black or African American	8%	8%	7%
Hispanic or Latino/Latina	4%	4%	3%
American Indian and Alaska Native	0%	0%	0%
Asian	4%	5%	1%
White	75%	75%	74%
Prefer not to answer	13%	10%	16%
<b>Income</b>			
Under 250% FPL	14%	18%	10%
Between 250-400% FPL	13%	12%	14%
Over 400% FPL	41%	41%	41%
Don't know	6%	7%	6%
Prefer not to answer	25%	22%	29%

**Participants and non-participants reported similar home occupancy characteristics.** The Evaluators 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. The portion of respondents without a job at any point during the past 12 months was also similar (see Figure 11-5).



*Figure 11-5: HER Program Home Occupancy Characteristics*

**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 product in the past 12 months; this was similar to non-participant respondents (see Table 11-42). The number and types of energy saving purchases made by non-participants and participants were similar in the past 12 months, though the portion of non-participants that indicated installing insulation was higher than the portion of the participant group (see Table 11-43). The portion of HERs participants that read most or all reports that purchased one or more energy efficient product was similar to and HERs participants that said they read them half the time or less often.

*Table 11-42: Comparison of HER Participants and Non-participants on Energy-Saving Purchases*

	Participants (n = 73)	Non-participants (n = 69)
Bought one or more energy efficiency items	60%	65%
<b>Number of Items Bought – All Respondents</b>		
None	40%	35%
1 to 5	54%	52%
6 or more	7%	10%

*Table 11-43: Installation of Energy Efficient Items/Products in Past 12 Months by HER Participants and Non-participants*

Measure	Participants (n = 73)	Non-participants (n = 69)
Smart thermostat (e.g., Nest, Lyric, Ecobee, Sensi)	22%	23%
ENERGY STAR® dishwasher	18%	17%
Low flow showerheads	15%	17%
ENERGY STAR® clothes dryer	15%	25%
ENERGY STAR® clothes washer	15%	26%
Energy efficient windows	14%	10%
ENERGY STAR® gas water heater	14%	14%
Energy efficient doors	12%	10%
Low flow faucet aerators	11%	7%
ENERGY STAR® furnace	8%	14%
Attic, floor or wall insulation*	7%	19%
Water heater pipe insulation	5%	9%
ENERGY STAR® heat pump water heater	3%	3%
ENERGY STAR® boiler	3%	3%
ENERGY STAR® heat pump	0%	1%

**Participants and non-participants indicated taking one-time energy saving actions at similar rates.** The Evaluators asked respondents if they had completed any of eight one-time energy saving actions that have been suggested to SJG HER recipients. Ten percent of respondents (both participants and non-participants) said they had not taken any of the recommended one-time actions. The Evaluators compared the number of one-

time actions taken by customers who had read most or all the reports versus those that read half of reports or fewer. Forty-two percent of participants who said they had read all or most of the reports ( $n=62$ ) indicated they fixed leaky faucets in the past 12 months compared to nine percent of participants who read half or less of the reports ( $n=11$ ).

**Survey respondents generally endorsed positive beliefs and attitudes about energy efficiency, with similar attitudes among participants and non-participants** (see Figure 11-6). The portion of non-participants and participants that endorsed beliefs was similar. The Evaluators did not find statistically significant differences between participants and non-participants for any of the survey's nine attitude questions.

