

# Efficient Products EM&V Report

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Jersey Central Power & Light

PY22: July 1, 2021–June 30, 2022

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# 1 Abstract

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On May 23, 2018, New Jersey's Governor signed into law the Clean Energy Act of 2018<sup>1</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 percent clean energy by 2050 by establishing aggressive energy reduction requirements, among other clean energy strategies. Specifically, the CEA directs the BPU to require that:

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

The CEA requires that evaluation, measurement, and verification activities are used to review the electric and gas energy usage reductions and peak demand reductions for the utility's energy efficiency programs. A Statewide Evaluator (SWE), hired by the BPU to coordinate the evaluations for all utilities, 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 conforms to the SWE's basic rigor guidance for evaluations for all JCP&L programs and aligns with approved M&V Plans from June 2, 2022.

For programs that produce both electricity and gas savings, the lead utility is responsible for evaluating both fuels, and reported savings that are held on behalf of the partner utility will be passed via the Statewide Coordinator system in 2023. Therefore, program gas savings are included in this report.

ADM is under contract with the Jersey Central Power & Light (JCP&L) to provide evaluation, measurement, and verification (EM&V) services of its energy efficiency programs. The contract provides for annual EM&V reporting covering a three-year period from July 1, 2021, through June 30, 2024, culminating in a final report that covers the

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

triennium to be delivered to the BPU. This report summarizes findings from an initial evaluation of the program, covering activities in the first year of implementation (PY22). Both reported (or *ex ante*) and verified (or *ex post*) impacts in this report are constructed with calculation methods prescribed in the NJ Coordinated Measures List (NJCML or CML)<sup>2</sup>. The NJCML serves as the technical reference manual (TRM) for the CEA's first triennium. The NJ FY20 Protocols and the FY21 Protocols Addendum are the primary documents referenced in the CML. The CML also prescribes sections from other TRMs for measures that are not yet included in the NJ Protocols.

## 1.1 PY22 Achievements

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The reported and verified annual electric energy, electric demand, and gas energy impacts<sup>3</sup> for the program are shown in Table 1-1 below.

*Table 1-1: Efficient Products Program PY22 Gross Energy and Demand Impacts*

Impact	Reported	Verified
Electric Energy (kWh)	85,364,733	84,778,084
Demand (kW)	7,212	7,056
Gas Energy (Therms)	-803,818	-940,953

## 1.2 PY22 Evaluation Results

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### 1.2.1 Gross Verified Impacts and Realization Rates

The Efficient Products Program contains six program components which are described in Section 3 of this report. Gross impact evaluation results by program component are reported in Table 1-2 and Table 1-3.

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<sup>2</sup> Per [BPU DOCKET NOS. QO19010040. Agenda Date: 10/12/2022. Agenda Item: 8D. Page 7](#): "Calculations used by the utilities to determine program savings counted toward compliance are cataloged in the Joint Utility Coordinated Measures List, which references the FY20 Protocols, the FY21 Protocols Addendum, and TRMs from other states when no applicable New Jersey specific measure calculation was available."

<sup>3</sup> Evaluated therms and MMBtus include heating penalties where included in applicable protocols.

*Table 1-2: Efficient Products Program PY22 Gross Annual Retail  
kWh Savings and kW Demand Reduction*

<b>Program Component</b>	<b>Ex-ante kWh</b>	<b>Ex-post kWh</b>	<b>RR kWh</b>	<b>Ex-ante kW</b>	<b>Ex-post kW</b>	<b>RR kW</b>
Appliance Rebates	991,204	1,108,072	112%	129.17	142.00	110%
Appliance Recycling	5,520,707	5,520,707	100%	863.27	899.00	104%
Energy Efficient Kits	29,703,573	26,581,399	89%	2,318.94	2,035.14	88%
HVAC Rebates	534,612	532,170	100%	310.60	490.60	158%
Lighting	47,119,638	49,510,589	105%	3,551.04	3,450.13	97%
Online Marketplace	1,494,999	1,525,147	102%	38.51	39.47	102%
<b>Total</b>	<b>85,364,733</b>	<b>84,778,084</b>	<b>99%</b>	<b>7,211.52</b>	<b>7,056.34</b>	<b>98%</b>

*Table 1-3: Efficient Products Program PY22 Gross Annual Retail  
Therms and MMBtu Savings<sup>4</sup>*

<b>Program Component</b>	<b>Ex-ante therms</b>	<b>Ex-post therms</b>	<b>Ex-ante MMBtu</b>	<b>Ex-post MMBtu</b>	<b>RR</b>
Appliance Rebates	4,989.00	3,031.12	498.90	303.11	61%
Appliance Recycling	-	-	-	-	-
Energy Efficient Kits	(329,430.43)	(478,206.22)	(32,943.04)	(47,820.62)	145%
HVAC Rebates	9,605.16	9,605.18	960.52	960.518	100%
Lighting	(713,486.29)	(697,149.17)	(71,348.63)	(69,714.92)	98%
Online Marketplace	224,504.77	221,765.88	22,450.48	22,176.59	99%
<b>Total</b>	<b>(803,817.79)</b>	<b>(940,953.21)</b>	<b>(80,381.78)</b>	<b>(94,095.32)</b>	<b>117%</b>

### 1.2.2 Summary of Key Parameters Collected by the Evaluation Effort

The gross impact evaluation effort also collected and analyzed important data related to measure installation rates or in-service rates (ISRs) and fuel shares (e.g., electric vs. gas) for space heating and water heating. These key parameters can inform the ongoing updates to the New Jersey Technical Reference Manual (TRM), formerly known as the Protocols to Measure Resource Savings (New Jersey Protocols).

Table 1-4 shows PY22 evaluation findings relative to measure installation rates. The first two columns of the table list the program component and measure. The third column denotes the measured parameter. In that column, the term *VR* indicates the verification rate for appliance recycling programs. The verification rate indicates the fraction of survey responses that indicated the recycled unit was operable and was collected by the program implementor. The term *ISR* indicates the in-service rate or the

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<sup>4</sup> Evaluated therms and MMBtus include heating penalties where included in applicable protocols.

installation rate for the measure. It takes on the value 1 if the measure is verified to be installed, and 0 otherwise. For energy efficiency kits, the *kit receipt rate* is the rate at which surveyed participants confirm receipt of the kits. Not all kits are deliverable, and some get sent back to the implementer, the receipt rate shown in the table is typical for such programs. The next two columns show the mean and standard deviation for each parameter, while the final two columns show the number of sample points and relative precision at the 90 percent confidence limit for the parameter. ADM has separately provided tables similar to Table 1-4 to the New Jersey Statewide Evaluator (SWE) to support the ongoing TRM update process.

*Table 1-4: Summary of Installation or Verification Rates*

Program Component	Measure	Parameter	Mean	Standard Deviation	N Sample Points	RP at 90% CL
Appliance Recycling	Refrigerator Recycling	VR	0.99	0.11	164	1%
Appliance Recycling	Freezer Recycling	VR	0.99	0.12	74	2%
Appliance Recycling	Room Air Conditioner Recycling	VR	0.98	0.14	48	3%
Appliance Recycling	Dehumidifier Recycling	VR	0.85	0.36	46	10%
Appliance Rebates	Clothes Washer	ISR	1.00	0.00	20	0%
Appliance Rebates	Dehumidifier	ISR	1.00	0.00	32	0%
Appliance Rebates	Air Purifier	ISR	1.00	0.00	40	0%
Appliance Rebates	Clothes Dryer	ISR	1.00	0.00	35	0%
Appliance Rebates	Refrigerator	ISR	1.00	0.00	47	0%
Appliance Rebates	Room Air Conditioner	ISR	1.00	0.00	20	0%
Appliance Rebates	Heat Pump Water Heater	ISR	1.00	0.00	4	0%
Online Marketplace	LED Nightlights	ISR	0.89	0.33	28	12%
Online Marketplace	LED Bulb	ISR	0.81	0.29	403	3%
Online Marketplace	LED Holiday Lights	ISR	1.00	0.00	10	0%
Online Marketplace	Air Purifier	ISR	NA	NA	4	NA
HVAC Rebates	Minisplit	ISR	1.00	0.00	30	0%
HVAC Rebates	Smart Thermostat	ISR	1.00	0.00	42	0%
HVAC Rebates	CAC	ISR	1.00	0.00	77	0%
HVAC Rebates	ASHP	ISR	1.00	0.00	5	0%
HVAC Rebates	Heat Pump Water Heater	ISR	1.00	0.00	2	0%
HVAC Rebates	GSHP	ISR	1.00	NA	0	100%
HVAC Rebates	Furnace	ISR	1.00	NA	1	100%
EE Kits	Overall Kit	Receipt rate	0.93	0.32	254	4%
EE Kits	LED Bulb	ISR	0.85	0.21	254	2%
EE Kits	LED Nightlight	ISR	0.62	0.38	254	6%
EE Kits	Shower Head	ISR	0.19	0.40	254	22%
EE Kits	Furnace Whistle	ISR	0.04	0.21	254	51%
EE Kits	Faucet Aerator	ISR	0.23	0.43	254	19%
EE Kits	APS	ISR	0.69	0.44	254	7%

In addition to installation rates, the evaluation effort collected data on key parameters that are inputs to TRM algorithms used for reporting impacts in PY22. These parameters are summarized in Table 1-5 below. ADM has separately provided a similar table to the SWE to support the ongoing TRM update process.

*Table 1-5: Summary of Fuel Shares and Other Key Parameters*

Program Component	Measure	Parameter Name	Parameter Mean	Parameter Standard Deviation	Parameter Count	Relative Precision at 90%
Appliance Rebates	Clothes Washer	% Elec_wh	0.53	0.52	15	41%
Appliance Rebates	Clothes Washer	% Elec_dryer	0.59	0.51	17	34%
Online Marketplace	Smart Thermostat	% Heat Pump	0.05	0.22	384	33%
Online Marketplace	Smart Thermostat	% Manual Baseline	0.28	0.45	391	13%
Online Marketplace	Advanced Power Strip	% Entertainment	0.58	0.37	21	23%
HVAC Rebates	Minisplit	% Secondary Zone	0.88	0.35	8	24%
HVAC Rebates	Smart Thermostat	% Heat Pump	0.08	0.27	38	92%
HVAC Rebates	Smart Thermostat	% Manual Baseline	0.33	0.48	39	38%
EE Kits	Shower Head	% Electric WH	0.71	0.53	21	27%
EE Kits	Furnace Whistle	% Central Cooling	0.33	0.46	6	93%
EE Kits	Faucet Aerator	% Electric WH	0.68	0.52	28	24%
EE Kits	Faucet Aerator	% Kitchen	0.66	0.48	32	21%
EE Kits	Advanced Power Strip	% Entertainment	0.47	0.50	129	15%

### 1.3 Evaluation Recommendations

ADM has provided the recommendations summarized in Table 1-6 for continued improvement of tracking and reporting for the Efficient Products Program. As of this writing, three of the four recommendations have been accepted and follow-up actions completed. The recommendation regarding aerators is still under consideration as it interacts with other tracking and reporting considerations, such as updating ISRs or fuel shares for EE Kits.

*Table 1-6: Summary of Tracking and Reporting Recommendations*

Recommendation	JCP&L Disposition	Follow-Up Status	Verified by ADM
<b>Update Clothes Washer savings calculations using NJ FY2021 protocols</b> as indicated in the NJCML. The revised protocol uses a more accurate calculated value rather than the replaced deemed savings value.	Accepted	Completed	Yes
<b>Update Room Air Conditioner deemed kW demand reduction value. to 0.09</b> to correct an error in the NJ CML.	Accepted	Completed	Yes
<b>Update Aerator savings calculations for EE Kits</b> as indicated in the NJ CML to use minutes rather than hours.	Under Consideration	NA	NA
<b>Use baseline wattage table in the NJ CML</b> to calculate lighting measures savings since baseline wattages are not available in the NJ Protocols.	Accepted	Completed	Yes

## 1.4 TRM Updates

Recommendations for TRM updates and evaluation data collected to support the effort are included in the Cross Cutting Program Results document submitted in conjunction with this report. Since the initial draft of this report, many draft TRM measures have been made available to utilities and their evaluators for review. In this process we have confirmed that the two measures in this program that lacked entries in the NJ Protocols, Smart Thermostats and LED Holiday lights, have been added to the NJ TRM for the next Triennium.

Recommendations for TRM updates and evaluation data collected to support the effort are included in the Cross Cutting Program Results document and are summarized below:

*Table 1-7: Summary of TRM Update Recommendations*

Measure	Recommendation
Refrigerator recycling, freezer recycling	Consider a partially-deemed approach such as the one in the PA TRM. Utilities can use default or market-specific values for certain parameters such as part-use factors or unit construction dates.
Smart Thermostats	Add this measure to the NJ Protocols.
LED Holiday Lights	Add this measure to the NJ Protocols.
Clothes Washers	Update TRM to allow utility-specific (or measure-specific) parameter values for water heating and clothes drying fuel types
LED Nightlights	Add an in-service rate (ISR) term to the savings algorithm, different default ISRs are needed for direct install, downstream/upstream, and kit delivery channels

Measure	Recommendation
LED Lighting	Add an in-service rate (ISR) term to the savings algorithm, different default ISRs are needed for direct install, downstream/upstream, and kit delivery channels
Air conditioners and heat pumps	Edit protocol to use the actual rated EER (or EER2) of the efficient units, rather than the current term $EER = SEER \times 11.3/13$
Peak Demand Window	Align summer peak demand window with PJM's summer peak period
Faucet Aerators	Update Aerator savings calculation in the NJ TRM as indicated in the NJ CML to use minutes rather than hours.

