



Residential HVAC Program Evaluation Report

Evaluation Cycle 1 – Program Year 1

Prepared for:

Atlantic City Electric



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Abstract

Guidehouse conducted an impact evaluation, process evaluation and net-to-gross study of Atlantic City Electric’s (ACE) Residential Heating Ventilation and Air Conditioning (HVAC) program for program year 1 (July 1st, 2021 – June 30th, 2022). The program transitioned from the New Jersey (NJ) Board of Public Utilities (BPU) to ACE on July 1st, 2021. Guidehouse evaluation activities in the first program year primarily focused on developing a robust understanding of the program and the implementer’s data collection activities to establish a foundation for future evaluations. We conducted a tracking database review to verify savings calculations. We fielded online surveys to gather information on quantity and types of measures installed and to gather information on process evaluation, net-to-gross and demographics. Additionally, we also conducted interviews with program staff and implementers to deepen our understanding of the challenges experienced for implementation of the program. Guidehouse’s impact evaluation results and NTG results are summarized below in Table AB-1 and Table AB-2.

Table AB-1: ACE Residential HVAC Impact Evaluation Results

Types of Savings	Tracked Savings	FY 2020		FY 2022	
		Evaluated Savings	Realization Rates	Evaluated Savings	Realization Rates
Energy Savings (MWh)	275	267	0.97	267	0.97
Utility Peak Demand Savings (kW)	148	245	1.66	245	1.66

Table AB-2: Net-to-Gross Results

Type	Results
Freeridership	0.43
Spillover	0.01
Net-to-Gross Ratio	0.58

Our recommendations from the impact and process evaluations are described in Table AB-3.

Table AB-3: Residential HVAC Program Evaluation Recommendations

Evaluation Area	Recommendation
Process	Contractors should communicate potential measure shortages to customers to accurately and clearly portray installation timelines.
	Consider strengthening the contractor’s home pre-check processes prior to installation to avoid equipment malfunctions and issues moving forward.
	Increase customer outreach through channels such as mailers and flyers, bill inserts, and emails to direct customers to ACE’s website and to drive more program awareness and participation.
	Inform program participants and contractors that a follow up survey will be distributed and should be filled out by the customer.

Impact	Collect and provide customer email addresses in the tracking data.
	Update the savings algorithm for furnace fans to be inclusive of fan savings during cooling and heating seasons.
	Update peak demand savings calculations to align with NJ TRM algorithm for central air conditioners, air source heat pumps, and ductless mini-split air conditioners and heat pumps.
	Review algorithms used for calculating savings for ductless mini-split heat pumps to ensure they align with methods in the NJ TRM.
TRM Improvements	Develop calculation methodologies to account for partial displacement scenarios for heat pumps. Additionally, heating savings calculations must account for the heat pump heating capacity and not cooling capacity.

Executive Summary

Guidehouse conducted an impact evaluation, process evaluation and net-to-gross study for ACE's Residential HVAC program for PY 1. This program incentivizes replacements and upgrades of HVAC equipment such as central air conditioners, heat pumps, ductless mini-split heat pumps. The objective of our impact evaluation was to check completeness of the tracking data, evaluability of the data, and verify savings claimed by the implementers. Our evaluation analysis included a tracking data review, verification using surveys and reviewing documentation provided in project files. The tracking database review compared the savings calculated by the implementers with independent calculations conducted by Guidehouse using the New Jersey's protocols.¹ We also calculated savings using FY 2022 protocols which are the updated savings algorithms that are likely to be incorporated in the next version of the TRM. Table E-1 below shows the impact evaluation results using the FY 2020 and FY 2022 protocols.

Table E-1: ACE Residential HVAC Impact Evaluation Results

Types of Savings	Tracked Savings	FY 2020		FY 2022	
		Evaluated Savings	Realization Rates	Evaluated Savings	Realization Rates
Energy Savings (MWh)	275	267	0.97	267	0.97
Utility Peak Demand Savings (kW)	148	245	1.66	245	1.66

The primary driver for differences between the tracked and evaluated energy and demand savings pertain to differing TRM algorithm inputs for multiple measures. Guidehouse worked with the implementers to resolve these differences to ensure measures are adhering to the appropriate algorithm inputs.

Guidehouse also put forth several findings and recommendations to improve the documentation, data availability and savings calculations. Table E-2 below shows the findings and recommendations from the impact evaluation.

Table E-2: ACE Residential HVAC Impact Evaluation Findings and Recommendations

Measures Impacted	Finding	Recommendation
All Measures	Tracking data did not include email addresses for about 24% of the program participants. This resulted in a lower sample size for customer surveys.	Customer email address should be collected and provided in the tracking data.
Furnace Fans	Furnace Fan reported savings currently only account for fan energy savings during the cooling season.	Recommend updating measure algorithm to be inclusive of fan savings during cooling and heating seasons.

¹<https://www.njcleanenergy.com/files/file/NJCEP%20Protocols%20to%20Measure%20Resource%20Savings%20Clean.pdf>

Measures Impacted	Finding	Recommendation
Central ACs, Air Source HPs, Ductless Mini-split ACs and HPs	Evaluated utility peak demand savings do not align with reported peak demand savings.	Recommend updating the measure algorithm to align with NJ TRM algorithm.
Ductless Mini-Split HPs	Evaluated energy savings do not align with reported energy savings for a portion of the measures.	Recommend analyzing current database algorithms for the measure to ensure all individual measure calculations are in alignment.
Heat Pumps	Based on the NJ TRM, the program was using cooling capacity to calculate the heating energy savings for heat pumps.	Recommend fixing the heating savings calculations for heat pumps based on heating capacity adjusted to weather data applicable to ACE's service territory.
Heat Pumps	Based on the NJ TRM, the program was not considering the impact of partial displacement. Heat pumps such as ductless mini-split HPs are often installed alongside existing fossil-fuel based heating systems and are not likely to have the same hours of use as reflected in the TRM.	Recommend updating the TRM to account for partial displacement scenario for heat pumps especially ductless mini-split heat pumps.