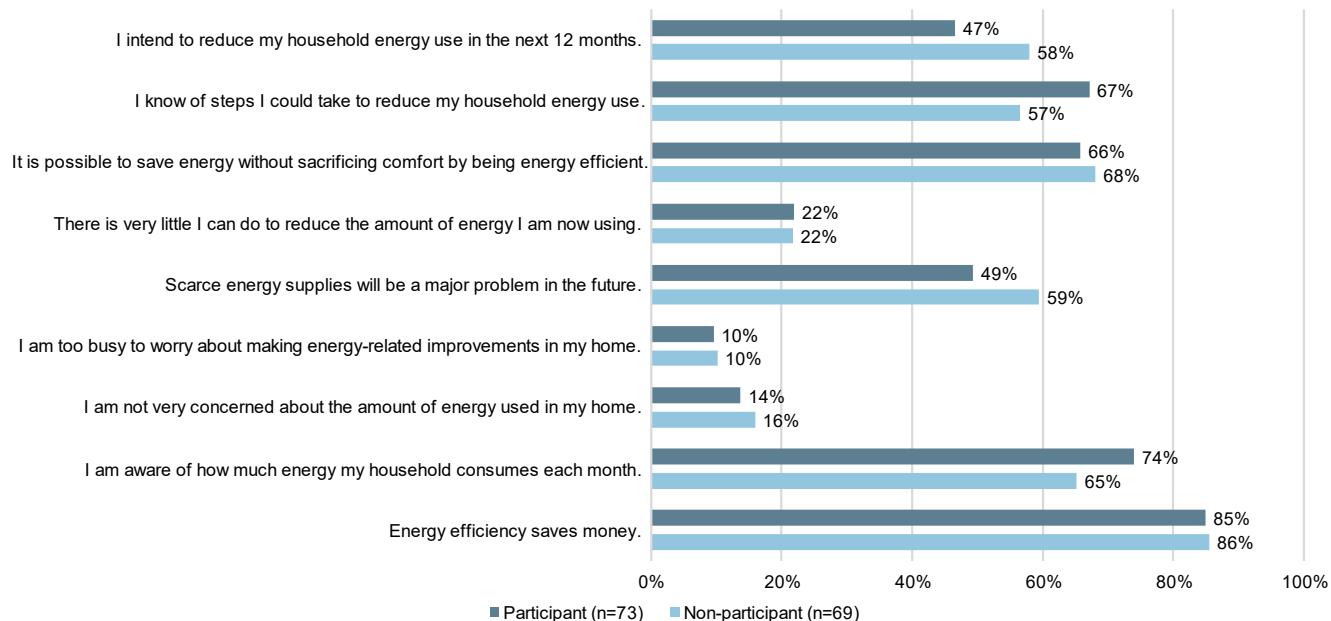
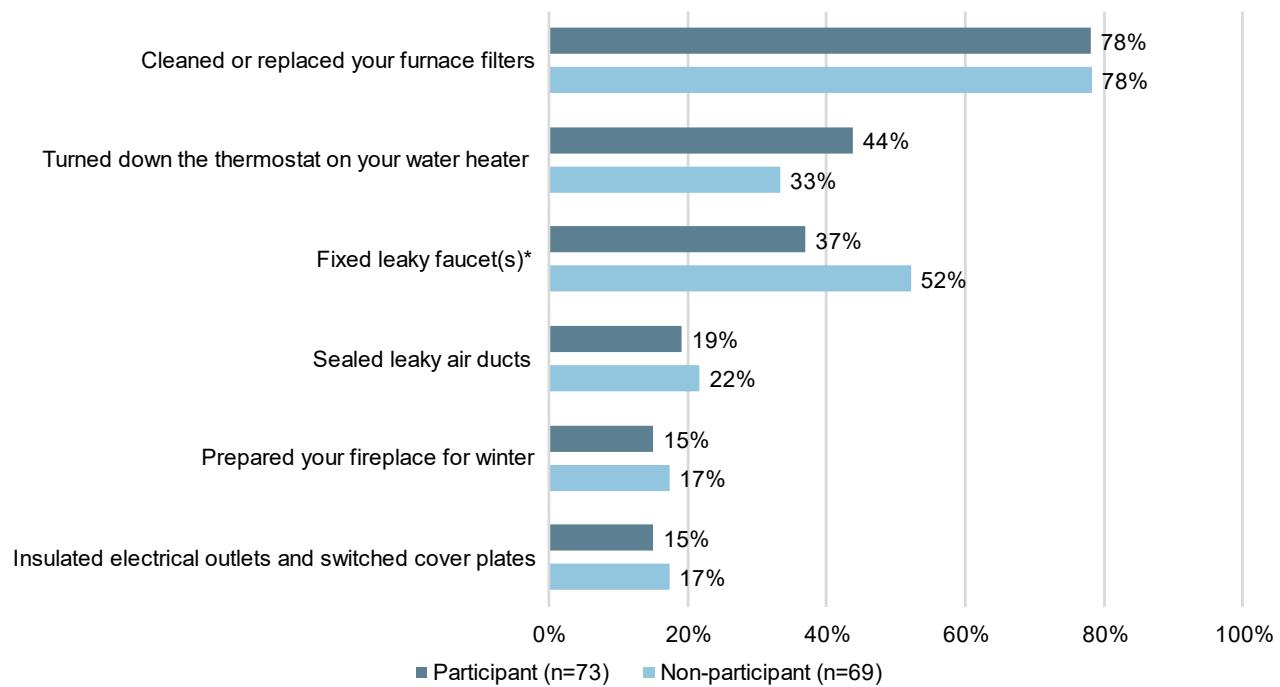


Figure 11-6: HER customers' energy efficiency beliefs and attitudes<sup>112</sup>