## 1.5 Process Evaluation Activity Summary

To date, process evaluation activities have served two objectives. The first objective is to ensure that program tracking and reporting systems and processes are established, accurate, and contain sufficient information to support upcoming enhanced-rigor evaluations. The second objective is to gather information and develop sufficient context to conduct deeper process evaluation activities in PY23. The first objective was accomplished through active participation in the launch of the data tracking and reporting systems. The ADM team reviewed all measure attributes that should be tracked and recorded and helped in the implementation of quality assurance rules related to key data fields for each measure. JCP&L has developed a process which applies logical and quantitative quality assurance rules to incoming program tracking data. Any outliers are flagged for further review and investigated to resolution by JCP&L's evaluation and implementation staff.

To build context for upcoming process evaluations, the ADM team has reviewed documentation such as policy documents drafted by BPU staff, evaluation guidance documents drafted by the SWE, and JCP&L's Energy Efficiency and Conservation plan. The ADM team has also conducted initial interviews with JCP&L's Energy Efficiency program managers and overall implementation managers to identify researchable issues for process evaluation.

Evaluators for utilities jointly gathered data to facilitate program benchmarking. The ADM team used benchmarking data primarily to identify gaps in energy efficiency measures or delivery that may be offered by CEA programs. The evaluation team also applied measure-specific benchmarking to develop accurate ex-ante estimates for energy efficiency kits, which were a high-impact measure in PY22. In this effort, anticipated values for in-service rates were developed based on recent evaluation findings in neighboring Pennsylvania, and these informed the ex-ante ISRs in the NJ CML, which utilities utilized to form ex-ante impact values for kits. The benchmarking study also gathered other program metrics such as realization rates, participation rates (normalized to 100,000 participants). In most cases, direct comparison of realization rates and participation rates is significantly qualified by differences in program maturity and state-

to-state differences in reporting and evaluation conventions. This is particularly true for PY22, which was a startup year for New Jersey.



## 2 Executive Summary

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### 2.1 Introduction

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The CEA requires that evaluation, measurement, and verification activities are used to review the electric and gas energy usage reductions and peak demand reductions for the utility's energy efficiency programs. A Statewide Evaluator (SWE), hired by the BPU to coordinate the evaluations for all utilities, 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, while the CEA required a triannual report due at the end of the first triennium. This report conforms to the SWE's basic rigor guidance for evaluations for all JCP&L programs and aligns with approved M&V Plans from June 2, 2022.

For programs that produce both electricity and gas savings, the lead utility is responsible for evaluating both fuels, and reported savings that are held on behalf of the partner utility will be passed via the Statewide Coordinator system in 2023. Therefore, program gas savings are included in this report.

ADM is under contract with JCP&L to provide evaluation, measurement, and verification (EM&V) services of its energy efficiency programs. The contract provides for annual EM&V reporting covering a three-year period from July 1, 2021, through June 30, 2024, culminating in a final report that covers the triennium to be delivered to the BPU. This report summarizes findings from an initial evaluation of the program, covering activities in the first year of implementation (PY22).

### 2.2 Program Description

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The Efficient Products Program provides residential customers with financial incentives to install selected energy efficient products. The Efficient Products Program includes the following six program components:

- **Appliance Rebates.** Mail-in and online rebates are available for ENERGY STAR® qualified air purifiers, room air conditioners, dehumidifiers, heat pump water heaters, clothes washers and dryers, and refrigerators.
- **Appliance Recycling.** Offers residential customers a financial incentive to schedule the pick-up and disposal of older model, inefficient refrigerators, freezers, dehumidifiers, and room air conditioners.
- **Energy Efficient Kits.** Free energy efficient kits are sent to customers either when they create an account at a new address or request a kit either online or

- over the phone. Kits include LEDs, smart power strips, furnace whistles, and for customers with electric water heaters, water saving measures.
- **HVAC Rebates.** Rebates are available to customers that install high-efficiency HVAC equipment including air source heat pumps, central air conditioners, ductless mini-split air conditioners and heat pumps, geothermal heat pumps, and smart thermostats.
  - **Upstream Lighting.** ENERGY STAR LED standard and specialty light bulbs are available at discounted rates at participating retailers<sup>5</sup>.
  - **Online Marketplace.** Discounted high-efficiency lighting products, smart thermostats, advanced power strips, and air purifiers are available to customers online.

Program Components are administered by contracted program implementers. The Appliance Recycling program component is administered by ARCA Recycling. Energy Efficient Kits and the Online Marketplace are administered by AM Conservation Group. Appliance Rebates, Upstream Lighting, and HVAC Rebates program components are administered by CLEAResult.

The JCP&L implementation team managed to quickly launch the two largest program components – Energy Efficiency Kits and Upstream Lighting, in part due to their experience in running similar programs outside of New Jersey. The reported impacts were accurate on the whole, as JCP&L’s implementation, evaluation, and tracking and reporting teams made considerable efforts to adhere to agreed-upon energy savings protocols. This effort included an important benchmarking activity during the program startup phase: Developing ex-ante savings estimates for energy efficiency kits (EE Kits) for the NJ CML using in-service rates for kit components derived from similar programs offered in Pennsylvania.

## 2.3 Evaluation Summary

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Both reported and verified impacts in this report are constructed with calculation methods prescribed in the NJCML<sup>6</sup>. The NJCML serves as the TRM for the CEA’s first triennium. The NJ FY20 Protocols and the FY21 Protocols Addendum are the primary documents referenced in the CML. The CML also prescribes sections from other TRMs for measures that are not yet included in the NJ Protocols.

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<sup>5</sup> The program component also included distribution of energy efficiency kits at food banks but is called upstream lighting in this report since the food bank kits are a small component.

<sup>6</sup> Per [BPU DOCKET NOS. QO19010040. Agenda Date: 10/12/2022. Agenda Item: 8D. Page 7](#): "Calculations used by the utilities to determine program savings counted toward compliance are cataloged in the Joint Utility Coordinated Measures List, which references the FY20 Protocols, the FY21 Protocols Addendum, and TRMs from other states when no applicable New Jersey specific measure calculation was available."

Gross impact evaluations for the six program components generally followed the same logic and process:

- Review program tracking data to inform sample design and target sample sizes
- Pull samples and compute gross impacts in accordance with agreed-upon TRM protocols as specified in the NJ CML using the following data:
  - Installation rates derived from customer surveys or documentation review
  - Installation locations or interacted equipment fuel types (e.g., water and space heating)
  - Equipment capacities, efficiencies, or other attributes as derived from specification sheets or cross-referenced in ENERGY STAR or Air-Conditioning, Heating, and Refrigeration Institute (AHRI) databases.
- Develop gross realization rates as the ratios of reports (or ex-ante) and verified (or ex-post) impacts for sampled projects or measured within each sampling stratum

While gross realization rates are an important evaluation outcome, other key evaluation findings include specific recommendations for implementation, tracking, and reporting in subsequent program years. This initial evaluation yielded the following important information:

- A list of measures that are not currently covered by the NJ Protocols (but are covered by the NJ CML)
- Specific recommendations for additions or enhancements of TRM protocols (whether in the NJ Protocols or other regional TRMs cited by the NJ CML)
- Measured values for key parameters such as measure installation rates, installation locations, and fuel shares for space and water heating

More detailed descriptions of each program component evaluation effort and findings are provided in Section 3, with detailed results provided in subsequent appendices.

This report does not include results from a full round of process evaluations. Process activities to date have been of two kinds. The first kind is *embedded evaluation* in the sense that the evaluation team works closely and concurrently with the implementation and tracking and reporting teams to ensure that important data are collected and saved for each program. The outcome of this effort is that the tracking and reporting process is properly established and maintained. The second kind of process evaluation activity conducted thus far is to gather data to provide context for upcoming process evaluations to be completed in PY23.

### **2.3.1 Evaluation Methods**

#### ***Appliance Rebates***

The NJ CML provided partially and fully deemed protocols to calculate appliance recycling savings. Primary sources included program tracking data and customer surveys. Model specification values were used whenever model numbers were provided in the tracking data.

#### ***Appliance Recycling***

The NJ CML provided partially and fully deemed protocols to calculate appliance recycling savings. Primary sources included program tracking data and customer surveys.

#### ***Energy Efficient (EE) Kits***

The NJ CML provided partially and fully deemed protocols to calculate savings for kit components. Primary sources included program tracking data and customer surveys.

#### ***HVAC Rebates***

The NJ CML provided partially and fully deemed protocols to calculate HVAC Rebate savings. Primary sources included program tracking data and customer surveys. Model specification values were used whenever model numbers were provided in the tracking data. Product data was sourced from the ENERGY STAR product database (ENERGYSTAR.gov) and the Air-Conditioning, Heating, and Refrigeration Institute (AHRI) product database (ahrinet.org).

#### ***Lighting***

The NJ CML provided partially and fully deemed protocols to calculate lighting savings. Primary sources included program tracking data and general population surveys. Model specification values were used whenever model numbers were provided in the tracking data. Product data was sourced from the ENERGY STAR product database (ENERGYSTAR.gov).

#### ***Online Marketplace***

The NJ CML provided partially and fully deemed protocols to calculate savings for measures sold through the online marketplace. Primary sources included program tracking data and general population surveys.

## Process Evaluation Approach

For PY22, the process evaluation consisted of an in-depth interview with JCP&L program staff. Expanded process evaluation activities for PY23 will also include customer surveys and interviews with implementation staff.

## 2.4 Evaluation Results

Gross impact evaluation results by program component are reported in Table 2-1 and Table 2-2.

*Table 2-1: Efficient Products Program PY22 Gross Annual Retail kWh Savings and kW Demand Reduction*

Program Component	Ex-ante kWh	Ex-post kWh	RR kWh	Ex-ante kW	Ex-post kW	RR kW
Appliance Rebates	991,204	1,108,072	112%	129.17	142.00	110%
Appliance Recycling	5,520,707	5,520,707	100%	863.27	899.00	104%
Energy Efficient Kits	29,703,573	26,581,399	89%	2,318.94	2,035.14	88%
HVAC Rebates	534,612	532,170	100%	310.60	490.60	158%
Lighting	47,119,638	49,510,589	105%	3,551.04	3,450.13	97%
Online Marketplace	1,494,999	1,525,147	102%	38.51	39.47	102%
<b>Total</b>	<b>85,364,733</b>	<b>84,778,084</b>	<b>99%</b>	<b>7,211.52</b>	<b>7,056.34</b>	<b>98%</b>

*Table 2-2: Efficient Products Program PY22 Gross Annual Retail Therms and MMBtu Savings<sup>7</sup>*

Program Component	Ex-ante therms	Ex-post therms	Ex-ante MMBtu	Ex-post MMBtu	RR
Appliance Rebates	4,989.00	3,031.12	498.90	303.11	61%
Appliance Recycling	-	-	-	-	-
Energy Efficient Kits	(329,430.43)	(478,206.22)	(32,943.04)	(47,820.62)	145%
HVAC Rebates	9,605.16	9,605.18	960.52	960.518	100%
Lighting	(713,486.29)	(697,149.17)	(71,348.63)	(69,714.92)	98%
Online Marketplace	224,504.77	221,765.88	22,450.48	22,176.59	99%
<b>Total</b>	<b>(803,817.79)</b>	<b>(940,953.21)</b>	<b>(80,381.78)</b>	<b>(94,095.32)</b>	<b>117%</b>

<sup>7</sup> Evaluated therms and MMBtus include heating penalties where included in applicable protocols.

Table 2-3 shows PY22 evaluation findings relative to measure installation rates. The first two columns of the table list the program component and measure. The third column denotes the measured parameter. In that column, the term *VR* indicates the verification rate for appliance recycling programs. The verification rate indicates the fraction of survey responses that indicated the recycled unit was operable and was collected by the program implementor. The term *ISR* indicates the in-service rate or the installation rate for the measure. It takes on the value 1 if the measure is verified to be installed, and 0 otherwise. For energy efficiency kits, the *kit receipt rate* is the rate at which surveyed participants confirm receipt of the kits. Not all kits are deliverable, and some get sent back to the implementer, the receipt rate shown in the table is typical for such programs. The next two columns show the mean and standard deviation for each parameter, while the final two columns show the number of sample points and relative precision at the 90 percent confidence limit for the parameter. ADM has separately provided tables similar to Table 2-3 to the New Jersey Statewide Evaluator (SWE) to support the ongoing TRM update process.