For the process evaluation, Guidehouse conducted program staff and implementer interviews to gather information on the delivery, marketing approach, implementation, trade allies, and customer outreach. These interviews also provided information on barriers to increasing participation, experienced by the program staff and implementers. Guidehouse also conducted online surveys to identify challenges and barriers experienced by customers. Table E-3 below shows the key results, findings, and recommendations from our process evaluation.

Table E-3: ACE Residential HVAC Process Evaluation Findings and Recommendations

Finding	Recommendation
Some customers reported a delay in installation, which contractors attributed to supply chain issues associated with the pandemic.	Recommend contractors continue to communicate potential measure shortages to accurately portray installation timelines to the customers.
One customer experienced an equipment malfunction due to issues with existing wiring in the home.	Consider strengthening the contractor's home pre-check processes prior to installation to avoid equipment malfunctions and issues moving forward.

ACE’s communication efforts, through the website, mailer and flyers, and ACE’s representatives made up only 17% of program awareness as reported by respondents. The remaining was driven mostly by contractors.

Consider increasing outreach through channels such as mailers and flyers, bill inserts, and emails that direct customers to the ACE website for program participation information. This could help drive more program awareness and participation outside of contractors.

The response rate for this survey was less than optimal.

Consider informing program participants and contractors that a follow up survey will be distributed and should be filled out by the customer.

The surveys included questions on awareness, satisfaction, experience in the program, and measure related questions. These surveys also captured net-to-gross and demographics using questions recommended by the SWE. Table E-4 shows the net-to-gross results from this study.

Table E-4: Net-to-Gross Results

Type	Results
Freeridership	0.43
Spillover	0.01
Net-to-Gross Ratio	0.58

Guidehouse notes that this program had 606 unique participants in PY 1. Out of these, only 74% of the records had the customer’s email addresses. This reduced our sample size to 447 customers. We received 34 survey responses out of which 29 had usable responses. Guidehouse has raised this as a key concern for future evaluations. Due to the nature of the program, a customer’s physical address is the most reliable contact information, which is why in PY 2, Guidehouse will engage customers via postcards to help increase the population of potential respondents.

Introduction

1.1 Program Description

The Residential HVAC program was previously administered by the New Jersey Board of Public Utilities (NJ BPU) and was transitioned to ACE on July 1, 2021. This program offers downstream incentives to contractors and residential customers for installing efficient HVAC equipment. The program is primarily marketed through contractors, many of which continued to participate in the program after it transitioned to ACE from the NJ BPU.

Program measures include air source heat pumps, central air conditioners, ductless mini-split heat pumps, ductless mini-split air conditioners, packaged terminal air conditioners, packaged terminal heat pumps, electronically commutated furnace motors, furnace fans, ground-source heat pumps, smart thermostats.

Table 1-1 below provides PY 1 program participation and reported savings. The PY 1 population consisted of 606 unique customers and a total of 679 measures installed.

Table 1-1: PY 1 Program Participation and Reported Savings

Measure	Planned Savings*	Reported Savings	Reported Energy Savings as a % of Portfolio Energy Savings
Energy Savings (MWh)	296	275	1%
Peak Demand Savings (kW)	14	148	

Note: The planned savings in the table is estimated based on ACE's planned savings filed for Efficient Products program.

1.1.1 Program Population

As part of our impact evaluation, Guidehouse has organized the population based on measure types. This method allows for the investigation of savings results from specific measures and provides more focused recommendations. Table 1-2 shows the total number of participants and savings from the program in PY 1.

Table 1-2: PY 1 Residential HVAC Program Survey Population

Measure Strata	Total Measures	Total Energy Savings (MWh)	Total Peak Demand Savings (kW)
Furnace Fans	2	0	0
Ductless Mini-Split Air Conditioners	13	3	2
Smart Thermostats	62	10	0
Air Source Heat Pumps	15	18	4
Ductless Mini-Split Heat Pumps	127	111	18

Measure Strata	Total Measures	Total Energy Savings (MWh)	Total Peak Demand Savings (kW)
Central Air Conditioners	460	133	123
Total	679	275	148

1.2 Conclusions and Recommendations

Guidehouse had the following conclusions from the PY 1 evaluation:

- Evaluability
 - The tracking data that was provided to Guidehouse had a mix of contractor and customer emails. About 26% of the email addresses belonged to contractors who installed the HVAC unit. This reduced the total population of participants that could be served an online survey. On investigating further, it appears contractors that submitted a paper application often included their email address instead of the customer's. Guidehouse discussed our concerns with the implementer and recommended that they require their contractors who use a paper application to include the customer email address. All other pertinent variables in the tracking data were found to be complete and well-populated.
- Impact Evaluation
 - The evaluated utility peak demand savings do not align with the reported peak demand savings due to the incorrect application of the NJ TRM algorithms. Guidehouse is working with the implementers to identify and correct the source of this discrepancy. These discrepancies will be corrected in PY2 for measures moving forward.
 - The furnace fan reported savings only account for fan energy savings during the cooling season, which is inconsistent with the NJ TRM.
 - Currently, the NJ TRM algorithm for heat pumps uses the cooling capacity to calculate heating energy savings, whereas the heat pump heating capacity should be referenced instead.
- Process Improvements
 - Contractors should communicate potential measure shortages to accurately portray installation timelines to the customers.
 - ACE should consider customer outreach through channels such as mailers and flyers, bill inserts, and emails to direct customers to ACE's website to drive more program awareness and participation in the program.
 - ACE should encourage contractors to inform customers that a follow up survey will be distributed and should be completed.

2. Evaluation Analysis

This section presents the results of our PY 1 evaluation. Section 2.1 of this report compares our results with similar utilities. Section 2.2 speaks to the evaluability concerns for this program. Sections 2.3, 2.4 and 2.5 discuss the methodology and results from our impact, process and net-to-gross studies. Section 2.6 includes our cost-effectiveness results.

2.1 Benchmarking

This section provides comparison of the evaluation results with similar utilities.