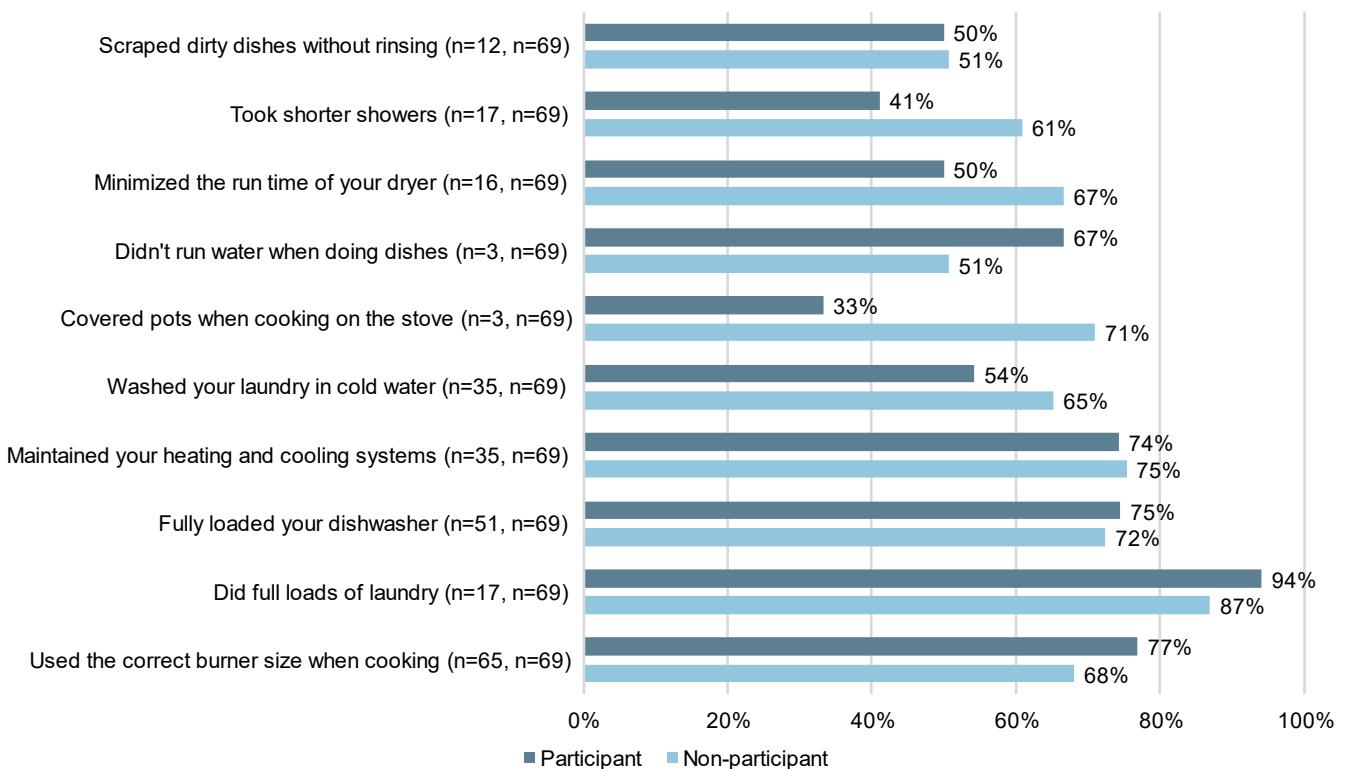
**Barriers to additional energy saving actions and purchases may include a lack of knowledge about the steps to take and awareness about the household energy use.** Responses to the level of agreement questions regarding energy attitudes and behaviors indicated that these factors were barriers. Though 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% did not. 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 (see Figure 11-7).

<sup>112</sup> Figure displays agreement as defined with a rating of 7 or higher on scale from 0 (strongly disagree) to 10 (strongly agree). The Evaluators compared the proportions with two proportion z-tests. There were no differences found to be significant with an alpha of 0.05 using a two-tailed p value.



*Figure 11-7: One-time energy saving actions by HER customers taken in past 12 months*

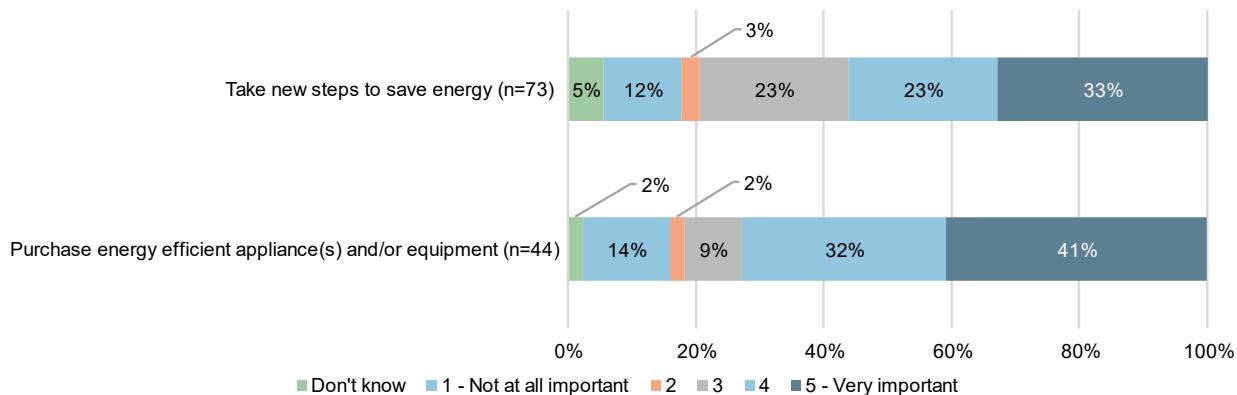
**Participants and non-participants reported taking routine energy saving actions at similar rates.** The Evaluators asked HERs participants about up to four routine energy saving actions that they had been recommended through the reports and asked non-participants about 10 routine energy saving actions 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. There were no significant differences between participants and non-participants (see Figure 11-8).