*Table 2-3: Summary of Installation or Verification Rates*

<b>Program Component</b>	<b>Measure</b>	<b>Parameter</b>	<b>Mean</b>	<b>Standard Deviation</b>	<b>N Sample Points</b>	<b>RP at 90% CL</b>
Appliance Recycling	Refrigerator Recycling	VR	0.99	0.11	164	1%
Appliance Recycling	Freezer Recycling	VR	0.99	0.12	74	2%
Appliance Recycling	Room Air Conditioner Recycling	VR	0.98	0.14	48	3%
Appliance Recycling	Dehumidifier Recycling	VR	0.85	0.36	46	10%
Appliance Rebates	Clothes Washer	ISR	1.00	0.00	20	0%
Appliance Rebates	Dehumidifier	ISR	1.00	0.00	32	0%
Appliance Rebates	Air Purifier	ISR	1.00	0.00	40	0%
Appliance Rebates	Clothes Dryer	ISR	1.00	0.00	35	0%
Appliance Rebates	Refrigerator	ISR	1.00	0.00	47	0%
Appliance Rebates	Room Air Conditioner	ISR	1.00	0.00	20	0%
Appliance Rebates	Heat Pump Water Heater	ISR	1.00	0.00	4	0%
Online Marketplace	LED Nightlights	ISR	0.89	0.33	28	12%
Online Marketplace	LED Bulb	ISR	0.81	0.29	403	3%
Online Marketplace	LED Holiday Lights	ISR	1.00	0.00	10	0%
Online Marketplace	Air Purifier	ISR	NA	NA	4	NA
HVAC Rebates	Minisplit	ISR	1.00	0.00	30	0%
HVAC Rebates	Smart Thermostat	ISR	1.00	0.00	42	0%
HVAC Rebates	CAC	ISR	1.00	0.00	77	0%
HVAC Rebates	ASHP	ISR	1.00	0.00	5	0%
HVAC Rebates	Heat Pump Water Heater	ISR	1.00	0.00	2	0%
HVAC Rebates	GSHP	ISR	1.00	NA	0	100%
HVAC Rebates	Furnace	ISR	1.00	NA	1	100%

EE Kits	Overall Kit	Receipt rate	0.93	0.32	254	4%
EE Kits	LED Bulb	ISR	0.85	0.21	254	2%
EE Kits	LED Nightlight	ISR	0.62	0.38	254	6%
EE Kits	Shower Head	ISR	0.19	0.40	254	22%
EE Kits	Furnace Whistle	ISR	0.04	0.21	254	51%
EE Kits	Faucet Aerator	ISR	0.23	0.43	254	19%
EE Kits	APS	ISR	0.69	0.44	254	7%

In addition to installation rates, the evaluation effort collected data on key parameters that are inputs to TRM algorithms used for reporting impacts in PY22. These parameters are summarized in Table 2-4 below. ADM has separately provided a similar table to the SWE to support the ongoing TRM update process.

*Table 2-4: Summary of Fuel Shares and Other Key Parameters*

Program Component	Measure	Parameter Name	Parameter Mean	Parameter Standard Deviation	Parameter Count	Relative Precision at 90%
Appliance Rebates	Clothes Washer	% Elec_wh	0.53	0.52	15	41%
Appliance Rebates	Clothes Washer	% Elec_dryer	0.59	0.51	17	34%
Online Marketplace	Smart Thermostat	% Heat Pump	0.05	0.22	384	33%
Online Marketplace	Smart Thermostat	% Manual Baseline	0.28	0.45	391	13%
Online Marketplace	Advanced Power Strip	% Entertainment	0.58	0.37	21	23%
HVAC Rebates	Minisplit	% Secondary Zone	0.88	0.35	8	24%
HVAC Rebates	Smart Thermostat	% Heat Pump	0.08	0.27	38	92%
HVAC Rebates	Smart Thermostat	% Manual Baseline	0.33	0.48	39	38%
EE Kits	Shower Head	% Electric WH	0.71	0.53	21	27%
EE Kits	Furnace Whistle	% Central Cooling	0.33	0.46	6	93%
EE Kits	Faucet Aerator	% Electric WH	0.68	0.52	28	24%
EE Kits	Faucet Aerator	% Kitchen	0.66	0.48	32	21%
EE Kits	Advanced Power Strip	% Entertainment	0.47	0.50	129	15%

## 2.5 Recommendations and Next Steps

### 2.5.1 Tracking and Reporting Updates

ADM has provided the recommendations summarized in Table 2-5 for continued improvement of tracking and reporting for the Efficient Products Program. As of this writing, three of the four recommendations have been accepted and follow-up actions completed. The recommendation regarding aerators is still under consideration as it interacts with other tracking and reporting considerations, such as updating ISRs or fuel shares for EE Kits. The EE Kit program will soon be discontinued, so updates to the tracking and reporting system may be of limited value going forward.

*Table 2-5: Summary of Tracking and Reporting Recommendations*

Recommendation	JCP&L Disposition	Status of Follow-Up Items	Verified by ADM
<b>Update Clothes Washer savings calculations using NJ FY2021 protocols</b> as indicated in the NJCML. The revised protocol uses a more accurate calculated value rather than the replaced deemed savings value.	Accepted	Completed	Yes
<b>Update Room Air Conditioner deemed kW demand reduction value. to 0.09</b> to correct an error in the NJ CML.	Accepted	Completed	Yes
<b>Update Aerator savings calculations for EE Kits</b> as indicated in the NJ CML to use minutes rather than hours.	Under Consideration	NA	NA
<b>Use baseline wattage table in the NJ CML</b> to calculate lighting measures savings since baseline wattages are not available in the NJ Protocols.	Accepted	Completed	Yes

### 2.5.2 TRM Updates

Recommendations for technical reference manual (TRM) updates and evaluation data collected to support the effort are included in the Cross Cutting Program Results document and are summarized below:

*Table 2-6: Summary of TRM Update Recommendations*

Measure	Recommendation
Refrigerator recycling, freezer recycling	Consider a partially-deemed approach such as the one in the PA TRM. Utilities can use default or market-specific values for certain parameters such as part-use factors or unit construction dates.
Smart Thermostats	Add this measure to the NJ Protocols.
LED Holiday Lights	Add this measure to the NJ Protocols.



Clothes Washers	Update TRM to allow utility-specific (or measure-specific) parameter values for water heating and clothes drying fuel types
LED Nightlights	Add an in-service rate (ISR) term to the savings algorithm, different default ISRs are needed for direct install, downstream/upstream, and kit delivery channels
LED Lighting	Add an in-service rate (ISR) term to the savings algorithm, different default ISRs are needed for direct install, downstream/upstream, and kit delivery channels
Air conditioners and heat pumps	Edit protocol to use the actual rated EER (or EER2) of the efficient units, rather than the current term $EER = SEER \times 11.3/13$
Peak Demand Window	Align summer peak demand window with PJM's summer peak period
Faucet Aerators	Update Aerator savings calculation in the NJ TRM as indicated in the NJ CML to use minutes rather than hours.

While many of the above recommendations are already reflected in the NJ CML, we include them to inform the NJ TRM update process for the next triennium.

**2.5.3 Next Steps**

The ADM team is carrying out a second round of basic-rigor evaluations for the program. In PY23, the ADM team will also conduct process evaluations and enhanced-rigor studies for program components that are expected to continue into PY24: Appliance Recycling, Appliance Rebates, Online Marketplace, and HVAC Rebates.

## 3 Evaluation Methods

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This section discusses gross impact evaluation approaches and process evaluation activities for each program component. The ADM team relied primarily on participant surveys for measure verification and determination of key parameter values. Project documents such as invoices, AHRI certificates, and references to the ENERGY STAR database also served to determine and verify key attributes of the efficient equipment rebated or distributed by the program.

Both reported (or *ex ante*) and verified (or *ex post*) impacts in this report are constructed with calculation methods prescribed in the NJCML<sup>8</sup>. The NJCML serves as the TRM for the CEA's first triennium. The NJ FY20 Protocols and the FY21 Protocols Addendum are the primary documents referenced in the CML. The CML also prescribes sections from other TRMs for measures that are not yet included in the NJ Protocols.

### 3.1 Description of the Efficient Products Program

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The Efficient Products Program provides residential customers with financial incentives to install selected energy efficient products. The Efficient Products Program includes the following six program components:

- **Appliance Rebates.** Rebates are available to residential customers for ENERGY STAR qualified air purifiers, room air conditioners, dehumidifiers, heat pump water heaters, clothes washers and dryers, and refrigerators.
- **Appliance Recycling.** The program removes and disposes of customers' old appliances, as well as paying the customer an incentive to have the appliances removed. Refrigerators, freezers, dehumidifiers, and room air conditioners are eligible for this program.
- **Energy Efficient Kits.** Free energy efficient kits are sent to customers either when they create an account with JCP&L at a new address or request a kit either online or over the phone. Kits include LEDs, smart power strips, furnace whistles, and for customers with electric water heaters, water saving measures.
- **HVAC Rebates.** Rebates are available to residential customers that install high-efficiency HVAC equipment including air source heat pumps, central air conditioners, ductless mini-split heat pumps, geothermal heat pumps, and smart thermostats.

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<sup>8</sup> Per [BPU DOCKET NOS. QO19010040. Agenda Date: 10/12/2022. Agenda Item: 8D. Page 7](#): "Calculations used by the utilities to determine program savings counted toward compliance are cataloged in the Joint Utility Coordinated Measures List, which references the FY20 Protocols, the FY21 Protocols Addendum, and TRMs from other states when no applicable New Jersey specific measure calculation was available."

- **Upstream Lighting.** Discounted ENERGY STAR LED general purpose and specialty lightbulbs are available at participating retailers in JCP&L's service territory.
- **Online Marketplace.** Discounted high-efficiency lighting products, smart thermostats, advanced power strips, and air purifiers are available to customers for purchase from a JCP&L online store.

Program components are administered by contracted program implementers. The Appliance Recycling program component is administered by ARCA Recycling. Energy Efficient Kits and the Online Marketplace are administered by AM Conservation Group. Appliance Rebates and HVAC Rebates program components are administered by CLEAResult.

## 3.2 Gross and Net Savings

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Gross savings reflect the change in energy consumption directly resulting from program-related actions taken by participants, regardless of why they participated. 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) and spillover (additional program-induced energy savings, generated by both participants and non-participants, for which the program didn't provide any specific financial incentive). Net savings are calculated by multiplying gross savings by a net-to-gross (NTG) ratio. NTG equals one minus free ridership plus spillover.

The NJ BPU has stipulated that NTG is set to 1.0<sup>9</sup> for the first triennium of the program. The data to calculate NTG will be collected using an approved battery of free ridership and spillover questions in customer surveys that are run during the first triennium to inform NTG value updates to the NJ TRM.

## 3.3 Appliance Rebates

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ADM evaluated the Appliance Rebates program component using program tracking data and participant surveys as primary data sources.

### 3.3.1 Sampling and Surveying

ADM developed a simple random sample with an overall target of  $\pm 10$  percent precision at the 90 percent confidence level to verify the accuracy of tracking data. A coefficient of variation (CV) of 0.5 was assumed to calculate and monitor relative precision for the gross impact evaluation. For this program, the key data to extract from surveys is the

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<sup>9</sup> [BPU Docket Nos. QO1901040, QO19060748 & QO17091004, Agenda Date: 6/10/2020, Agenda Item: 8D](#), page 31.

verification rate or installation rate (ISR) of the rebated measures. In practice, the CV for this parameter was much smaller than 0.5, since the ISR tends toward 1.0 for downstream appliance rebates. The selected value of 0.5 for the CV is an important planning tool since it leads to a relatively large survey sample, which is advisable since the marginal cost of data collection is small.

While ADM employed a simple random sample, relative precisions were calculated and tracked at the measure level as shown in Table 3-1 below. The relative precision was calculated using ex-post annual electric energy savings, using the planning CV of 0.5 and the finite population correction. ADM separately provided to SWE key parameters collected from the survey with as-found means, standard deviations, and relative precisions.

*Table 3-1: Appliance Rebates Sampling Results*

Measure Category <sup>10</sup>	Ex-Ante kWh	Ex-Post kWh	Population	Sample Size	Assumed CV	Relative Precision at 90% CL
Air Purifier	455,250	454,957	672	26	0.5	16%
Clothes Dryer	152,012	151,127	738	15	0.5	21%
Clothes Washer	45,160	153,399	38	12	0.5	20%
Dehumidifier	93,615	105,135	505	13	0.5	23%
Heat Pump Water Heater	86,037	86,037	285	4	0.5	41%
Refrigerator	142,436	141,866	905	19	0.5	19%
Room Air Conditioner	16,695	15,551	51	11	0.5	22%
<b>Total</b>	<b>991,204</b>	<b>1,108,072</b>	<b>3,194</b>	<b>100</b>	<b>0.5</b>	<b>8.9%</b>

ADM used an online survey platform but carried out mixed-mode surveys. The primary mode was online surveys through email invitations, since the program tracking data included valid email addresses for nearly all participants. Telephone surveys helped to expedite the data collection rate and to increase survey response rates for measures with few responses from the online surveys. Table 3-3 shows the number of contacted customers and the survey response rate. All contacted participants were offered a \$5 gift card to complete the survey.

*Table 3-2: Appliance Rebates Survey Response Rate*

<b>Population</b>	5,573
<b>Contacted (Email or Phone)</b>	313
<b>Surveys Completed</b>	100

<sup>10</sup> Measure quantities in this report differ from unique participant counts in JCP&L's PY22Q4 report. There is not a one-to-one correspondence between participants and measures for this program.

<b>Response Rate</b>	32%
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**3.3.2 Gross Verified Savings Calculation**

ADM calculated gross verified energy impacts (also referred to as ex-post savings throughout the report) for measures in this program component using savings algorithms from the NJ Protocols as listed in Table 3-3.

*Table 3-3: Appliance Rebates TRM Summary<sup>11</sup>*

<b>Measure</b>	<b>TRM</b>
Air Purifier	FY2020 NJ TRM (pg. 53)
Clothes Dryer	FY2020 NJ TRM (pg. 53)
Clothes Washer	FY2021 NJ TRM (pg. 38)
Dehumidifier	FY2020 NJ TRM (pg. 62)
Heat Pump Water Heater	FY2020 NJ TRM (pg. 17)
Refrigerator	FY2020 NJ TRM (pg. 53)
Room Air Conditioner	FY2020 NJ TRM (pg. 60)

The impact calculations have the following types of variable input parameters:

- The measure installation rate
- Equipment-specific capacities and efficiencies
- Baseline equipment efficiencies provided by the TRM
- For certain measures such as clothes washers, fuel types for water heating and clothes drying

The relevant TRM protocols also supply parameters such as annual hours of use, peak demand coincidence factors, or other terms that characterize equipment utilization. These parameters are considered to be fixed for the purposes of impact evaluation at the basic level of rigor.