2.1.1 Savings and Realization Rates

Guidehouse compared the savings and realization rates (RRs) of ACE's Residential HVAC Program with similar programs offered by other utilities. ACE's program is roughly the same size as Delmarva's program, however, savings per participant vary significantly. Table 2-1 shows the difference between ACE's savings and realization rates and the savings and realization rates of peer utilities. ACE's energy savings realization rate falls within the expected range of other utilities' energy realization rates, while ACE's demand savings realization rate is much higher than other utilities' demand realization rates.

Table 2-1: Residential HVAC Program Impact Evaluation Benchmarking

Utility	Reported Energy Savings (MWh)	Energy Savings per Participant (kWh)	Peak Demand Savings per Participant (kW)	Energy RR	Peak Demand RR
ACE	275	425	0.22	0.97	1.66
Potomac Edison	1,208	497	0.15	1.00	1.11
BGE	5,922	540	0.27	0.91	1.22
Pepco	1,621	615	0.44	0.99	1.05
ComEd	6,141	721	0.29	1.00	1.00
Delmarva	319	938	0.37	1.03	1.1
SMECO	1,395	1,084	0.3	0.88	1.31

2.1.2 Measure Mix

ACE's Residential HVAC program offers similar measures as peer utility programs with the main difference being ACE not offering geothermal heat pumps as part of their program offering.

Table 2-2: Residential HVAC Program Measure Mix Benchmarking

Measures Offered by ACE's Res HVAC Program	Measures Offered by Maryland utilities
Central ACs and HPs Ductless Mini-split ACs and HPs Furnace Fans (ECM Motors) Smart Thermostats	Central ACs and HPs Ductless Mini-split ACs and HPs Furnace Fans (ECM Motors) Smart Thermostats Geothermal HPs

2.1.3 Process Evaluation Results

Table 2-3 below shows the process results of ACE's Residential HVAC program benchmarked with another similar utility. We note, these results are based on a small population and results will likely change as the program gets larger and the survey gets more responses in PY 2.

Table 2-3: Residential HVAC Program Process Benchmarking

Focus Area	ACE (n=29)	Midwestern Utility (n=1,202)
Program Awareness	Installation contractor (46%), word of mouth (11%), and ACE's website (11%) ¹	Contractor/vendor/installer (84%), Utility website (10%), Bill insert (9%)
Program Satisfaction	Program satisfaction: 4.21 using a 1-5 scale. Dissatisfaction was primarily driven by a lack of clear communication about next steps after application submission (n=1) and accessible customer service support (n=1)	Program satisfaction: 94% using a 0-10 scale, satisfaction is calculated using percentage of applicable responses that rate satisfaction with the program as 6 or higher
Other Satisfaction	Satisfaction with contractor : 4.76	Satisfaction with contractor : 92%
Challenges	Customers reported challenges concerning measure availability (n=2), malfunction (n=1), and incorrect measure information (n=1) and reported that most of these challenges (n=3) were extremely serious	NA

2.1.4 Net-to-Gross

Table 2-4 below shows the results of ACE’s Residential HVAC program benchmarked against other utilities with similar programs. Based on the results, the NTG for ACE is comparable to both benchmarked utilities, but spillover results vary slightly which results in a relatively, lower Net-to-Gross ratio.

Table 2-4: Net-to-Gross Results Benchmarked with Other Utilities

Utility	Freeridership	Participant Spillover	NTGR
Atlantic City Electric (n=29)	0.43	0.01	0.58
Midwestern Utility	0.46	0.07	0.61
Mid-Atlantic Utility	0.46	0.33	0.88

2.2 Evaluability

The accuracy and comprehensiveness of program tracking data is critical to conduct an effective evaluation. For PY 1, Guidehouse used the tracking database to obtain contact information for customer surveys and savings calculation inputs (such as efficiency and capacity for HVAC equipment). The following issues were found in the program tracking data:

- About 26% of the projects in the tracking data did not have a customer email address but rather contractor contact information.
- NJ TRM methods use cooling capacity to calculate the heating energy savings for heat pumps,
- Measures such as ductless mini-split HPs are often installed alongside pre-existing heating system. The current and amended version of the NJ protocols do not provide any guidance on how to estimate savings for such applications.

2.3 Impact Evaluation

2.3.1 Impact Evaluation Overview and Methodology

Guidehouse applied industry-standard methods and approaches to conduct the evaluation as established in the following documents:

- Uniform Methods Project (UMP)²
- NJ Coordinated measure list – approved by NJ utilities for estimating savings for PY 1.

² See Department of Energy, Office of Energy Efficiency and Renewable Energy website at <http://energy.gov/eere/about-us/ump-home>.

- New Jersey's Clean Energy Program Protocols (NJCEP) FY 2020³ and FY 2022

To estimate evaluated savings, Guidehouse calculated energy and peak demand savings for the Residential HVAC Program using FY 2020 and FY 2022 New Jersey protocols. The FY 2022 protocols included updates recommended by the Technical Reference Manual (TRM) working group.

2.3.1.1 Evaluation Objectives

The following are the key objectives this first impact evaluation addresses:

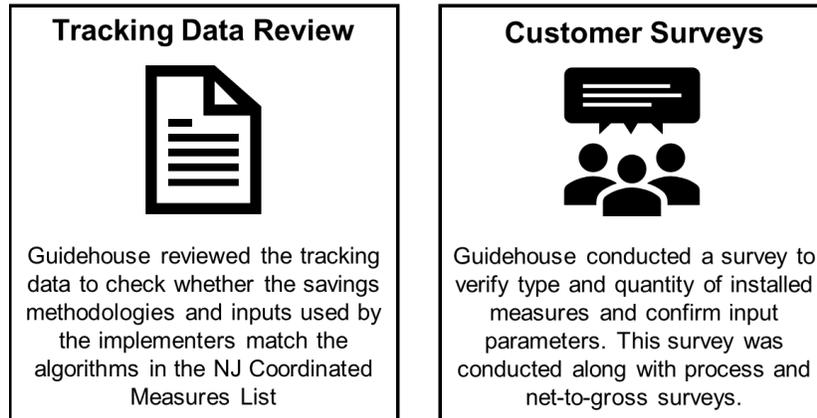
- Review the data being collected by the implementation contractor (IC) and establish data collection requirements for different types of measures offered by the program.
- Establish a smooth process for transfer of tracking data and project files with the aim of streamlining the process for future evaluations.
- Calculate evaluated gross energy and peak demand savings using the NJCEP Protocols.
- Calculate savings using new and revised measures developed by New Jersey's TRM working group.
- Establish a process for data collection and calculation of PJM summer and winter peak demand reductions for PJM-eligible measures.
- Highlight areas for the implementation team to improve data collection, estimate savings, etc.
- Highlight gaps or inaccuracies in the NJCEP Protocols.