*Figure 11-8: Routine energy saving actions taken by HER customers in past 12 months<sup>113</sup>*

HERs participants indicated that the reports were important in their decision to take steps to save energy and buy energy efficient products. The Evaluators 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 (Figure 11-9). Fifty-five percent of participants that read most or all reports said the reports were important in their decision to take energy saving actions (n=53) compared to 22% of those who read a few or about half of the reports (n=9). The Evaluators did not note a relationship between the reported number of reports read and importance participants assigned to the HERs on energy saving item purchases.

<sup>113</sup> 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).



*Figure 11-9: Importance of HERs on Participant Energy Saving Actions and Purchases*

## 11.5 Conclusions and Recommendations

**Conclusion:** HER Program verified annual savings of 1,494,014 therms for PY1 are positive and statistically significant for all three 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 0.7% and 1.2% of annual billed use in PY1. Typical behavioral programs display average annual gas savings between 0.25% and 2%. Therefore, verified savings are within the range the Evaluators typically find for behavioral programs.
- The downstream and upstream double counted savings of 8,110 therms for PY1 were removed from the estimated savings from the regression results. This ensures there is no double counting of savings of observable, billed energy usage in the SJG portfolio. The double counted savings represent 0.5% 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 25% for the treatment group and 25% for the control group. In addition, the annual attrition rate in PY1 is roughly 6% 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:** Most participant survey respondents reported receiving paper reports and reading all or most of them, but generally have not visited the online portal.

Eighty-five percent of participants said they read most or all the reports but only 38% of participants recalled logging onto SJG's online portal.

**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.

### **11.6 Barriers to Participation**

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**The perceived accuracy and value of information, as well as 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 and they cited various reasons for not reading 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 the 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.** Thirty-eight percent of participants recalled logging onto SJG'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.

### **11.7 Evaluability Recommendations**

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**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**

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The Evaluators noted additional data collection in PY2 would be required to continue to develop understanding of program design and barriers to program success. Specifically, the Evaluators 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?

## **11.9 Surveys**

The program survey instrument is combined into the report on the following pages.

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](mailto: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](mailto: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]

The screenshot shows a Home Energy Report from Elizabethtown Gas for February 2022. At the top, it says "Good job! This month, you only spent about \$14 more than the most energy-efficient homes within the Elizabethtown Gas service area. Just a few small changes could help increase your savings." Below this, there are two main sections: "How am I doing this month?" and "Things to do". The "How am I doing this month?" section compares the user's home (150 therms) to an efficient home (136 therms). The "Things to do" section includes links to "See your usage", "How does my home use energy?", and "Consider a Quick Home Energy Checkup". Further down, there are sections on "Who am I being compared to?", "How can I save more?", and "Save up to \$10/year". The "Save up to \$10/year" section provides tips for minimizing laundry time. At the bottom, there is a "Questions?" section with contact information and a "TERMS & CONDITIONS" link.

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 **[EXLUSIVE]**
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 **[EXLUSIVE]**

**[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]

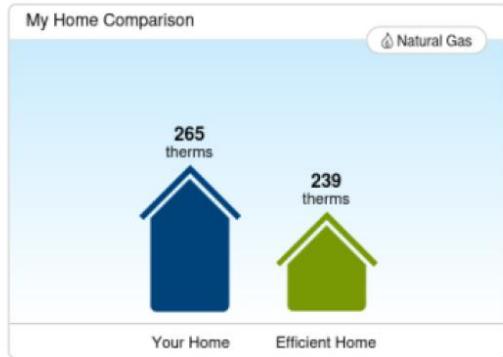
19. How accurate do you believe the information in your Home Energy Report is about your home energy usage? [INSERT 1-5 SCALE AS DEFINED 1=NOT AT ALL ACCURATE AND 5=VERY ACCURATE, WITH 98 = I DON'T KNOW]

### **[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?

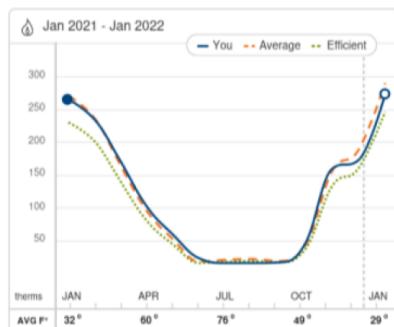


\*Who am I being compared to?