ADM calculated ex-post savings for the census of records in the tracking data. For each record, ADM cross-referenced attributes such as capacity and efficiency from the ENERGY STAR database and used measure installation rates derived from participant surveys. The participant surveys also supplied the following information required to calculate savings for clothes washers:

- The fractions of clothes washers installed in homes with electric and gas water heaters

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<sup>11</sup> Source : NJ CML.

- The fractions of clothes washers installed in homes with electric and gas dryers

### **3.3.3 Process Evaluation Activities**

For PY22, the process evaluation consisted of an in-depth interview with JCP&L's program manager and the overall residential implementation manager. Expanded process evaluation activities for PY23 will also include customer surveys and interviews with implementation staff, trade allies, and retailers. Section Appendix G includes PY23 process evaluation research questions.

## **3.4 Appliance Recycling**

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ADM evaluated the Appliance Recycling program component using program tracking data and customer surveys as primary data sources.

### **3.4.1 Sampling and Surveying**

ADM developed a simple random sample with an overall target of  $\pm 10$  percent precision at the 90 percent confidence level to verify the accuracy of tracking data. CV of 0.5 was assumed to calculate and monitor relative precision for the gross impact evaluation. For this program, the key data to extract from surveys is the verification rate of the rebated measures. Verification means that the surveyed participant states that the appliance in question was (1) recycled by the program implementer and (2) was in working condition when collected by the implementer. In practice, the CV for this parameter was much smaller than 0.5, since the verification rate tends toward 1.0 for appliance recycling. The selected value of 0.5 for the CV is an important planning tool since it leads to a relatively large survey sample, which is advisable since the marginal cost of data collection is small.

While ADM employed a simple random sample, relative precisions were calculated and tracked at the measure level as shown in Table 3-4 below. The relative precision was calculated using ex-post annual electric energy savings, using the planning CV of 0.5 and the finite population correction. ADM separately provided to SWE and summarized in Table 2-3 and Table 2-4 a table of key parameters collected from the survey with as-found means, standard deviations, and relative precisions.

Table 3-4: Appliance Rebates Sampling Summary

Measure Category <sup>12</sup>	Ex-Ante kWh	Ex-Post kWh	Population	Sample Size	Assumed CV	Relative Precision at 90% CL
Dehumidifier Recycling	69,776	69,776	356	18	0.5	19%
Freezer Recycling	624,910	624,910	874	16	0.5	20%
Refrigerator Recycling	4,775,202	4,775,202	4349	55	0.5	11%
Room Air Conditioner Recycling	50,819	50,819	571	28	0.5	15%
<b>Total</b>	<b>5,520,707</b>	<b>5,520,707</b>	<b>6,150</b>	<b>117</b>	<b>0.5</b>	<b>9.81%</b>

ADM used an online survey platform but carried out mixed-mode surveys. The primary mode was online surveys through email invitations, since the program tracking data included valid email addresses for nearly all participants. Telephone surveys helped to expedite the data collection rate and to increase survey response rates for measures with few responses from the online surveys. Table 3-5 shows the number of contacted customers and the survey response rate. All contacted participants were offered a \$5 gift card to complete the survey.

Table 3-5: Appliance Recycling Survey Response Rate

<b>Population</b>	6,150
<b>Contacted (Email or Phone)</b>	244
<b>Surveys Completed</b>	117
<b>Response Rate</b>	48%

### 3.4.2 Gross Verified Savings Calculation

ADM calculated gross verified energy impacts (also referred to as ex-post savings throughout the report) for measures in this program component using savings algorithms from the NJ Protocols as listed in Table 3-6.

Table 3-6: Appliance Recycling TRM Summary<sup>13</sup>

Measure	TRM
Dehumidifier Recycling	FY2020 NJ TRM (pg. 68)
Freezer Recycling	FY2020 NJ TRM (pg. 68)
Refrigerator Recycling	FY2020 NJ TRM (pg. 68)
Room Air Conditioner Recycling	FY2020 NJ TRM (pg. 68)

<sup>12</sup> Measure quantities in this report differ from unique participant counts in JCP&L's PY22Q4 report. There is not a one-to-one correspondence between participants and measures for this program.

<sup>13</sup> Source : NJ CML.

The impact calculations, according to the FY2020 NJ TRM, are fully deemed, so the verification rate is the only parameter that impacts the calculation. ADM's surveys collected additional information such as location of installation and part-use factors, and whether refrigerators are primary or secondary units, in case the NJ TRM will be updated to use partially deemed algorithms.

### **3.4.3 Process Evaluation Activities**

For PY22, the process evaluation consisted of an in-depth interview with JCP&L's program manager and the overall residential implementation manager. Expanded process evaluation activities for PY23 will also include customer surveys and interviews with implementation staff, trade allies, and retailers. Section Appendix G includes PY23 process evaluation research questions.

## **3.5 Energy Efficiency Kits**

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ADM evaluated the Energy Efficient Kits program component using program tracking data and customer surveys as primary data sources.

Customer surveys were used to determine:

- if the customer received the kit
- what type of kit the customer received
- which kit components the customer installed
- the customer's water heater fuel type

### **3.5.1 Sampling and Surveying**

ADM developed a simple random sample with an overall target of  $\pm 10$  percent precision at the 90 percent confidence level to verify the accuracy of tracking data. A coefficient of variation (CV) of 0.5 was assumed to calculate and monitor relative precision for the gross impact evaluation. For this program, the key data to extract from surveys is the verification rate or installation rate (ISR) of the rebated measures. In practice, the CV for this parameter was much smaller than 0.5, since the overall ISR tends to be close to 1.0 for downstream HVAC programs. The selected value of 0.5 for the CV is an important planning tool since it leads to a relatively large survey sample.

The overall relative sample count and relative precision is shown in Table 3-7 below. The relative precision was calculated using ex-post annual electric energy savings, using the planning CV of 0.5 and the finite population correction. ADM separately provided to SWE



and summarized key parameters collected from the survey with as-found means, standard deviations, and relative precisions<sup>14</sup>.

*Table 3-7: EE Kits Sampling Summary*

<b>Measure Category<sup>15</sup></b>	<b>Ex-Ante kWh</b>	<b>Ex-Post kWh</b>	<b>Population</b>	<b>Sample Size</b>	<b>Assumed CV</b>	<b>Relative Precision at 90% CL</b>
EE Kits	29,703,573	26,581,399	75,435	110	0.5	7.8%
<b>Total</b>	<b>29,703,573</b>	<b>26,581,399</b>	<b>75,435</b>	<b>110</b>	<b>0.5</b>	<b>7.8%</b>

ADM used an online survey platform but carried out mixed-mode surveys. The primary mode was online surveys through email invitations, since the program tracking data included valid email addresses for nearly all participants. Telephone surveys helped to expedite the data collection rate and to increase survey response rates for measures with few responses from the online surveys. Table 3-8 shows the number of contacted customers and the survey response rate. All contacted participants were offered a \$5 gift card to complete the survey.

*Table 3-8: Appliance Rebates Survey Response Rate*

<b>Population</b>	75,435
<b>Contacted (Email or Phone)</b>	1303
<b>Surveys Completed</b>	110
<b>Response Rate</b>	8%

### **3.5.2 Gross Verified Savings Calculation**

ADM calculated gross verified energy impacts (also referred to as ex-post savings throughout the report) for measures in this program component using savings algorithms from the NJ CML as listed in Table 3-9. Unit savings for each component reflect component-level, in-service rates (ISRs).

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<sup>14</sup> For the EE Kits program, ADM provided data from both the PY22 and PY23 basic rigor evaluations to achieve better precision on ISRs for all kit components. This is why the counts in Table 2-3 are higher than the counts in Table 3-7.

<sup>15</sup> Measure quantities in this report differ from unique participant counts in JCP&L's PY22Q4 report. There is not a one-to-one correspondence between participants and measures for this program.

*Table 3-9: Energy Efficient Kits TRM and ISR Summary<sup>16</sup>*

<b>Kit Components</b>	<b>TRM</b>
3-way LED (6/11/15 watt)	2020 NJ TRM (pg. 65)
LED (A19 or equivalent – 15 watt)	2020 NJ TRM (pg. 65)
LED (A19 or equivalent – 9 watt)	2020 NJ TRM (pg. 65)
Tier 1 Smart Strip	2020 NJ TRM (pg. 57)
LED Night Lite	2020 NJ TRM (pg. 33)
Furnace Whistle	2021 PA TRM (pg. 45)
Low-flow Showerhead	2021 NJ TRM (pg. 32)
Low-flow Showerhead	2021 NJ TRM (pg. 32)
Bathroom Aerator	2020 NJ TRM (pg. 182)
Kitchen Swivel Aerator	2020 NJ TRM (pg. 182)

ADM calculated unit savings for kit components using product model specifications (verified by model numbers) and survey results (ISRs and percentages of water heater fuel types). ISRs were calculated separately for each kit component.

The impact calculations have several types of variable input parameters:

- The measure installation rate
- Equipment-specific parameters such as lumen outputs, flow rates, and watts
- Baseline equipment efficiencies provided by the TRM
- For certain measures such as shower heads and aerators, fuel types for water heating
- For lighting measures, the space heating fuel type
- For aerators and advanced power strips, the location of installation within the house (kitchen vs. bathroom for aerators)

### **3.5.3 Process Evaluation Activities**

For PY22, the process evaluation consisted of an in-depth interview with JCP&L’s program manager and the overall residential implementation manager. Expanded process evaluation activities for PY23 will also include customer surveys and interviews with implementation staff, trade allies, and retailers. Section Appendix G includes PY23 process evaluation research questions. For Energy Efficiency kits, the ADM team performed an important benchmarking activity during the program startup phase. The overall energy savings for the kits are highly dependent on ISRs. ADM compared kit contents and quantities to a similar program offered by several utilities in Pennsylvania and provided average ISRs for each measure. This activity helped to maintain the

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<sup>16</sup> Source: NJ CML.

program’s realization rate much closer to 100 percent, compared to other similar programs in their startup year.

### 3.6 HVAC Rebates

ADM evaluated the HVAC Rebates program component using program tracking data and customer surveys as primary data sources.

#### 3.6.1 Sampling and Surveying

ADM developed a simple random sample with an overall target of  $\pm 10$  percent precision at the 90 percent confidence level to verify the accuracy of tracking data. CV of 0.5 was assumed to calculate and monitor relative precision for the gross impact evaluation. For this program, the key data to extract from surveys is the verification rate of the rebated measures. Sampling requirements and results are reported in in Table 3-10. While ADM employed a simple random sample, relative precisions were calculated and tracked at the measure level as shown in Table 3-10 below. The relative precision was calculated using ex-post annual electric energy savings, using the planning CV of 0.5 and the finite population correction. ADM separately provided to SWE key parameters collected from the survey with as-found means, standard deviations, and relative precisions.

*Table 3-10: HVAC Rebates Sampling Summary*

Measure Category <sup>17</sup>	Ex-Ante kWh	Ex-Post kWh	Population	Sample Size	Assumed CV	Relative Precision at 90% CL
Central Air Conditioner	301,087	301,215	1,005	50	0.5	11%
Ductless Muni-Split	144,657	144,903	155	18	0.5	18%
Smart Thermostat	38,878	38,878	251	31	0.5	14%
Air Source Heat Pump	27,208	24,886	23	1	0.5	80%
Geothermal Heat Pump	14,139	13,852	6	0	0.5	100%
Heat Pump Water Heater	8,435	8,435	5	2	0.5	45%
Gas Furnace	0	0	13	0	0.5	NA
<b>Total</b>	<b>534,405</b>	<b>532,170</b>	<b>1,458</b>	<b>102</b>	<b>0.5</b>	<b>9.4%</b>

ADM used an online survey platform but carried out mixed-mode surveys. The primary mode was online surveys through email invitations, since the program tracking data included valid email addresses for nearly all participants. Telephone surveys helped to expedite the data collection rate and to increase survey response rates for measures with few responses from the online surveys. Table 3-11 shows the number of contacted

<sup>17</sup> Measure quantities in this report differ from unique participant counts in JCP&L’s PY22Q4 report. There is not a one-to-one correspondence between participants and measures for this program.

customers and the survey response rate. All contacted participants were offered a \$5 gift card to complete the survey.

*Table 3-11: HVAC Survey Response Rate*

<b>Population</b>	1,457
<b>Contacted (Email or Phone)</b>	291
<b>Surveys Completed</b>	102
<b>Response Rate</b>	35%

### 3.6.2 Gross Verified Savings Calculation

ADM calculated gross verified savings for measures in this program component using savings protocols included in NJ CML as listed in Table 3-12.

ADM collected model specifications (unit capacity, SEER, EER and HSPF values) using AHRI ID numbers provided in the tracking data. Deemed values for equivalent full-load hours (EFLH) for both cooling and heating were sourced from the NJ Protocols.

*Table 3-12: HVAC Rebates TRM Summary<sup>18</sup>*

<b>Measure</b>	<b>TRM</b>
Air Source Heat Pump (SEER >=16, EER>=12.5, HSPF >=9)	FY2020 NJ TRM (pg. 15)
Air Source Heat Pump (SEER >=18, EER>=13, HSPF >=10)	FY2020 NJ TRM (pg. 15)
Central Air Conditioner (SEER >=16, EER >=12.5)	FY2020 NJ TRM (pg. 15)
Central Air Conditioner (SEER >=18, EER >=13)	FY2020 NJ TRM (pg. 15)
Ductless Mini-Split A/C (SEER >=20, EER>=12.5)	FY2020 NJ TRM (pg. 15)
Ductless Mini-Split Heat Pump – Multi Zone (SEER >=18, >=12.5, HSPF >=10)	FY2020 NJ TRM (pg. 15)
Ductless Mini-Split Heat Pump - Single Zone (SEER >=20, >=12.5, HSPF >=10)	FY2020 NJ TRM (pg. 15)
Gas Furnace – Tier 1 AFUE – 95-96.9%	FY2020 NJ TRM (pg.23)
Gas Furnace – Tier 2 AFUE >= 97%	FY2020 NJ TRM (pg.23)
Geothermal Heat Pump	FY2020 NJ TRM (pg. 16)
Heat Pump Water Heater – ENERGY STAR	FY2020 NJ TRM (pg. 17)
Smart Thermostat – Electric A/C and Elec Heat	Mid Atlantic TRM V10 (pg.103)
Smart Thermostat – Electric A/C and No Natural Gas	Mid Atlantic TRM V10 (pg.103)
Smart Thermostat – Gas Heat w/ CAC	Mid Atlantic TRM V10 (pg.103)

The impact calculations have the following types of variable input parameters:

- The measure installation rate
- Equipment-specific capacities and efficiencies

<sup>18</sup> Source : NJ CML.