2.3.1.2 Evaluation Methods and Tools

Guidehouse used two methods to conduct the impact evaluation for this program: a tracking data review to verify the methods used by the implementers and customer surveys to verify installation type and quantity. We used the results to calculate the verified gross energy and peak demand savings for the program. Figure 1 demonstrates the evaluation methodologies we used for impact evaluation, with more details located in Appendix A1.

³ See New Jersey's Clean Energy Program website at https://njcleanenergy.com/files/file/NJCEP%20Protocols%20to%20Measure%20Resource%20Savings%20FY20_FIN_AL.pdf

Figure 1: Impact Evaluation Methodology for ACE's Residential HVAC Program



2.3.2 Impact Evaluation Results

2.3.2.1 Program-Level Verified Gross Energy and Peak Demand Savings

The evaluation team calculated savings for rebate-eligible appliances and found that the FY2022 Addendum calculations yielded the same evaluation results as the savings calculated using the methodology specified in the FY2020 New Jersey Protocols. Table 2-5 and Table 2-6 show the program-level savings and realization rates using FY 2020 and FY 2022 NJ Savings Protocols, respectively. The primary driver for both the energy and demand realization rates stem from the implementer using differing TRM algorithm inputs (e.g., heating/cooling capacity, efficient EER values, etc.) than what was provided in the tracking data. These input discrepancies were present in both the FY2020 and FY2022 algorithms, which explains why the realization rates were the same for both TRM approaches.

Table 2-5: FY 2020 Residential HVAC Program Calculated Savings

Program	Tracked Energy (MWh)	Tracked Peak Demand (kW)	Evaluated Energy FY 2020 (MWh)	Evaluated Peak Demand FY 2020 (kW)	FY 2020 Energy RR	FY 2020 Peak Demand RR
Residential HVAC	275	148	267	245	0.97	1.66

Table 2-6: FY 2022 Residential HVAC Program Calculated Savings

Program	Tracked Energy (MWh)	Tracked Peak Demand (kW)	Evaluated Energy FY 2022 (MWh)	Evaluated Peak Demand FY 2022 (kW)	FY 2022 Energy RR	FY 2022 Peak Demand RR
Residential HVAC	275	148	267	245	0.97	1.66

2.3.2.2 Measure-Level Verified Gross Energy and Peak Demand Savings

Table 2-7 and Table 2-8 show the measure-level savings and realization rates using FY 2020 and FY 2022 NJ Savings Protocols, respectively. The FY 2020 and FY 2022 realization rates are calculated relative to the reported energy and peak demand savings.

Table 2-7: FY 2020 Residential HVAC Program Measure Level Calculated Savings

Measure	Tracked Energy (MWh)	Tracked Peak Demand (kW)	Evaluated Energy FY2020 (MWh)	Evaluated Peak Demand FY2020 (kW)	FY 2020 Energy RR	FY 2020 Peak Demand RR
Central Air Conditioners	133	123	133	176	1.00	1.43
Ductless Mini-Split HPs	111	18	103	55	0.92	3.01
Air Source Heat Pumps	18	4	18	9	1.00	2.10
Smart Thermostats	10	0	10	0	1.00	0.00
Ductless Mini-Split ACs	3	2	3	5	1.00	2.55
Furnace Fans	0	0	0	0	1.73	0.00
Total	275	148	267	245	0.97	1.66

Table 2-8: FY 2022 Residential HVAC Program Measure Level Calculated Savings

Measure	Tracked Energy (MWh)	Tracked Peak Demand (kW)	Evaluated Energy FY2022 (MWh)	Evaluated Peak Demand FY2022 (kW)	FY 2022 Energy RR	FY 2022 Peak Demand RR
Central Air Conditioners	133	123	133	176	1.00	1.43
Ductless Mini-Split HPs	111	18	103	55	0.92	3.01
Air Source Heat Pumps	18	4	18	9	1.00	2.10
Smart Thermostats	10	0	10	0	1.00	0.00
Ductless Mini-Split ACs	3	2	3	5	1.00	2.55
Furnace Fans	0	0	0	0	1.73	0.00
Total	275	148	267	245	0.97	1.66

2.3.3 Key Findings and Recommendations

2.3.3.1 Recommendation Summary

Table 2-9 presents the Guidehouse evaluation team’s impact findings and recommendations.

Table 2-9: Residential HVAC Program Impact Findings and Recommendations

Measure Type(s)	Finding	Recommendation	Impact
All Measures	Tracking data that was provided to Guidehouse did not include customer email addresses for all participants. This resulted in a lower sample size for customer surveys.	Customer email address should be collected and provided in the tracking data.	Improved documentation, Bigger survey population.
Furnace Fans	Furnace Fan reported savings currently only account for fan energy savings during the cooling season.	Recommend updating measure algorithm to be inclusive of fan savings during cooling and heating seasons.	Increase measure energy savings
Central ACs, Air Source HPs, Ductless Mini-split ACs and HPs	Evaluated utility peak demand savings do not align with reported peak demand savings.	Recommend updating measure algorithm to align with NJ TRM algorithm. Ensure all TRM algorithm inputs are referenced and applied correctly.	Increase measure peak demand savings
Ductless Mini-Split HPs	Evaluated energy savings do not align with reported energy savings for a portion of the measures.	Recommend analyzing current database algorithms for the measure to ensure all individual measure calculations are in alignment. Ensure heating and cooling capacities are applied separately to their respective savings calculations.	