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: Direct Install Program Evaluation Report**

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### **12.1 Introduction**

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South Jersey Gas (SJG) 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 SJG employees, the primary implementation contractor AEG, and an implementation subcontractor CMC.

Sixty-two audits were completed in PY1. Fifty-two declined DI measures and chose not to complete the proposed retrofit projects. Ten customers were offered free DI measures<sup>114</sup> and two completed projects beyond the free DI measures.

The first year of the program resulted in program level annual savings of **11,795.42 therms, 1,931 kWh, 1.1 kW** as shown in Table 11-2 and Table 12-3, and **projected lifetime savings of 156,037.88 therms and 28,964 kWh**.

Because the number of completed projects were limited during this ramp-up year, the bulk of the Evaluators' evaluation of the program focused on a process evaluation.

#### **12.1.1 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 required documentation to SJG. 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.

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<sup>114</sup> 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 SJG 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.

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

## **12.2 Methodology**

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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 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, the Evaluators used values from applicable baseline tables for direct install measures that more accurately reflected the project’s baseline conditions.

### **12.2.1 Program Measures**

The following table lists all potential measures for the DI Program along with the source for savings calculations for each measure. Boilers and water heating equipment generated the most savings during the program’s first year. 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 12-1: Commercial DI Measures and Protocol Sources*

<b>Measure</b>	<b>Source</b>
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

Measure	Source
Programmable Thermostat	NJ FY2020 (Pg. 176)
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)

### 12.2.2 Sampling

The Evaluators reviewed of a sample of four projects to ensure that the appropriate use of deemed savings values were used to calculate gross savings. The four reviewed projects accounted for 95% of program savings and achieved 90% confidence with 10% precision evaluation requirements.

For the PY2 evaluation, the Evaluators will create two samples, one to 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% confidence level with relative precision of +/- 10%, and the 85% confidence level with relative precision of +/- 15% for all measures<sup>115</sup> that represent more than 5% of the program savings. The M&V samples will be used in conjunction with the TRMs and Protocols listed in Table 12-1 to verify gross savings for the program.

### 12.2.3 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.

<sup>115</sup> Including at least two non-lighting measures.

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.

#### **12.2.4 Data Collection**

The Evaluators reviewed the available documentation (e.g., audit reports, measure descriptions, project schematics, performance data, savings calculations, and any additional supporting materials) for each of the four program projects completed during PY1, including the three projects that were not included in the program impact results. The Evaluators reviewed calculation procedures, documentation for savings estimates (e.g., support documentation, consistency with the TRM, etc.). The Evaluators 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 Evaluators contacted program staff to seek further information to ensure the completeness of the project data.

#### **12.2.5 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 Evaluators 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 Evaluators plan 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% 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?

### **12.3 Impact Evaluation Results**

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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 Evaluators found that the information provided an accurate picture of the program projects and all information necessary to perform a minimally rigorous evaluation.

Ex-ante program results are reported in Table 12-2 and Table 12-3.

The results of the desk review of the four sampled projects are shown in Table 12-4 and Table 12-5. Ex-post results were not calculated for total program savings because the Evaluators did not complete a full evaluation of the program.

*Table 12-2: Commercial DI Ex-Ante Gas Savings*

<b>Measure Name</b>	<b>Quantity</b>	<b>Annual Savings (therms)</b>	<b>Total Annual Savings (therms)</b>	<b>Measure Life</b>	<b>Lifetime Savings (therms)</b>
Assessment Fee	62	--	--	--	--
Boiler	2	1,430.10	2,860.20	20.00	57,204.00
Boiler Fuel Economizer	4	509.05	617.86	15.00	9,267.90
Boiler Reset Controls	2	255.38	510.75	10.00	5,107.50
Central Air Conditioning with Gas Furnace	2	26.31	52.63	15.00	789.45
Demand Control Ventilation	2	21.76	43.52	15.00	652.80
Pipe Insulation	8	51.65	5,911.63	11.00	65,027.93
Low Flow Aerators	48	322.48	1,798.83	10.00	17,988.30
<b>Total</b>	<b>130</b>	<b>2,616.73</b>	<b>11,795.42</b>	<b>13.23</b>	<b>156,037.88</b>

*Table 12-3: Commercial DI Ex-Ante Energy and Demand Savings*

<b>Measure Name</b>	<b>Quantity</b>	<b>Total Annual Savings (kWh)</b>	<b>Total Demand Reduction (kW)</b>	<b>Measure Life</b>	<b>Lifetime Savings (kWh)</b>
Central Air Conditioning with Gas Furnace	2	303	0.26	15	4,542
Demand Control Ventilation	2	1,628	0.83	15	24,422
<b>Total</b>	<b>4</b>	<b>1,931</b>	<b>1.10</b>	<b>15</b>	<b>28,964</b>