- Baseline equipment efficiencies provided by the TRM
- For certain measures such as smart thermostats, fuel types for space heating

The relevant TRM protocols also supply parameters such as annual hours of use, peak demand coincidence factors, or other terms that characterize equipment utilization. These parameters are considered to be fixed for the purposes of impact evaluation at the basic level of rigor.

ADM calculated ex-post savings for the census of records in the tracking data. For each record, ADM cross-referenced attributes such as capacity and efficiency from the ENERGY STAR or AHRI databases and used measure installation rates derived from participant surveys.

### **3.6.3 Process Evaluation Activities**

For PY22, the process evaluation consisted of an in-depth interview with JCP&L's program manager and the overall residential implementation manager. Expanded process evaluation activities for PY23 will also include customer surveys and interviews with implementation staff, trade allies, and retailers. Section Appendix G includes PY23 process evaluation research questions.

## **3.7 Lighting**

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ADM evaluated the Lighting program component using program tracking data and general population customer survey results as primary data sources. General population survey responses were used to calculate ex-post ISRs and HOU's. ADM reviewed product model numbers included in program tracking data to verify that lighting products sold through the program were ENERGY STAR certified and to obtain bulb wattages.

### **3.7.1 Sampling and Surveying**

ADM conducted a general population survey to determine the following key parameters associated with the upstream lighting program:

- What fraction of rebated lamps have been installed?
- What fraction of rebated lamps have been installed outdoors vs. indoors?
- What fraction of rebated lamps have been installed in non-residential settings?

The general population survey included preliminary screening questions to identify customers that purchased LED lamps that were rebated at the point of sale, at participating retailer stores. The response rate for the general population survey is shown in Table 3-13. We note that the total number of customers that completed the survey was higher than 140, but that preliminary screening questions ended surveys if respondents

reported that they had not purchased LED lamps from participating stores within the last 12 months. All contacted participants were offered a \$5 gift card to complete the survey.

*Table 3-13: General Population Survey Response Rate*

<b>Population</b>	-
<b>Contacted (Email or Phone)</b>	4732
<b>Surveys Completed</b>	140
<b>Response Rate</b>	3%

### 3.7.2 Gross Verified Savings Calculation

ADM calculated gross verified savings for measures in this program component using savings protocols included in the NJ Protocols as listed in Table 3-14.

*Table 3-14: Lighting TRM Summary<sup>19</sup>*

<b>Measure</b>	<b>TRM</b>
Foodbank Kit A	FY2020 NJ TRM (pg. 53 &/ pg. 64)
LED – Decorative – 150 – 299 lumens	FY2020 NJ TRM (pg. 64)
LED – Decorative – 300 – 499 lumens	FY2020 NJ TRM (pg. 64)
LED – Decorative – 500 – 699 lumens	FY2020 NJ TRM (pg. 64)
LED – Decorative – 90 – 149 lumens	FY2020 NJ TRM (pg. 64)
LED – Globe – 350 – 499 lumens	FY2020 NJ TRM (pg. 64)
LED – Globe – 500 – 574 lumens	FY2020 NJ TRM (pg. 64)
LED – Other Decorative – 500 – 699 lumens	FY2020 NJ TRM (pg. 64)
LED – Reflector/Flood – BR30 ->1419 lumens	FY2020 NJ TRM (pg. 64)
LED – Reflector/Flood – BR30, BR40, ER30, ER40 – 500 – 1419 lumens	FY2020 NJ TRM (pg. 64)
LED – Reflector/Flood – PAR - >1300 lumens	FY2020 NJ TRM (pg. 64)
LED – Reflector/Flood – PAR – 1000 – 1300 lumens	FY2020 NJ TRM (pg. 64)
LED – Reflector/Flood – PAR – 300 - 599 lumens	FY2020 NJ TRM (pg. 64)
LED – Reflector/Flood – PAR – 600 - 849 lumens	FY2020 NJ TRM (pg. 64)
LED – Reflector/Flood – PAR – 850 - 999 lumens	FY2020 NJ TRM (pg. 64)
LED – Reflector/Flood – R – 300 - 599 lumens	FY2020 NJ TRM (pg. 64)
LED – Reflector/Flood – R – 600 - 849 lumens	FY2020 NJ TRM (pg. 64)
LED – Reflector/Flood – R – 200 - 299 lumens	FY2020 NJ TRM (pg. 64)
LED – Reflector/Flood – R20 -> 715 lumens	FY2020 NJ TRM (pg. 64)
LED – Reflector/Flood – R20 – 450 – 715 lumens	FY2020 NJ TRM (pg. 64)
LED – Standard – 2550 – 3000 lumens	FY2020 NJ TRM (pg. 64)
LED – Standard – 1100 – 1599 lumens	FY2020 NJ TRM (pg. 64)

<sup>19</sup> Source : NJ CML.

Measure	TRM
LED – Standard – 1600 – 1900 lumens	FY2020 NJ TRM (pg. 64)
LED – Standard – 2000 – 2549 lumens	FY2020 NJ TRM (pg. 64)
LED – Standard – 250 – 449 lumens	FY2020 NJ TRM (pg. 64)
LED – Standard – 450 – 799 lumens	FY2020 NJ TRM (pg. 64)
LED – Standard – 800 – 1099 lumens	FY2020 NJ TRM (pg. 64)

ADM calculated ex-post unit savings using baseline wattages from NJ CML, efficient wattages drawn from the ENERGY STAR database based on the model numbers provided in the tracking data. ISRs and HOU were calculated using general population survey results. Remaining variables were sourced from 2020 NJ Protocols.

### *Hours of Use*

ADM calculated ex-post HOU based survey responses about installation location. Ex-post HOU reflect that 91 percent of bulbs were installed in interior residential locations, 6.6 percent of bulbs were installed in exterior locations, and 1.9 percent of bulbs were installed in commercial locations.

### *In Service Rate*

ADM calculated an ISR of 95.14 ( $\pm 2.6$  percent at the 90 percent confidence level) using general population survey results. This is comparable to ISR values listed in numerous technical reference manuals. The NJ Protocols for upstream lighting do not include a term for ISR for residential lighting. ADM has recommended that ISRs should be incorporated into the savings algorithms for residential lighting, although the ISRs are dependent on the delivery mechanism. ADM has provided ISRs developed from our PY22 evaluation effort to SWE.

### *Process Evaluation Approach*

For PY22, the process evaluation consisted of an in-depth interview with JCP&L’s program manager and the overall residential implementation manager. Expanded process evaluation activities for PY23 will also include customer surveys and interviews with implementation staff, trade allies, and retailers. Section Appendix G includes PY23 process evaluation research questions.

## **3.8 Online Marketplace**

ADM evaluated the HVAC Rebates program component using program tracking data and customer surveys as primary data sources.

### 3.8.1 Sampling and Surveying

ADM developed a simple random sample with an overall target of  $\pm 10$  percent precision at the 90 percent confidence level to verify the accuracy of tracking data. CV of 0.5 was assumed to calculate and monitor relative precision for the gross impact evaluation. For this program, the key data to extract from surveys is the verification rate of the rebated measures. Sampling requirements and results are reported in Table 3-15. While ADM employed a simple random sample, relative precisions were calculated and tracked at the measure level as shown in Table 3-15 below. The relative precision was calculated using ex-post annual electric energy savings, using the planning CV of 0.5 and the finite population correction. ADM separately provided to SWE key parameters collected from the survey with as-found means, standard deviations, and relative precisions.

*Table 3-15: Online Marketplace Sampling Results*

Measure Category <sup>20</sup>	Ex-Ante kWh	Ex-Post kWh	Population	Sample Size	Assumed CV	Relative Precision at 90% CL
Smart Thermostats	1,017,188	1,005,496	5,614	172	0.5	6%
LED Lamps	399,652	447,131	1,451	188	0.5	6%
Air Purifier	39,863	39,863	40	0	0.5	100%
Advanced Power Strip	37,953	32,391	192	5	0.5	36%
Holiday Lights	343	266	10	10	0.5	0%
<b>Total</b>	<b>1,494,999</b>	<b>1,525,147</b>	<b>7,307</b>	<b>375</b>	<b>0.5</b>	<b>5.2%</b>

ADM used an online survey platform but carried out mixed-mode surveys. The primary mode was online surveys through email invitations, since the program tracking data included valid email addresses for nearly all participants. Telephone surveys helped to expedite the data collection rate and to increase survey response rates for measures with few responses from the online surveys. Table 3-16 shows the number of contacted customers and the survey response rate. Note the number of sample points exceeded the number of completed surveys because many respondents had purchased multiple items - particularly LED lamps and to a lesser extent smart thermostats. All contacted participants were offered a \$5 gift card to complete the survey.

*Table 3-16: Online Marketplace Survey Response Rate*

<b>Population</b>	7,692
<b>Contacted (Email or Phone)</b>	1601
<b>Surveys Completed</b>	118
<b>Response Rate</b>	7%

<sup>20</sup> Measure quantities in this report differ from unique participant counts in JCP&L's PY22Q4 report. There is not a one-to-one correspondence between participants and measures for this program.



### 3.8.2 Gross Verified Savings Calculation

ADM calculated ex-post savings for measures in this program component using savings protocols included in NJ CML as listed in Table 3-17.

Table 3-17: Online Marketplace TRM Summary<sup>21</sup>

Measure	TRM
Advanced Power Strip + Multi-sensor 7-outlet Tier 2	FY2020 NJ TRM (pg. 53)
Advanced Power Strip 7-outlet Tier 1	FY2020 NJ TRM (pg. 53)
Air Purifier - (CADR 120)	FY2020 NJ TRM (pg. 54)
Air Purifier - (CADR 230)	FY2020 NJ TRM (pg. 54)
Air Purifier - (CADR 380)	FY2020 NJ TRM (pg. 54)
Holiday 25 Light Cool White C7 LED String Lights, 8" spacing, 17 ft length	2021 PA TRM (pg. 9)
Holiday 25 Light Cool White C9 LED String Lights, 8" spacing, 17 ft length	2021 PA TRM (pg. 9)
Holiday 25 Light Multi-Color C9 LED String Lights, 8" spacing, 17 ft length	2021 PA TRM (pg. 9)
Holiday 70 Light Cool White LED String Lights, 4" spacing, 24 ft long	2021 PA TRM (pg. 9)
Holiday 70 Light Multi-Color LED String Lights, 4" spacing, 24 ft long	2021 PA TRM (pg. 9)
LED 12W LED A-lamp 3-way (2 pack)	FY2020 NJ TRM (pg. 64)
LED 7 watt MR16 Lamp with GU10 base (4 pack)	FY2020 NJ TRM (pg. 64)
LED 7 watt MR16 Lamp with GU5.3 base (4 pack)	FY2020 NJ TRM (pg. 64)
LED A19 Lamp - 11 Watt (4 pack)	FY2020 NJ TRM (pg. 64)
LED A19 Lamp - 15 Watt (4 pack)	FY2020 NJ TRM (pg. 64)
LED A19 Lamp - 6 watt (4 pack)	FY2020 NJ TRM (pg. 64)
LED A19 Lamp - 9 watt (4 pack)	FY2020 NJ TRM (pg. 64)
LED BR30 Flood Lamp 11 Watt (4 pack)	FY2020 NJ TRM (pg. 64)
LED BR30 Flood Lamp 8 Watt (4 pack)	FY2020 NJ TRM (pg. 64)
LED BR40 Flood Lamp 17 Watt (4 pack)	FY2020 NJ TRM (pg. 64)
LED Candelabra Lamp 5 Watt E12 base (4 pack)	FY2020 NJ TRM (pg. 64)
LED Filament Candelabra 4 watt E12 base (4 pack)	FY2020 NJ TRM (pg. 64)
LED G25 Globe 6 Watt E26 base (4 pack)	FY2020 NJ TRM (pg. 64)
LED Night Light 0.3 Watt (2 pack)	FY2020 NJ TRM (pg. 33)
LED Par 38 Dimmable 15 Watt (2 pack)	FY2020 NJ TRM (pg. 64)
Smart Thermostat - Electric A/C and No Natural Gas Not Controlled	Mid Atlantic TRM V10 (pg.103)
Smart Thermostat - Electric AC and Electric Heat Not Controlled	Mid Atlantic TRM V10 (pg.103)
Smart Thermostat - Electric AC and no Natural Gas	Mid Atlantic TRM V10 (pg.103)
Smart Thermostat - Gas Heat Not Controlled with CAC	Mid Atlantic TRM V10 (pg.103)
Smart Thermostat - No CAC and Electric Heat Not Controlled	Mid Atlantic TRM V10 (pg.103)

<sup>21</sup> Source: NJ CML.