2.3.3.2 TRM Updates

Guidehouse recommends two updates to the TRM:

- We recommend updating the savings calculations for heat pump measures, especially ductless mini-split heat pumps to account for partial displacement scenarios. Based on studies we have conducted in other jurisdictions; it is not uncommon for heat pumps to be installed and operated alongside existing fossil fuel-based heating systems.

- We also recommend updating the heating energy savings calculations for heat pumps to consider the heating capacity of the unit, rather than cooling capacity.

2.4 Process Evaluation

2.4.1 Process Evaluation Overview and Methodology

To obtain process findings, Guidehouse reviewed the program materials and tracking database, surveyed customers, and interviewed program implementors and program managers to identify areas for improvement and barriers to participation.

2.4.1.1 Process Evaluation Objectives

The objective of the process evaluation was to better understand what is going well and what could be improved in the program. The SWE’s guidance for such programs recommends conducting a process evaluation with the objectives outlined in Table 2-10. Guidehouse used the guidance provided by the SWE to define the objectives for this process evaluation.

Table 2-10: Process Evaluation Objectives

Overall Objective	Detailed Objectives
Document changes from NJ BPU to IOU	Document the changes that occurred in the program implementation and what stayed the same when the IOU began implementing the program.
Participation	Document participation rate, closing rate, project completion rate, number of participants, partial participants and, where possible, compare with NJ BPU management.
End-user satisfaction	Satisfaction with all key steps and elements of the program process by end users, reasons for participation, challenges to participation, decision-making, reasons for adoption or rejection of recommended measures, and suggestions to address challenges and barriers.
Program staff satisfaction	Satisfaction with the back-office processes by the implementation team; cycle time findings for back-office processes.
Implementation team satisfaction	Satisfaction with all key steps and elements of the program processes by market actors involved in program delivery and for market actors involved in NJ BPU period request assessment of any differences, their reasons for being in the program, challenges to participating in the program, access to products, reasons for recommending services and products, comparison of experiences prior to and during program, and suggestions to address challenges and barriers.
Challenges	Document any difficulties with program-related efficiency products from end user, trade ally, and implementation team perspectives such as availability, quality of materials, installation, quality of product, waiting times, etc. Differentiate COVID-19-related causes where possible.

2.4.2 Process Evaluation Results

Table 2-11 presents the participant survey disposition. The survey response rate was 6.5%. The process evaluation results presented in this report were primarily based on the customer survey.

Table 2-11: Residential HVAC Participant Survey Disposition

Description	Count
Unique participants	606
Unique participants with emails	447
Survey responses	34
Screen outs	5
Usable responses	29
Response rate	6.5%

Note: Screen outs refers to Customers that could not provide information on their participation in the program. Usable responses are the total number of surveys minus the screened out customers.

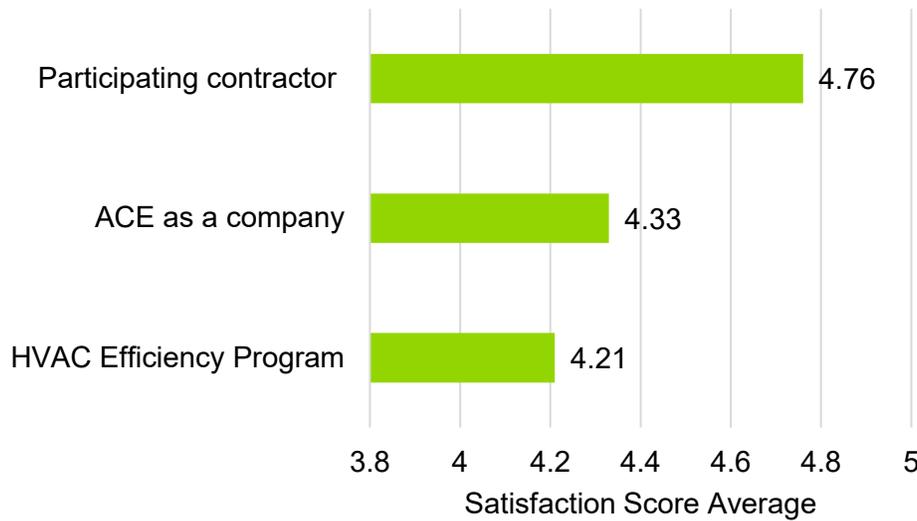
The remaining sections provide the process evaluation survey results by topic.

2.4.2.1 Program Design

Customers that responded to the survey (n=29) were generally satisfied with ACE's Residential HVAC program, providing an average score of 4.21 using a scale of 1-5, where 1 is extremely dissatisfied and 5 is extremely satisfied⁴ as seen in Figure 2. A lack of clear communication about next steps after application submission (n=1) and accessible customer service support (n=1) were the main drivers of program dissatisfaction.

⁴ In PY 2, Guidehouse will implement a 9-point satisfaction scale.