*Table 12-4: Commercial DI Sampled Sites Gas Savings Results*

<b>Measure</b>	<b>Ex-Ante Savings (therms)</b>	<b>Ex-Post Savings (therms)</b>	<b>RR therms</b>
Boiler	2,860.20	2,860.20	100%
Boiler Fuel Economizer	617.86	617.86	100%
Boiler Reset Controls	510.75	510.75	100%
Central Air Conditioning with Gas Furnace	52.63	52.63	100%
Demand Control Ventilation	43.52	435.20	1000%
Pipe Insulation	5,829.42	5,829.44	100%
Low Flow Aerators	1,287.97	1,287.97	100%
<b>Total</b>	<b>11,202.35</b>	<b>11,594.05</b>	<b>103%</b>

*Table 12-5: Commercial DI Sampled Sites Energy and Demand Savings Results*

Measure	Ex-Ante Savings (kWh)	Ex-Post Savings (kWh)	RR kWh	Ex-Ante Demand Reduction (kW)	Ex-Post Demand Reduction (kW)	RR kW
Central Air Conditioning with Gas Furnace	303	303	100%	0.26	0.26	100%
Demand Control Ventilation	1,628	1,628	100%	0.83	0.83	100%
<b>Total</b>	<b>1,931</b>	<b>1,931</b>	<b>100%</b>	<b>1.09</b>	<b>1.09</b>	<b>100%</b>

### 12.3.1 Discussion of Realization Rates

Ex-ante savings for demand control ventilation measures were calculated without a necessary conversion factor of 10 which resulted in a 1000% realization rate for the measure.

### 12.3.2 Evaluability

The Evaluators 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 Evaluators reported and what SJG reported 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 Evaluators found that the information provided an accurate picture of the Direct Install projects and all the necessary information to perform an enhanced rigor evaluation.

## **12.4 Process Evaluation Results**

The Evaluators facilitated two discussions in July and August 2022 to investigate the design and implementation of South Jersey Gas' (SJG) commercial energy efficiency programs. The first discussion was held with South Jersey Industries' EM&V manager, SJG's energy efficiency manager, and two SJG energy efficiency analysts in July of 2022. The second was held in August 2022 with AEG's program manager and lead engineer. The Evaluators also held a call with South Jersey Gas staff and South Jersey Industries' EM&V manager in July 2022; that discussion helped build understanding of SJG'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 Evaluators provide the conclusions and recommendations drawn from those conversations in the following sections.

## **12.5 Conclusions and Recommendations**

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**Conclusion:** Staff noted budgetary concerns because of significant past participation in the NJCEP DI program and customer interest developed during PY1. SJG'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 SJG 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 SJG 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, SJG 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% 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.

**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 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 waive 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 SJG DI customers, as there

was some reluctance to provide their electric bill to SJG. SJG 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.

## **12.6 Barriers to Participation**

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**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 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 SJG DI customers, as there was some reluctance to provide their electric bill to SJG. SJI contacts posited that this step may spur internal conversations at customers' companies which in turn lead them not to participate.

**The contacts noted a variety of reasons for “partial” or “near” participants.** The SJG energy efficiency analyst observed that time and financial resources were the two primary reasons customers did not continue after having an audit. She also observed that SJG serves a substantial number of seasonal businesses on the Jersey Shore and that a “decent chunk” of this type of customer had assessments but had not completed projects yet. She expected to follow-up and encouraged participation after summer ended.

**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.** South Jersey Gas' energy efficiency manager 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.

## **12.7 Evaluability Recommendations**

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

- The Evaluators 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 Evaluators reported and what SJG reported 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 Evaluators found that the information provided an accurate picture of the Direct Install projects and all the necessary information to perform a minimum rigor evaluation.

**Staff noted budgetary concerns because of significant past participation in the NJCEP DI Program and customer interest developed during PY1.** SJG's energy efficiency manager noted budgetary constraints that limited the extent to which the DI Program was marketed initially, though he also noted they "don't need to hit a million jobs to hit our goals, so we do have to be careful about not over doing our budget." Further, he said that the state-run DI Program was "wildly successful" and popular with customers, so this year had been "a little bit more of pumping the brakes."

**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 SJG 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, SJG 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% of Direct Install 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. In addition to the formal QA/QC required to be conducted by PSD, the utility staff "shadows" vendors and has done site visits for the Direct Install Program to familiarize themselves and to look for areas of improvement.

## **12.8 Research Questions for PY2**

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The Evaluators noted additional data collection in PY2 would be required to continue to develop understanding of program design and barriers to program success. Specifically, the Evaluators 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 any 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 Evaluators' 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?

# 13. Appendix G: Commercial Prescriptive and Custom Program Evaluation Report

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## 13.1 Introduction

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South Jersey Gas (SJG) 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 SJG 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 SJG employees, the primary implementation contractor AEG, and various subcontractors.