Measure	TRM
Smart Thermostat - No Central A/C and Electric Heat	Mid Atlantic TRM V10 (pg.103)
Smart Thermostat - No Central A/C and No Natural Gas	Mid Atlantic TRM V10 (pg.103)
Smart Thermostats - Electric A/C and Elec Heat	Mid Atlantic TRM V10 (pg.103)
Smart Thermostats - Gas Heat and no CAC or Muni	Mid Atlantic TRM V10 (pg.103)
Smart Thermostats - Gas Heat Not Controlled and No CAC or Muni	Mid Atlantic TRM V10 (pg.103)
Smart Thermostats - Gas Heat w/ CAC	Mid Atlantic TRM V10 (pg.103)
Wall plate	N/A
WiFi Smart A19, 9W CCT+RGB+WiFi, EnergyStar, Gen 2, NOT suitable for use in totally enclosed fixtures (2 pack)	FY2020 NJ TRM (pg. 64)
WiFi Smart BR30, 8W, CCT+RGB+WiFi, EnergyStar, Gen 2 (2 pack)	FY2020 NJ TRM (pg. 64)

The impact calculations have the following types of variable input parameters:

- The installation rate
- For smart thermostats, the heating fuel source

ADM calculated ex-post unit savings for lighting measures using baseline wattages from NJ CLM and efficient wattages drawn from the ENERGY STAR database based on the model numbers provided in the tracking data. Smart thermostats ex-post savings were calculated using deemed savings based on heating and cooling fuels indicated in the tracking data.

### 3.8.3 Process Evaluation Activities

For PY22, the process evaluation consisted of an in-depth interview with JCP&L's program manager and the overall residential implementation manager. Expanded process evaluation activities for PY23 will also include customer surveys and interviews with implementation staff, trade allies, and retailers. Section Appendix G includes PY23 process evaluation research questions.

## 4 Process Evaluation

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The Efficient Product Program includes six components that fall into the following categories:

- Product discounts and rebates (appliances, HVAC, lighting)
- Recycled appliances
- Energy Efficient Kits
- Online Marketplace

### 4.1 Appliance Rebates

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The Efficient Products Program offers residential customers rebates on appliances and HVAC equipment, and point-of-sale discounts on retail LED lightbulbs. Measures generate both electricity and natural gas savings. The rebate and discount program components launched on July 1, 2021 and is operated by CLEAResult. Lighting measures contributed 51 percent of portfolio savings, while appliance and HVAC measures each contributed approximately 1 percent. The ADM team interviewed JCP&L program staff to evaluate program operations. Note that these findings are based on JCP&L staff interviews only.

#### 4.1.1 Program Design and Implementation

##### *Lighting*

The lighting program component provides point-of-sale discounts on select LED lightbulbs at 807 participating retail stores including The Home Depot, Target, Costco, Dollar Tree, Goodwill, Walmart, and independent stores. CLEAResult recruits and manages relationships with the retailers. The lighting program component also distributed LED lighting kits through foodbanks.

##### *Appliances*

The Appliance Rebates program component offers retail customers rebates on qualified ENERGY STAR qualified air purifiers, room air conditioners, dehumidifiers, heat pump water heaters, clothes washers and dryers, and refrigerators. Customers can apply for rebates online or by mail. The program provides participating retailers with program signage and rebate applications to promote the program. Qualified appliances are eligible for rebates regardless of where they are purchased.

## **HVAC Rebates**

The HVAC Rebates program component offers rebates for qualified air source heat pumps, central air conditioners, ductless mini-splits, geothermal heat pumps, and smart thermostats. Either the JCP&L retail customer or the HVAC contractor can submit a rebate application for a specific eligible HVAC installation. Contractors can submit rebate applications and track their progress through a trade allies web site. If a customer purchases HVAC equipment from one of over 50 approved contractors, the customer can apply for five-year, zero-percent financing from the National Energy Improvement Fund (NEIF) for projects that cost from \$2,500 to \$15,000. For qualifying low- and moderate-income (LMI) customers, projects can be financed over seven years. LMI customers can also receive an additional \$200 rebate per HVAC unit.

### **4.1.2 Marketing**

CLEAResult promotes residential rebate offers using e-mails, bill inserts, store signage, and in-store promotional events that give program staff the opportunity to educate store customers about energy efficient products and the rebate offering. CLEAResult also recruits and manages a trade ally network to promote HVAC rebates.

### **4.1.3 Implementation and Barriers to Participation**

Program staff recruit and train a network of HVAC, electrical, plumbing, and other trade allies who can reliably install energy efficient equipment. Program staff monitors trade allies to assess the effectiveness of outreach efforts, incentive levels, delivery methods, and to solicit suggestions for program improvement. CLEAResult managed the online application portal, verified customer eligibility, and managed rebate processing.

The primary market barriers that impact this program include:

- **Initial Cost of Efficient Equipment:** energy efficient equipment usually has a higher purchase price and a lower lifetime operating cost than baseline efficiency products. Higher upfront cost barriers are addressed by providing financial incentives and attractive financing to help mitigate the up-front cost barrier.
- **Customer Awareness and Engagement:** Residential customers may not be aware of the benefits of installing efficient equipment. Program staff educate customers about the benefits of efficient equipment through targeted marketing. The program partners with retailers and trade allies to promote program offerings and focus marketing, education, and outreach efforts to ensure that trade allies can educate their customers about program benefit. Program materials are provided in both English and Spanish and expect to provide materials in more languages.

- **Owner versus tenant Interests:** Property owners may be resistant to investing in energy efficient appliances and HVAC equipment, when tenants rather than owners benefit from lower utility bills. To address this barrier, the program was marketed to both property owners and tenants to assure that those exposed to energy costs were able to participate in the program. Program staff and trade allies provide technical assistance to property owners and managers to develop and market green properties to attract tenants.

#### 4.1.4 Survey Results

ADM surveyed participants in all three program components that offered discounts and rebates. Participant demographic data is presented below for each program component.

##### *Appliance Rebates*

ADM surveyed 84 residential customers who participated in the Appliance Rebates program component. Most respondents were homeowners living in single-family homes. Nearly 85 percent of respondents said they lived with at least one other person. Table 4-1 summarizes the Appliance Rebates participants home characteristics.

*Table 4-1: Appliance Rebates Respondent Home Characteristics*

Question	Response	Percentage
Do you own or rent your home?	Own	97.6%
	Rent	2.4%
Which of the following best describes your home type?	Single family detached	76.2%
	Apartment/condo in a 2–4-unit building	4.8%
	Duplex	3.6%
	Apartment/condo in a 5+ unit building	4.8%
	Single family townhouse or row house (adjacent walls to another house)	10.7%
When was your home built?	Before 1960	22.6%
	1960-1979	28.6%
	1980-1999	27.4%
	2000-2009	7.1%
	2010 or later	10.7%
	I don't know	3.6%
Including yourself, how many people live in your household?	1	14.3%
	2	46.4%
	3	26.2%

Question	Response	Percentage
	4	6.0%
	5	4.8%
	6	1.2%
	Prefer not to answer	1.2%
About how many square feet is your home?	Less than 1,000 square feet	10.7%
	1,000-1,999 square feet	41.7%
	2,000-2,999 square feet	33.3%
	3,000-3,999 square feet	7.1%
	4,000-4,999 square feet	3.6%
	5,000 or greater square feet	1.2%
	I don't know	2.4%

Most survey respondents identified as white and nearly half said their income was over 400 percent of the Federal Poverty Level (FPL). Thirteen percent reported an income between 250 and 400 percent of FPL, and 12 percent of respondents reported an income below 250 percent of the FPL. Table 4-2 provides additional demographic information about Appliance Rebates program component participants.

*Table 4-2: Appliance Rebates Participant Demographics*

Question	Response	Percentage
What is your age?	Under 35 years old	10%
	35- 55 years old	37%
	Over 55 years old	52%
	Prefer not to answer	1%
How would you identify your race or ethnicity?	Asian	6%
	Black or African American	1%
	Hispanic or Latino/Latina	2%
	Middle Eastern or North African	1%
	White	83%
	Prefer not to answer	6%

### **HVAC Rebates Survey Results**

ADM surveyed 101 customers who participated in the HVAC Rebates program component.

Most participants were homeowners, and most were living in single family homes. Table 4-3 summarizes HVAC respondents' home characteristics.

*Table 4-3: HVAC Rebates Respondent Home Characteristics*

Question	Response	Percentage
Do you own or rent your home?	Own	97.0%
	Rent	1.0%
Which of the following best describes your home type?	Single family detached	88.1%
	Apartment/condo in a 2-4 unit building	5.0%
	Duplex	1.0%
	Apartment/condo in a 5+ unit building	1.0%
	Single family townhouse or row house (adjacent walls to another house)	3.0%
When was your home built?	Before 1960	21%
	1960-1979	34%
	1980-1999	22%
	2000-2009	16%
	2010 or later	5%
	I don't know	1%
Including yourself, how many people live in your household?	1	15%
	2	47%
	3	9%
	4	20%
	5	8%
	6	1%
About how many square feet is your home?	Less than 1,000 square feet	4%
	1,000-1,999 square feet	37%
	2,000-2,999 square feet	44%
	3,000-3,999 square feet	10%
	4,000-4,999 square feet	3%
	5,000 or greater square feet	-
	I don't know	2%

About six percent of respondents reported an income below 250 percent of FPL, and nine percent reported an income between 250 percent and 400 percent of FPL. Table 4-4 provides additional demographic information about HVAC Rebates participants.

*Table 4-4: HVAC Rebates Respondent Demographics*

Question	Response	Percentage
What is your age?	Under 35 years old	6%
	35- 55 years old	32%
	Over 55 years old	57%
	Prefer not to answer	5%
How would you identify your race or ethnicity?	American Indian and Alaska Native	2%
	Asian	1%
	Black or African American	6%
	Hispanic or Latino/Latina	3%
	Native Hawaiian and Other Pacific Islander	1%
	White	65%
	Prefer not to answer	21%

**General Population Survey Results**

ADM surveyed 132 customers in a general population survey designed to collect data about customers who purchased discounted LED lightbulbs that were sold through the Lighting program component. Most participants were homeowners living in single family homes. Table 4-5 summarizes General Population Survey responses about home characteristics.

*Table 4-5: General Population Survey Home Characteristics*

Question	Response	Percentage
Do you own or rent your home?	Own	83.3%
	Rent	15.9%
	Prefer not to answer	0.8%
Which of the following best describes your home type?	Single family detached	70.5%
	Apartment/condo in a 2-4 unit building	6.1%
	Duplex	0.8%
	Apartment/condo in a 5+ unit building	8.3%
	Single family townhouse or row house (adjacent walls to another house)	8.3%
	I don't know	0.8%
	Triple decker (e.g., three story house with each floor being a separate unit)	0.8%
	Mobile home or trailer	3.0%



Question	Response	Percentage
	Other (please describe):	0.8%
	No Answer	0.8%
When was your home built?	Before 1960	24.2%
	1960-1979	26.5%
	1980-1999	24.2%
	2000-2009	6.8%
	2010 or later	9.8%
	I don't know	6.8%
	No Answer	1.5%
Including yourself, how many people live in your household?	1	18.9%
	2	36.4%
	3	21.2%
	4	14.4%
	5	5.3%
	6	2.3%
	7	0.8%
	No Answer	0.8%
About how many square feet is your home?	Less than 1,000 square feet	11.4%
	1,000-1,999 square feet	45.5%
	2,000-2,999 square feet	29.5%
	3,000-3,999 square feet	4.5%
	4,000-4,999 square feet	3.0%
	I don't know	5.3%
	No Answer	0.8%

Half of the General Population Survey respondents were over 55 years old and most identified as white. Table 4-6 provides additional demographic information.

*Table 4-6: General Population Respondent Demographics*

Question	Response	Percentage
What is your age?	Under 35 years old	18%
	35- 55 years old	26%
	Over 55 years old	50%
	Prefer not to answer	5%

Question	Response	Percentage
	No Answer	1%
How would you identify your race or ethnicity?	Asian	5%
	Black or African American	4%
	Hispanic or Latino/Latina	6%
	Two or more races or ethnicity (Asian, White)	1%
	Middle Eastern or North African	0%
	Two or more races or ethnicity (Black or African American, White)	1%
	White	73%
	Prefer not to answer	8%
	Not Listed (please specify):	2%

## 4.2 Appliance Recycling

The following section summarizes the findings from an interview with JCP&L Appliance Recycling program staff. The Appliance Recycling program offers customers an incentive to schedule the removal of inefficient appliances. The program removes and recycles old appliances. The program began operating at the beginning of July 2021.

### 4.2.1 Program Design and Implementation

The Appliance Recycling program is available to all customers, whether residential or commercial though most marketing efforts have been focused on residential customers. Commercial program goals and participation have been much lower.

Customers can schedule the removal of refrigerators, freezers, dehumidifiers, and room air conditioners. The customer receives an incentive payment when the appliance is removed.

### 4.2.2 Marketing

The Appliance Recycling program is marketed primarily through email blasts and bill inserts. The utility has seen a high response to these marketing efforts. JCP&L markets the program and its benefits on its website where customers can follow a link to website where they can schedule a pick-up appointment.

### **4.2.3 Appliance Recycling Survey Results**

ADM surveyed 96 customers who participated in the Appliance Recycling program component. Most respondents were homeowners and were living in single-family homes. Ninety-three percent of respondents said they lived with at least one additional person. Table 4-7 summarizes Appliance Recycling survey respondents' home characteristics.