Figure 2: Program Component Satisfaction



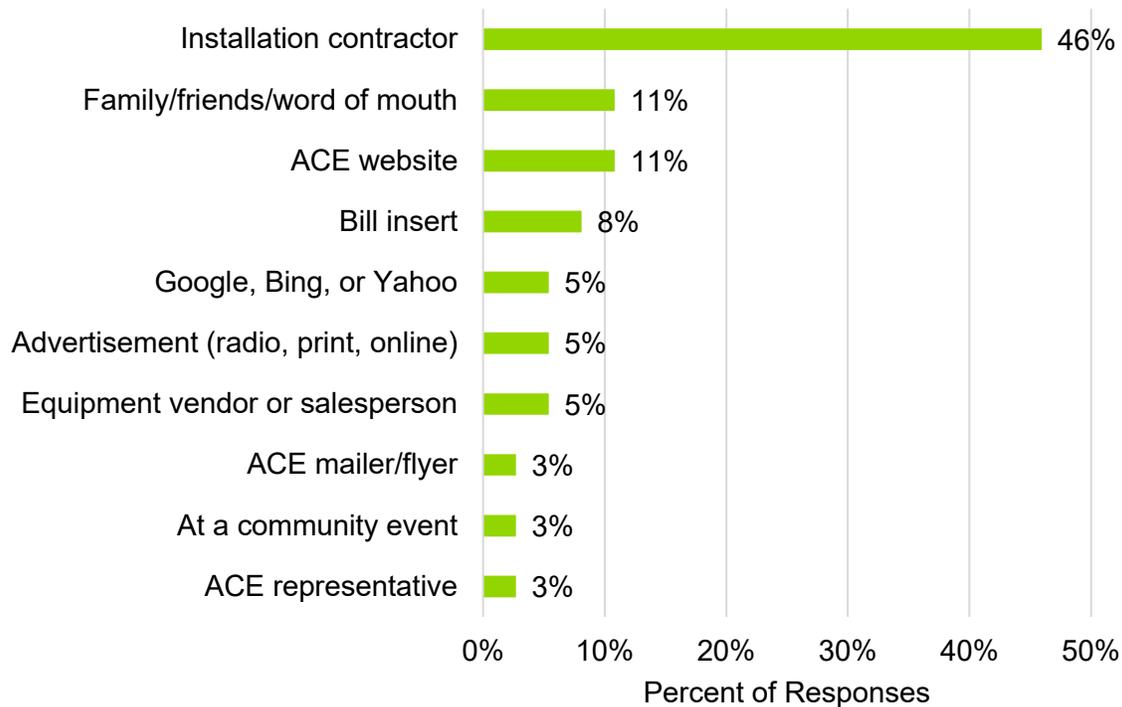
Satisfaction of a similar HVAC program in the mid-west presented a satisfaction score of 94%. Responses are based on a 0-10 scale and calculated using the percentage of applicable responses that rate satisfaction with the program as 6 or higher.

In PY 2, Guidehouse will implement a 9-point satisfaction scale to better assess customers' sentiment on the above-mentioned factors.

2.4.2.2 Program Implementation

Through the online survey we found that respondents learned about the program through a variety of communication strategies. Most respondents (46%) reported learning about the program through their installation contractor. ACE communication efforts, such as the website, mailer and flyer, or a representative only make up a total of 17% of responses suggesting that there are opportunities for ACE to increase their marketing and communication strategies for this program. Other benchmarked programs had similar top awareness channels; contractor/vendor/installer (84%), Utility website (10%), Bill insert (9%), as seen in Figure 3.

Figure 3: Residential HVAC Program Awareness (n=37)



Note: Customers were allowed to provide multiple responses to the question, “How did you learn about ACE’s HVAC Efficiency Program? Select all that apply.”, which is why the n value is higher than the number of respondents.

Guidehouse also found that respondents were generally satisfied with the participating contractor that installed the measure in their home, providing an average satisfaction score of 4.76. Customers did not provide any insight into drivers of dissatisfaction.

The satisfaction of contractors of a similar residential HVAC program in the mid-west presented a satisfaction score of 92%.

2.4.2.3 Challenges

Customers reported challenges concerning measure availability (n=2), malfunction due to issues with existing wiring (n=1), and incorrect measure information (n=1) and reported that most of these challenges (n=3) were extremely serious. To mitigate these challenges in the future contractors could set customers’ expectations by communicating measure availability and provide a preliminary project timeline given supply issues.

2.4.3 Key Findings and Recommendations

Table 2-12 presents the Guidehouse evaluation team’s process findings and recommendations.

Table 2-12: Residential HVAC Program Process Findings and Recommendations

Finding	Recommendation	Impact
Some customers reported a delay in installation, which contractors attributed to supply chain issues associated with the pandemic.	Recommend contractors continue to communicate potential measure shortages to accurately portray installation timelines to the customers.	Improve satisfaction
ACE's communication efforts, through the website, mailer and flyer, and ACE's representatives made up only 17% of program awareness as reported by respondents. The remaining was driven mostly by contractors.	Consider increasing outreach through channels such as mailers/flyers, bill inserts, and emails that direct customers to the ACE website for program participation information. This could help drive more program awareness and participation outside of contractors.	Increase participation
One customer experienced an equipment malfunction due to issues with existing wiring in the home.	Consider strengthening the contractor's home pre-check processes prior to installation to avoid equipment malfunctions and issues moving forward.	Improve satisfaction
The response rate for this survey was less than optimal.	Consider informing program participants and contractors that a follow up survey will be distributed and should be filled out by the customer.	Increase response rates, improve further research efforts

2.5 Net-to-Gross Evaluation

2.5.1 Net to Gross Data Collection Methodology

Guidehouse used the self-report method to calculate NTG ratios and net savings by estimating freeridership and spillover. We conducted NTG surveys along with surveys for Process and Impact evaluation. Online surveys were fielded to all participants with valid email addresses. We received 29 usable responses which were used to estimate the NTG. Table 2-11 provides more information on program participants, total responses, usable responses etc.

The survey battery used for NTG was detailed in the NJ EMV Guidelines-NTG Triennium 1 documentation provided by the SWE. The methodology included template questions, response scoring, and a high-level function of how to calculate NTG. Guidehouse experienced several challenges in using this methodology and made several adjustments to overcome these issues:

- Challenges in determining how factors such as timing and efficiency were applied to the final freeridership ratio. In absence of this guidance, Guidehouse took an average of all scores to determine the intention score.
- The spillover calculations and the description provided were inconsistent. Guidehouse determined that the description was most accurate and decided against using the proposed calculations when determining spillover.

2.5.2 Net-to-Gross Results and Key Findings

For the program, Guidehouse found freeridership of 0.43 and participant spillover of 0.01 (see Table 2-13), and a NTG ratio (NTGR) of 0.58 based on 29 respondents.

When compared to other utility programs, the NTGR is comparable to both benchmarked utilities in freeridership but varies slightly in spillover values which leads the NTGR to be the lowest among benchmarked utilities.

Table 2-13: Program Year 2021 Residential HVAC Program NTGR

Utility	Freeridership	Participant Spillover	NTGR
Atlantic City Electric	0.43	0.01	0.58
Midwestern Utility	0.46	0.07	0.61
Mid-Atlantic Utility	0.46	0.33	0.88

Freeridership was driven by 10 participants who reported they would have not purchased the same system or purchased the system at a later date without the ACE rebate. These responses resulted in lower freeridership scores for the program.