Nine projects were completed in program year one (PY1). Of those, all were prescriptive projects. The program resulted in program level **ex-ante annual savings of 10,636.62 therms and 211,226.19 lifetime therms<sup>116</sup>.**

Because the number of projects completed in PY1 was low during this ramp-up year, the Evaluators' 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.

### 13.1.1 Program Description

The Program has two channels, prescriptive and custom, which together cover most energy savings upgrades and retrofits that SJG 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

<sup>116</sup> There were several differences between the participant definitions between the M&V program tracking data reports and SJG management data reports. This resulted in some small differences between the SJG 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.

## **13.2 Methodology**

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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 utilities. The Evaluators 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 part of the program were gas furnaces, condensing boilers, smart thermostats, and instantaneous water heaters. For PY1 there were no custom projects for SJG. The sections below detail the impact analysis methodologies for these measure categories<sup>117</sup> and the process evaluation approach for the Program.

### **13.2.1 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 measures:

<sup>117</sup> 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.

- NJ TRM 2022 Addendum and NJ 2020 Savings Protocols
  - Gas Furnace
  - Condensing Boiler
- MD / MA V10 TRM (Pg. 315)
  - Smart Thermostat
- NJ 2020 Savings Protocols
  - Instantaneous Water Heater

### **13.2.2 Sampling**

The Evaluators prepared a stratified sample plan to verify and calculate program savings for PY1. Because of the number of projects completed in PY1 the Evaluators reviewed a census of projects in the tracking data to verify that appropriate savings were calculated.

For the PY2 evaluation, the Evaluators will create two samples, one to collecting 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% confidence level with relative precision of +/- 10%, and the 85% confidence level with relative precision of +/- 15% for all measures<sup>118</sup> that represent more than 5% of the program savings.

### **13.2.3 Data Collection**

The Evaluators 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:

<sup>118</sup> Including at least two non-lighting measures.

- Descriptions
- 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 Evaluators contacted program staff to seek further information to ensure the completeness of the project data.

#### **13.2.4 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 Evaluators will incorporate an approved battery of free ridership and spillover questions in the 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 SWE. For the first triennium, the stipulated NTG is set 1.

#### **13.2.5 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 Evaluators plan 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 SJG'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 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?

### 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 Evaluators 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 for prescriptive projects are reported in Table 13-1 and Table 13-2.

*Table 13-1: Prescriptive and Custom Ex-Ante Gas Savings*

Measure Name	Quantity	Annual Savings (therms)	Total Annual Savings (therms)	Measure Life	Lifetime Savings (therms)
Gas Condensing Boiler	3	--	7,211.26	20	144,225.29
Gas Furnace	4	--	1,916.52	20	38,330.40
Smart Thermostat	1	120.51	120.51	7.5	903.83
Instantaneous Water Heater	1	1,388.33	1,388.33	20	27,766.67
<b>Total</b>	<b>9</b>	--	<b>10,636.62</b>	<b>19.9</b>	<b>211,226.19</b>

*Table 13-2: Prescriptive and Custom Sampled Sites Gas Savings*

Measure	Ex-Ante Savings (therms)	Ex-Post Savings (therms)	RR therms
Gas Condensing Boiler	7,211.26	7,751.72	107%
Gas Furnace	1,916.52	2,144.26	112%
Smart Thermostat	120.51	370.79	308%
Instantaneous Water Heater	1,388.33	1,194.71	86%
<b>Total</b>	<b>10,636.62</b>	<b>11,461.48</b>	<b>108%</b>

The overall savings for the prescriptive sub-program was **11,461.48 therms** resulting in a **108% realization rate**. The higher realization rate can be attributed to a variety of factors:

- The furnace measures were calculated using different baseline efficiencies. The ex-ante calcs used slightly higher efficiencies for baseline equipment resulting in a high realization rate. In addition, one project had different post-install efficiencies for (9) furnace units. It appears that the wrong efficiencies were mistakenly used from a different spec sheet.
- Two of the condensing boilers projects also had different baseline efficiencies in the ex-ante review. They used baseline thermal efficiencies which were higher

than what is required in the 2020 NJ protocol (p 158). This increased the realization rate.

- One project was submitted as a “programmable thermostat” measure, but we found that it was actually a “smart thermostat” measure. This changed the methods used to calculate savings resulting in a 308% realization rate for this project.
- The gas instantaneous water heater had a low realization rate, but the exact cause was indeterminable because the baseline calculations and formulas could not be provided. The most likely explanation for the low realization rate was the type of efficiency used in the calculations. The NJ protocols say to use the energy factor (EF) rating for units under 200 Btu/hr and the instantaneous water heaters are rated at 199 Btu/hr. However, the water heaters are only rated in thermal efficiency (TE) and their size was very close to 200 Btu/hr so the Evaluators calculated savings using TE. It seems possible that the ex-ante analysis used EF and estimated or calculated the EF for the new water heaters.