*Table 4-7: Appliance Recycling Respondent Home Characteristics*

Question	Response	Percentage
Do you own or rent your home?	Own	95.8%
	Rent	3.1%
	Prefer not to answer	1.0%
Which of the following best describes your home type?	Single family detached	92.7%
	Single family townhouse or row house (adjacent walls to another house)	3.1%
	Mobile home or trailer	1.0%
	Apartment/condo in a 2-4 unit building	1.0%
	Apartment/condo in a 5+ unit building	2.1%
When was your home built?	Before 1960	39.6%
	1960-1979	26.0%
	1980-1999	27.1%
	2000-2009	6.3%
	2010 or later	0.0%
	I don't know	1.0%
Including yourself, how many people live in your household?	1	7.3%
	2	51.0%
	3	11.5%
	4	24.0%
	5	3.1%
	6	3.1%
About how many square feet is your home?	Less than 1,000 square feet	6.3%
	1,000-1,999 square feet	42.7%
	2,000-2,999 square feet	33.3%
	3,000-3,999 square feet	4.2%
	4,000-4,999 square feet	2.1%
	5,000 or greater square feet	3.1%
	I don't know	8.3%

More than half of respondents were over 55 years old, and most identified as white, though a substantial portion identified as Asian, Black, or Hispanic or Latino/Latina and reported being between 35-55 years old. Approximately 16 percent of respondents reported an income below 250 percent of FPL, and half of respondents reported an income over 400 percent of FPL. Table 4-8 includes additional demographic information about survey respondents.

*Table 4-8: Appliance Recycling Respondent Demographics*

Question	Response	Percent
What is your age?	Under 35 years old	6%
	35- 55 years old	29%
	Over 55 years old	58%
	Prefer not to answer	6%
How would you identify your race or ethnicity?	American Indian and Alaska Native	1%
	Asian	13%
	Black or African American	1%
	Hispanic or Latino/Latina	5%
	Middle Eastern or North African	3%
	Native Hawaiian and Other Pacific Islander	3%
	White	66%
	Prefer not to answer	8%

### 4.3 Energy Efficient Kits

The following section summarizes the findings from an interview with JCP&L Energy Efficient Kits program staff. The program implementer ships an Energy Efficiency Kit to residential customers when they open a new account in JCP&L territory (a new mover) and to existing customers who request a kit online (opt-in). Kits include LED lightbulbs, LED night lights, a furnace filter whistle, an advanced power strip, installation instructions and information about other JCP&L offerings. Customers who report having an electric water heater also receive a faucet aerator and a low-flow showerhead.

JCP&L is one of the few utilities that offer a no-fee kit program. The offering launched in December 2021 and contributed 32 percent to the portfolio savings. AM Conservation Group (AMCG) implements the program. The Kit program will end in March of 2023 to align with the phase-out of lighting measures due to NJ A5160 an EISA.

Program staff noted the challenge of timing kit shipment to homes under construction. Builders typically start electric service before a home is ready for occupancy before kit arrival. To address this issue, the program implementer reviews a monthly list of building projects to determine when to send kits.

### 4.3.1 Marketing and cross-promotion

The program team uses the kits to educate customers and cross-promote other programs. Promotional material in the kits explain why the customer is receiving the kit and how to install kit components. The kits also include promotional materials about other JCP&L energy efficiency programs and an energy education publication titled “100 Ways to Save.”

Program staff noted that kits were undeliverable to a large number of vacation homes in the service territory because homes are not occupied full-time. To address this issue, program staff started sending kits to account mailing addresses rather than the service addresses to decrease the number of undeliverable kits.

### 4.3.2 Energy Efficient Kit Survey Results

ADM surveyed 127 customers who Energy Efficient Kits were shipped to. Nearly half of respondents were homeowners and half were renters. Nearly 30 percent of respondents said they lived alone. Table 4-9 summarizes Energy Efficient Kit Survey respondents’ home characteristics.

*Table 4-9: Energy Efficient Kits Survey Respondent Home Characteristics*

Question	Response	Percentage
Do you own or rent your home?	Own	50.6%
	Rent	48.2%
	Prefer not to answer	1.2%
Which of the following best describes your home type?	Single family detached	41.2%
	Single family townhouse or row house (adjacent walls to another house)	10.6%
	Duplex	4.7%
	Mobile home or trailer	1.2%
	Apartment/condo in a 2-4 unit building	15.3%
	Apartment/condo in a 5+ unit building	24.7%
	Prefer not to answer	2.4%
When was your home built?	Before 1960	21.2%
	1960-1979	25.9%
	1980-1999	10.6%
	2000-2009	8.2%
	2010 or later	11.8%
	I don't know	22.4%
	1	29.4%

Question	Response	Percentage
Including yourself, how many people live in your household?	2	41.2%
	3	9.4%
	4	9.4%
	5	4.7%
	6	3.5%
	Prefer not to answer	2.4%
About how many square feet is your home?	Less than 1,000 square feet	24.7%
	1,000-1,999 square feet	34.1%
	2,000-2,999 square feet	14.1%
	3,000-3,999 square feet	4.7%
	4,000-4,999 square feet	1.2%
	5,000 or greater square feet	2.4%
	I don't know	18.8%

An equal percentage of respondents reported being under 35 and over 55 (34 percent). Less than 20 percent of respondents reported an income below 250 percent of the FPL; 23 percent of respondents reported an income between 250 percent and 400 percent of FPL. Table 4-10 provides additional participant demographic information.

Table 4-10: Energy Efficient Kits Respondent Demographics

Question	Response	Percentage
What is your age?	Under 35 years old	34%
	35- 55 years old	25%
	Over 55 years old	34%
	Prefer not to answer	7%
How would you identify your race or ethnicity?	Asian	6%
	Black or African American	6%
	Hispanic or Latino/Latina	12%
	Middle Eastern or North African	2%
	White	62%
	Prefer not to answer	12%

## 4.4 Online Marketplace

The following section summarizes the findings from an interview with JCP&L Online Marketplace program staff. The Online Marketplace offers JCP&L customers discounted energy-efficient products such as smart thermostats, advanced power strips, LED bulbs, and air purifiers. This program launched in September 2021. AM Conservation Group operates and markets the online store.

Smart thermostats, discounted \$100 from the suggested retail price, have sold more than any other item offered.

### 4.4.1 Program Design and Delivery

Customers create an account on the online marketplace using their JCP&L account number to demonstrate eligibility. Customers must meet additional eligibility requirements to purchase a discounted smart thermostat. Customers are required to report heating and cooling fuel types to establish eligibility for a smart thermostat.

### 4.4.2 Marketing

AMCG operates and markets the Online Marketplace using email blasts, bill inserts, and Google Paid Search to promote sales. The Marketplace was actively promoted three times during PY22, including Black Friday and Earth Day promotions.

The program team believes it is beneficial to have AMCG implement both the Online Marketplace and Energy Efficiency Kits programs. Kits include Marketplace promotional materials.



### 4.4.3 Looking into PY23: Challenges and Opportunities

The program operated well in the first year, and the program team is not concerned about meeting second-year goals. Related to future evaluation needs, the program team was interested to learn:

- What other products would customers like added to JCP&L marketplace?
- How do customers learn about the Online Marketplace?
- Do customer shop both on JCP&L's and their gas utility's Online Marketplace? If so, what influences the customer's purchase preference of one marketplace over the other?

### 4.4.4 Online Marketplace Survey Results

ADM surveyed 119 customers that purchased products from the Online Marketplace during PY22. Most respondents were homeowners and were living in single-family homes. Eighty-nine percent of respondents said they lived with at least one additional person. Table 4-11 summarizes Online Marketplace Survey respondents' home characteristics.

*Table 4-11: Online Marketplace Respondent Home Characteristics*

Question	Response	Percentage
Do you own or rent your home?	Own	94.6%
	Rent	4.3%
	Prefer not to answer	1.1%
Which of the following best describes your home type?	Single family detached	83.9%
	Apartment/condo in a 2-4 unit building	4.3%
	Duplex	2.2%
	Apartment/condo in a 5+ unit building	1.1%
	Single family townhouse or row house (adjacent walls to another house)	6.5%
	Mobile home or trailer	1.1%
	Prefer not to answer	1.1%
When was your home built?	Before 1960	21.5%
	1960-1979	22.6%
	1980-1999	32.3%
	2000-2009	11.8%
	2010 or later	6.5%
	I don't know	5.4%
	1	10.8%

Question	Response	Percentage
Including yourself, how many people live in your household?	2	41.9%
	3	12.9%
	4	19.4%
	5	12.9%
	6	2.2%
About how many square feet is your home?	Less than 1,000 square feet	5.4%
	1,000-1,999 square feet	30.1%
	2,000-2,999 square feet	31.2%
	3,000-3,999 square feet	20.4%
	4,000-4,999 square feet	3.2%
	5,000 or greater square feet	3.2%
	I don't know	6.5%

Most respondents identified as white, and more than 40 percent reported an income over 400 percent of FPL. Less than 10 percent of respondents reported an income below 250 percent of FPL. Respondents were nearly evenly split between identifying as 35-55 years old and over 55 years old, with a smaller portion falling under 35 years old. Table 4-12 provides additional self-reported survey-taker demographic information.

*Table 4-12: Online Marketplace Respondent Demographics*

Question	Response	Percentage
What is your age?	Under 35 years old	12%
	35- 55 years old	39%
	Over 55 years old	42%
	Prefer not to answer	8%
How would you identify your race or ethnicity?	Asian	14%
	Black or African American	1%
	Hispanic or Latino/Latina	3%
	White	68%
	Prefer not to answer	14%

## 5 Key Findings and Recommendations

### 5.1 Energy Impacts Achieved in PY22

The Efficient Products Program PY22 results are reported in Table 5-1 and Table 5-2.

*Table 5-1: Efficient Products Program PY22 Gross Annual Retail kWh Savings and kW Demand Reduction*

Program	Ex-ante kWh	Ex-post kWh	RR kWh	Ex-ante kW	Ex-post kW	RR kW
Appliance Rebates	991,204	1,108,072	112%	129.17	142.00	110%
Appliance Recycling	5,520,707	5,520,707	100%	863.27	899.00	104%
EE Kits	29,703,573	26,581,399	89%	2,318.94	2,035.14	88%
HVAC	534,612	526,240	98%	310.60	490.60	158%
Lighting	47,119,638	49,510,589	105%	3,551.04	3,450.13	97%
Online Marketplace	1,494,999	1,525,147	102%	38.51	39.47	102%
<b>Total</b>	<b>85,364,733</b>	<b>84,772,154</b>	<b>99%</b>	<b>7,211.52</b>	<b>7,056.34</b>	<b>98%</b>

*Table 5-2: Efficient Products Program PY22 Gross Annual Retail Therms and MMBtu Savings<sup>22</sup>*

Program	Ex-ante therms	Ex-post therms	Ex-ante MMBtu	Ex-post MMBtu	RR therms
Appliance Rebates	4,989.00	3,031.12	498.90	303.11	61%

<sup>22</sup> Evaluated therms and MMBtus include heating penalties where included in applicable protocols.

Program	Ex-ante therms	Ex-post therms	Ex-ante MMBtu	Ex-post MMBtu	RR therms
Appliance Recycling	-	-	-	-	-
EE Kits	(329,430.43)	(478,206.22)	(32,943.04)	(47,820.62)	145%
HVAC	9,605.16	9,605.18	960.52	960.518	100%
Lighting	(713,486.29)	(697,149.17)	(71,348.63)	(69,714.92)	98%
Online Marketplace	224,504.77	221,765.88	22,450.48	22,176.59	99%
<b>Total</b>	<b>(803,817.79)</b>	<b>(940,953.21)</b>	<b>(80,381.78)</b>	<b>(94,095.32)</b>	<b>117%</b>

The Efficient Products Program accounted for 92 percent of the total portfolio kWh savings during PY22.

## 5.2 Program Launch

The JCP&L implementation team managed to quickly launch the two largest program components – Energy Efficiency Kits and Upstream Lighting, in part due to their experience in running similar programs outside of New Jersey. The reported impacts were accurate on the whole, as JCP&L’s implementation, evaluation, and tracking and reporting teams made considerable efforts to adhere to agreed-upon energy savings protocols. This effort included an important benchmarking activity during the program startup phase: Informing the NJ CML with ex-ante savings estimates for energy efficiency kits (EE Kits) using in-service rates for kit components derived from similar programs offered in Pennsylvania.

Utility evaluators benchmarked several comparable programs to the ones offered by utilities participating in the NJ CEA in PY22. While the program designs, distribution channels, and key performance indicators for the benchmarked programs are comparable to the EE Products program, it is also useful to compare JCP&L’s EE Products program to a similar program during the first year of implementation. Table 5-3 provides such a comparison with Metropolitan Edison Company’s Energy Efficient Program in its first year (PY1 of Act 129).

*Table 5-3 Comparison of JCP&L’s EE Products Program to Met-Ed’s EE Products program in its initial year.*

Program	Measure Quantity, JCPL	Measure Quantity, Met-Ed*	Notes
Appliance Rebates	5,573	303	Met-Ed launched the appliance rebate program later in the year compared to JCP&L
Appliance Recycling	6,150	2,438	Met-Ed launched the appliance recycling program later in the year compared to JCP&L

EE Kits	75,435	29,300	JCP&L made a strategic decision to increase kits in PY22 but to phase them out early in the cycle due to code changes
HVAC	1,457	0	Met-Ed launched the appliance rebate program late compared to JCP&L - Met-Ed's program did not post results until the second year of the implementation cycle
Lighting	307,909	165,000	Met-Ed emphasized their lighting program in their first year, but at the time they had under-estimated the market potential for the measure. They ramped up to comparable levels to JCP&L in their PY2.

The values for Met-Ed have been scaled to match JCP&L’s residential customer count to provide a normalized comparison. JCP&L’s program managed to launch more program components and scale them up faster than Met-Ed did in 2010. Much of this improvement can be attributed to institutional knowledge, business practices, and data infrastructure developed by FirstEnergy staff since the launch of programs in Pennsylvania in 2010.