Spillover was driven by two respondents, one of which reported installing a Wi-Fi enabled thermostat or Smart thermostat and another who reported installing a heat pump water heater after participating in ACE's HVAC program. These respondents stated that the program was very influential in their decision to purchase these additional items for which they did not receive a rebate from ACE or another organization.

Guidehouse also analyzed the Residential HVAC program on a measure level basis and developed measure specific NTGRs (illustrated in Table 2-14). All of the measures had comparable NTGRs.

Table 2-14: Program Year 2021 Residential HVAC Program Measure Level NTGRs

Measure	Freeridership	Participant Spillover	NTGR
Central Air Conditioners	0.39	0.01	0.62
Air Source Heat Pumps	0.43	0.01	0.58
Ductless Mini-Split Heat Pumps	0.43	0.01	0.58
Smart Thermostats	0.50	0.01	0.51

2.6 Cost Effectiveness

Guidehouse collected adequate data to support a portfolio-wide cost effectiveness analysis and adhered to the New Jersey Cost Test (NJCT). The NJCT was developed as the primary test to evaluate the benefits and costs of EE and PDR programs established in the state pursuant to the Clean Energy Act (CEA) during the first three-year program cycle, starting with PY 1 on July 1, 2021, and running through the end of program year 3 (PY3) on June 30, 2024.

The program costs available to Guidehouse were for all Efficient Products programs combined as one. We did not have costs disaggregated by sub-program i.e., Residential HVAC, Appliance Rebates etc. Therefore, we calculated cost effectiveness for all Efficient Products programs grouped together as if it were a single program.

Guidehouse calculated six cost tests for ACE’s Efficient Products program, including the New Jersey cost test as defined in New Jersey BPU Order 8A⁵. Administrative costs were not tracked by sub-program in a manner that allowed for sub-program level cost testing. The Residential HVAC sub-program contributed 6.05% of the Efficient Products program’s NJCT benefits. Cost test results presented in Table 2-15 and Table 2-16 were calculated using net ex-post savings. The Efficient Products program achieved a NJCT ratio above 1.0.

Table 2-15: Net Efficient Products Program Cost Test Results

Program	NJCT	PCT	PACT	RIMT	TRCT	SCT
Efficient Products	2.49	14.99	0.80	0.22	0.85	1.03

Table 2-16: Efficient Products Program NJCT NPV Benefits and Costs

Program	NPV Benefits (\$1,000)	NPV Costs (\$1,000)	Net Benefits (\$1,000)
Efficient Products	\$6,866	\$4,820	\$4,110

⁵ <https://www.state.nj.us/bpu/pdf/boardorders/2020/20200824/8A%20-%20ORDER%20New%20Jersey%20Cost%20Test.pdf>

Appendix A. Survey Verification

Guidehouse used participant contact information from the program tracking data to email participants an invitation to take an online survey. Rather than random sampling in PY 1, we used a census of ACE’s Residential HVAC program participants with valid contact information.

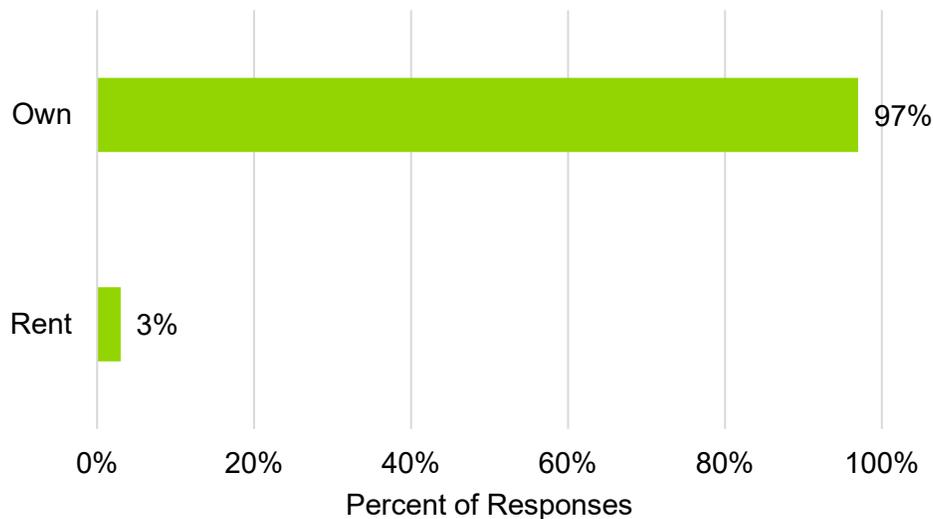
The participant survey included impact- and process-related questions. The statewide net-to-gross (NTG) battery of questions approved by the SWE were added to this survey and adjusted where necessary to match the specifics of the Residential HVAC program. For the first year, the impact questions were high level with the goal of verifying installation and examining whether the measure was early replacement or replace on burnout.

A.1 Survey Demographics

The overwhelming majority of survey respondents (97%) own their own home, with 91% indicating a single-family dwelling, as seen in Figure A-4. Other home types include triple decker (3%), row home (3%), and mobile home or trailer (3%). Additionally, most homes (72%) were reported as 3,000 square feet or less, with roughly 21% reporting a square footage of 3,000 square feet or larger.⁶

In comparison, owner-occupied housing rate for NJ State in the state census⁷ is reported at 63.8%. We also note that participants in the Residential HVAC program are more likely to homeowners as they need to make decisions about HVAC systems installed in the home.