### **13.3.1 Evaluability**

The Evaluators reviewed the Program tracking data and requested documentation for nine sampled sites. The program tracking data was complete, and uploads appeared to be timely. The Evaluators chose different baseline efficiency assumptions for some of the other projects; however, this did not affect the evaluability of those projects. Program documentation included most requested applications, models, engineering calculations, assessment reports, and savings calculations. The Evaluators 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.

## **13.4 Process Evaluation Results**

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### **13.4.1 Program Staff Facilitated Discussions**

The Evaluators facilitated two discussions in July and August 2022 to investigate the design and implementation of South Jersey Gas’ (SJG) commercial energy efficiency programs. The first discussion was held with South Jersey Industries’ EM&V manager, SJG’s energy efficiency manager, and two SJG energy efficiency analysts in July of 2022. The second was held in August 2022 with AEG’s program manager and lead engineer. The Evaluators also held a call with South Jersey Gas staff and South Jersey Industries’ EM&V manager in July 2022; that discussion helped build understanding of SJG’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.

**Interview findings indicate differing perspectives regarding the appropriateness of incentive levels for the Prescriptive and Custom program.** SJG contacts observed that the program incentives were sufficient, while the AEG contacts said that the incentive levels were a barrier to implementation success. SJG's energy efficiency manager suggested that a wide variety of robust rebate values and measures are being offered to customers. 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 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."

**Extensive utility collaboration was perceived to be a program strength.** 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.

**An easy application process is perceived as a program strength.** AEG's program manager observed that, compared to other utilities, the SJG application process is "relatively easy", and requires less information. He noted that other utilities outside of New Jersey 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 Evaluators visited the SJG 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<sup>119</sup>.

<sup>119</sup> <https://sjg-ciprescriptive.programprocessing.com/>

**There is an opportunity to further develop SJG's relationships with Prescriptive and Custom trade allies.** The Prescriptive and Custom program requires customers to independently engage with contractors. 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 suggest 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.** SJG'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 customer awareness is a barrier to implementation of the Prescriptive and Custom program.** The AEG contacts indicated the Custom and Prescriptive and Direct Install 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 savings goals from PY1 and PY2 would be combined, and these goals met in PY2. 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 a need to engage larger customers through more targeted outreach. SJG's energy efficiency manager suggested that ensuring customers are aware of financing options was a barrier to customer engagement.

**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. Staff mentioned that they were currently developing and implementing a sales team approach that will target larger 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 SJG 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% of all other projects. AEG and SJG contacts noted

that internal procedures are being effectively implemented, though there has been limited participation to require substantial QA/QC. Additionally, in the future SJG 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% 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.** Utility staff noted that from a customers’ perspective “not much had changed” other than interacting with another entity. Staff indicated that they were unaware of commercial customers having any challenges navigating the change. The utilities had set up several working groups that had been very helpful with the transition. 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. Because all the utilities must meet the same requirements, they have driven them to work together to split the burden.

### **13.5 Conclusions and Recommendations**

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**Conclusion:** **There is an opportunity to further develop SJG’s relationships with Prescriptive and Custom trade allies.** The Prescriptive and Custom program requires customers to independently engage with contractors. AEG’s lead engineer shared that there are a limited number of firms available to develop calculations and assist customers with projects. AEG staff noted that there had been one sparsely attended trade ally training early in PY1.

**Recommendation:** **Continue trying to develop relationships with trade allies.** 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. Explore options for marketing the program with a focus on the unique benefits of the program compared to the Direct Install offerings.

**Conclusion:** **The types of projects seen so far have been prescriptive condensing boilers, gas furnaces, smart thermostats, and gas instantaneous water heaters 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.

### **13.6 Barriers to Participation**

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**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 the utilities' lack of legacy programs was a barrier to the program's implementation as customers and contractors are not as familiar with it. Utility 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.** SJG contacts observed that the program incentives were sufficient, while the AEG contacts said that the incentive levels were a barrier to implementation success. SJG's energy efficiency manager suggested that a wide variety of robust rebate values and measures are being offered to customers. The AEG contacts noted that trade allies had shared comments with them regarding the incentive levels and acknowledged that the program can pay up to 50 percent of project costs and that "did not seem low."

**There is an opportunity to further develop SJG's relationships with Prescriptive and Custom trade allies.** The Prescriptive and Custom program requires customers to independently engage with contractors. 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.

**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 Evaluators visited the SJG website and found opportunities to improve the ease of navigation and user design for customers and trade.

### **13.7 Evaluability Recommendations**

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**Include formulas and energy calculations in project documentation to support M&V review.** Most of the savings' calculations submitted show the model inputs and incentive estimate but don't have transparency into the actual methods and formulas used to find the energy savings.

### **13.8 Research Questions for PY2**

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The Evaluators noted additional data collection in PY2 would be required to continue to develop understanding of program design and barriers to program success. Specifically, the Evaluators 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 any 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 Evaluators' 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?