Figure A-4: Respondent Homeownership Status

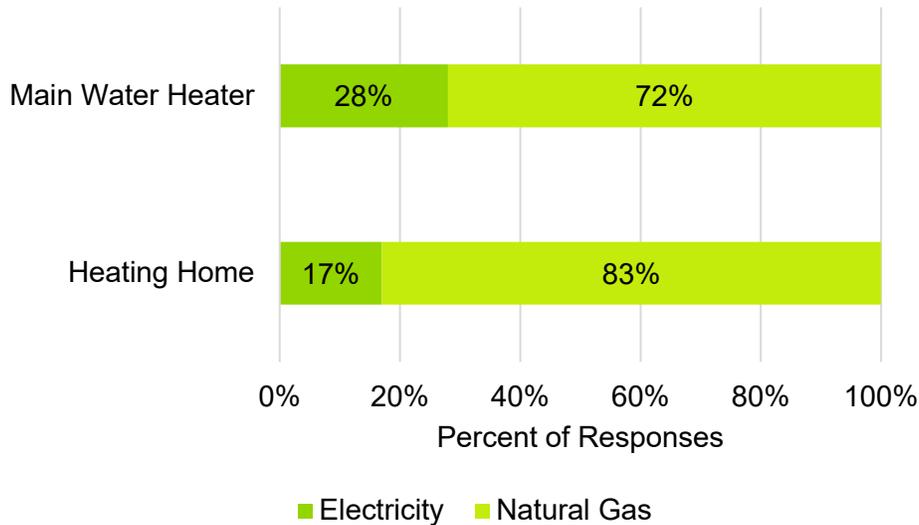


⁶ Seven percent of respondents did not know the square footage of their home.

⁷ <https://www.census.gov/quickfacts/NJ>

Most survey respondents heat their home with natural gas (83%) and the remainder use electricity (17%). Natural gas is the most common fuel being used to heat water (72%), followed by electric (28%). These results are shown in Figure A-5.

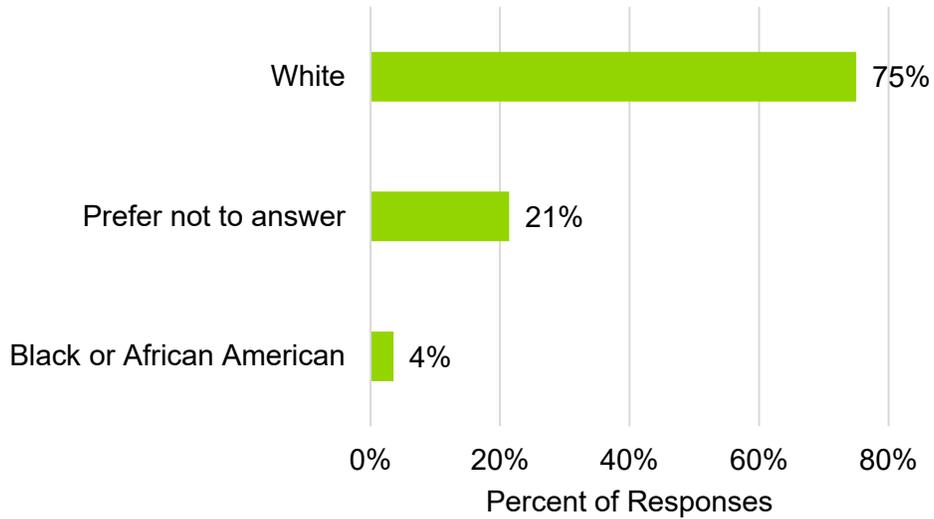
Figure A-5: Fuel Type for Home and Water Heating



Shown in Figure A-6, three quarter of survey respondents are identify as white (75%), 4% as black or African American, and 21% preferred not to answer this question. In comparison, the NJ state census reports the population to be 53.5% White (not Hispanic or not Latino) and 15.3% Black or African American.

Respondents overwhelmingly reported English was the primary language spoken at home (90%). In comparison, the NJ State census reports 31.9% of people aged 5+ spoke a language different than English at home.

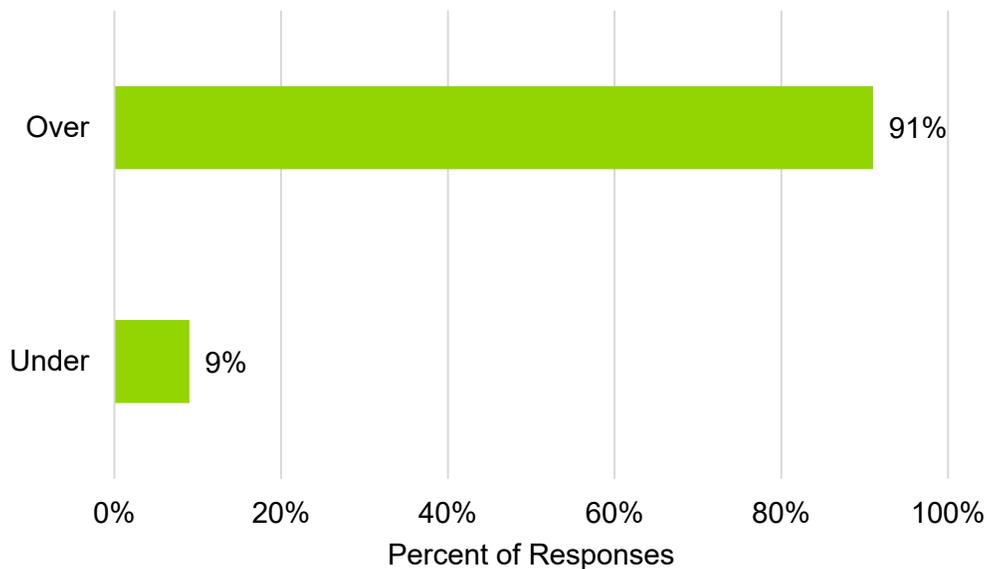
Figure A-6: Survey Respondent's Race



Respondents reported between one and five people in the home. Most respondents (62%) reported two individuals with the second highest reported occupancy at one person (21%). In comparison, homes in NJ per NJ State census reported an average of 2.66 persons per household.

When asked about annual household income levels, 91% of customers reported their income was over 250% of the federal poverty guidelines, as shown in Figure A-7. Customers who reported one or five occupants in their household were the only survey respondents who reported their income was under the survey base level.

Figure A-7: Income Status Relative to 250 Percent of Federal Poverty Guidelines



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