### 5.3 Key Evaluation Findings

The following are key findings from the PY22 evaluation effort.

- Program components launched promptly for an initial year of implementation
- Tracking and reporting systems were established, commissioned, and include sufficient detail to enable upcoming enhanced-rigor evaluations
- Communication channels for fast evaluation impact have been established, and many areas of improvement identified in the PY22 evaluation have been implemented by JCP&L and its implementation and data tracking vendors
- Energy and demand realization rates, on the whole, are near 100 percent
- The utilities that participate in the NJ CEA have launched and managed their programs in close coordination.
  - One of the key startup activities was the establishment of the New Jersey Coordinated Measures List (CML), which support uniform savings calculations and reporting by utilities and incorporates protocols for measures that were not in the New Jersey Protocols
- This evaluation has measured key parameters such as measure installation rates and fuel shares for space and water heating for program participants
  - ADM has shared these findings with the SWE to inform the NJ TRM update process

## 5.4 Recommendations

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### 5.4.1 Appliance Rebates

**Monitor the realization rate for clothes washers in PY23.** This recommendation is for ADM to confirm that the transition to the FY2021 Protocols for this measure helps to align ex-ante and ex-post savings. If the realization rate is still found to be far higher than 100 percent, then a follow-up recommendation would be to use water heater and dryer fuel shares as found from recent participant surveys if rebate-application-specific values are not known, rather than using default values in the NJ FY2021 Protocols.

**Use product model specification values** to calculate both ex-ante and ex-post savings at the record level whenever available to align accurate ex-ante and ex-post calculations.

### 5.4.2 Appliance Recycling

The evaluation effort did not find any significant opportunities to improve program operations or data tracking and reporting accuracy. One possible recommendation that resulted from the benchmarking effort was to include mini-fridges in the program (and also in the New Jersey TRM). Mini-fridges make up a small portion of savings in comparable programs, but their addition could help to make a more comprehensive offering to JCP&L's customers.

### 5.4.3 Energy Efficiency Kits

ADM would recommend a deeper investigation into kit ISRs, as any increase in ISRs are essentially "free savings". However, the program will soon be discontinued so any prospective update is of limited value. One recommendation for consideration is to correct the aerator savings calculations, which were missing a conversion factor from minutes to hours. However, the CML has already identified this issue and incorporates this recommendation. A related recommendation is to make the same correction in the NJ TRM for the next triennium.

### 5.4.4 HVAC Rebates

**Revisit efficient EER determination** in PY23. The NJ protocols currently direct utilities to use the quantity  $SEER \times 11.3/13$  instead of the actual EER. There can be significant differences between these two efficiency constructs. Longer peak demand windows tend to favor the derated SEER value, while shorter peak demand windows tend to favor the EER. A related recommendation is policy related: Align the peak demand window with PJM's summer peak definition.

**Use product model specification values** to calculate both ex-ante and ex-post savings at the record level whenever available to align accurate ex-ante and ex-post calculations.

#### **5.4.5 Lighting**

**Use NJ CML baseline wattage values** to align ex-ante and ex-post savings calculations.

**Use product model specification values** to calculate both ex-ante and ex-post savings at the record level whenever available to align accurate ex-ante and ex-post calculations.

#### **5.4.6 Online Marketplace**

**Use NJ CML baseline wattage values** to align ex-ante and ex-post savings calculations for lighting measures.

**Use product model specification values** to calculate both ex-ante and ex-post savings at the record level whenever available to align accurate ex-ante and ex-post calculations.

**Add distribution-channel-specific ISRs to the NJ Protocols** for lamps and advanced power strips.

## Appendix A. Appliance Rebates Impact Evaluation Detail

The Appliance Rebates program component offers residential customers financial incentives to purchase ENERGY STAR qualified air purifiers, room air conditioners, dehumidifiers, heat pump water heaters, clothes washers and dryers and refrigerators. After purchasing a qualified appliance, customers can submit rebate applications either online or can mail in a paper application.

### Gross Impact Evaluation Results

ADM calculated ex-post gross impact savings are summarized in Table A-1, Table A-2, Table A-3.

*Table A-1: PY22 Appliance Rebates Gross Annual Retail kWh Savings*

Measure	Quantity	Ex-ante kWh	Ex-post kWh	RR kWh
Air Purifier – ENERGY STAR	672	455,250	454,957	100%
Clothes Dryer – ENERGY STAR	738	137,268	136,469	99%
Clothes Dryer – ENERGY STAR MOST EFFICIENT	38	14,744	14,658	99%
Clothes Washer – ENERGY STAR	505	27,775	94,346	340%
Clothes Washer – ENERGY STAR MOST EFFICIENT	285	17,385	59,053	340%
Dehumidifier – ENERGY STAR	905	93,615	105,135	112%
Heat Pump Water Heater – ENERGY STAR	51	86,037	86,037	100%
Refrigerator – ENERGY STAR	1,672	98,648	98,253	100%
Refrigerator – ENERGY STAR MOST EFFICIENT	492	43,788	43,613	100%
Room Air Conditioner – ENERGY STAR	215	16,695	15,551	93%
<b>Total</b>	<b>5,573</b>	<b>991,204</b>	<b>1,108,072</b>	<b>112%</b>



Table A-2: PY22 Appliance Rebates Gross kW Demand Reduction

Measure	Ex-ante kW	Ex-post kW	RR kW
Air Purifier – ENERGY STAR	52.34	52.30	100%
Clothes Dryer – ENERGY STAR	11.81	11.74	99%
Clothes Dryer – ENERGY STAR MOST EFFICIENT	1.10	1.10	99%
Clothes Washer – ENERGY STAR	2.52	8.99	356%
Clothes Washer – ENERGY STAR MOST EFFICIENT	1.71	6.09	356%
Dehumidifier – ENERGY STAR	21.22	23.84	112%
Heat Pump Water Heater – ENERGY STAR	13.21	13.21	100%
Refrigerator – ENERGY STAR	11.70	11.66	100%
Refrigerator – ENERGY STAR MOST EFFICIENT	4.92	4.90	100%
Room Air Conditioner – ENERGY STAR	8.63	8.03	93%
<b>Total</b>	<b>129.16</b>	<b>141.86</b>	<b>110%</b>

Table A-3: PY22 Appliance Rebates Gross Annual Gas Savings

Measure	Ex-ante Therms	Ex-post Therms	Ex-ante MMBtu	Ex-post MMBtu	RR
Air Purifier – ENERGY STAR	-	-	-	-	-
Clothes Dryer – ENERGY STAR	-	-	-	-	-
Clothes Dryer – ENERGY STAR MOST EFFICIENT	-	-	-	-	-
Clothes Washer – ENERGY STAR	2,424.00	1,472.73	242.40	147.27	61%
Clothes Washer – ENERGY STAR MOST EFFICIENT	2,565.00	1,558.39	256.50	155.84	61%
Dehumidifier – ENERGY STAR	-	-	-	-	-
Heat Pump Water Heater – ENERGY STAR	-	-	-	-	-
Refrigerator – ENERGY STAR	-	-	-	-	-
Refrigerator – ENERGY STAR MOST EFFICIENT	-	-	-	-	-
Room Air Conditioner – ENERGY STAR	-	-	-	-	-
<b>Total</b>	<b>4,989.00</b>	<b>3,031.12</b>	<b>498.90</b>	<b>303.11</b>	<b>61%</b>

## Discussion of Realization Rates

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In the discussions that follow, the term “realization rate” without any qualifiers refers to the electric energy realization rate. In almost all cases, resolution of an underlying issue would also push peak demand and gas savings realization rates toward 100 percent. While ADM offers some recommendations to align ex-ante and ex-post reported impacts, we note that the absolute difference between ex-ante and ex-post reported impacts is very small when compared to total portfolio or sector impacts.

### *Air Purifier*

The realization rate for this measure was 100 percent. There were no data tracking issues and the installation rate, according to participant surveys, was 100 percent.

### *Clothes Dryer*

The gross realization rate for this measure was 99 percent. The installation rate, according to participant surveys, was 100 percent. Of 551 rebated clothes dryers, five were found to be gas-heated units through cross-referencing the EnergyStar database. This caused a small reduction in the electric impact realization rate, and a small increase in the gas impact realization rate. JCP&L maintains a shared document for tracking, investigating, and resolving such data entry issues. ADM has reported these five specific model numbers on that tracker and the issue is being driven to resolution.

### *Clothes Washer*

The installation rate for this measure, according to participant surveys, was 100 percent. The realization rate, however, was 356 percent, driven by differences in assumed and verified water heating and clothes drying fuel types. The New Jersey utilities initially used the NJ FY2020 protocols which included deemed percentages of electric and gas water heaters. In April 2021, the utilities transitioned to using the NJ FY2021 protocols which allows for more accurate savings calculations when water heating and clothes drying fuel types are known. Ex-post savings were calculated with water heating and clothes drying fuel types determined from the participant surveys. The percentage of electric water heaters was higher than the assumptions in the FY2020 protocols and also the default values in the FY2021 protocols. This drove up the electricity realization rates and drove down the gas realization rate. JCP&L is using the NJ FY2021 protocols for reporting impacts for this measure in PY23. Due to this, ADM is not making a recommendation other than to monitor the realization rate in PY23, and potentially act if it continues to vary significantly from 100 percent.

### *Dehumidifier*

The installation rate for this measure, according to participant surveys, was 100 percent. The dehumidifier realization rate was 112 percent. Dehumidifier ex-ante savings were calculated using the actual unit capacity, but the minimum-qualifying efficiency for ENERGY STAR, as provided in the NJ FY2020 protocols. Ex-post savings were calculated using the actual efficiencies as cross-referenced in the ENERGY STAR database. The utilities will likely continue to adhere to the NJ Protocols, which underestimate savings to a modest degree. Our recommendation is for SWE to consider issuing a guidance memorandum which updates the default average Energy Factors to those found in the PY22 evaluations or allows utilities to use updated values as found by their evaluators.

### *Heat Pump Water Heater*

The installation rate for this measure was 100 percent, as was the realization rate. No issues were found related to energy impact calculation, tracking, or reporting.

### *Refrigerator*

The installation rate for this measure was 100 percent, as was the realization rate. No issues were found related to energy impact calculation, tracking, or reporting.

### *Room Air Conditioner*

The installation rate for this measure was 100 percent. The realization rate was 93 percent. Room air conditioner ex-ante savings were calculated using deemed CEER values in the NJ Protocols. Ex-post savings were calculated using verified CEER values as determined by cross-referencing the ENERGY STAR database. Four models (ENERGY STAR IDs 2370423, 2348378, 2366422, 2364953) account for most of the deviation from the TRM default CEER values. A possible recommendation is to ask the implementation vendor to adjust reported impacts just for these four models.

## **Lifetime Savings**

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Lifetime savings were calculated for each measure by multiplying ex-post annual savings by the expected measure life. Lifetime savings results are reported in Table A-4, Table A-5, and Table A-6. Measure life values were sourced from the NJ CML.

*Table A-4: Appliance Rebates Lifetime kWh Savings*

Measure	Quantity	Measure Life	Ex-post Annual Saving kWh	Ex-post Lifetime Savings kWh
Air Purifier – ENERGY STAR	672	9	454,957	4,094,613
Clothes Dryer – ENERGY STAR	738	12	136,469	1,637,628
Clothes Dryer – ENERGY STAR MOST EFFICIENT	38	12	14,658	175,896
Clothes Washer – ENERGY STAR	505	11	94,346	1,037,806
Clothes Washer – ENERGY STAR MOST EFFICIENT	285	11	59,053	649,583
Dehumidifier – ENERGY STAR	905	12	105,135	1,261,620
Heat Pump Water Heater – ENERGY STAR	51	10	86,037	860,370
Refrigerator – ENERGY STAR	1,672	14	43,613	610,582
Refrigerator – ENERGY STAR MOST EFFICIENT	492	14	98,253	1,375,542
Room Air Conditioner – ENERGY STAR	215	9	15,551	139,959
<b>Total</b>	<b>5,573</b>	<b>-</b>	<b>1,108,072</b>	<b>11,843,599</b>

*Table A-5: Appliance Rebates Lifetime kW Peak Demand Reduction*

Measure	Ex-post Demand Reduction kW	Ex-post Lifetime Demand Reduction kW-years
Air Purifier – ENERGY STAR	52.30	470.70
Clothes Dryer – ENERGY STAR	11.74	140.88
Clothes Dryer – ENERGY STAR MOST EFFICIENT	1.10	13.20
Clothes Washer – ENERGY STAR	8.99	98.89
Clothes Washer – ENERGY STAR MOST EFFICIENT	6.09	66.99
Dehumidifier – ENERGY STAR	23.84	286.08
Heat Pump Water Heater – ENERGY STAR	13.21	132.10
Refrigerator – ENERGY STAR	11.66	163.24
Refrigerator – ENERGY STAR MOST EFFICIENT	4.90	68.60
Room Air Conditioner – ENERGY STAR	8.03	72.27
<b>Total</b>	<b>141.86</b>	<b>1,512.95</b>

Table A-6: Appliance Rebates Lifetime Gas Savings

Measure	Quantity	Ex-Post therms	Measure Life	Ex-post Lifetime Savings therms	Ex-post Lifetime Savings MMBtu
Air Purifier – ENERGY STAR	672	-	9	-	-
Clothes Dryer – ENERGY STAR	738	-	12	-	-
Clothes Dryer – ENERGY STAR MOST EFFICIENT	38	-	12	-	-
Clothes Washer – ENERGY STAR	505	1,473	11	16,203	1,620
Clothes Washer – ENERGY STAR MOST EFFICIENT	285	1,558	11	17,138	1,714
Dehumidifier – ENERGY STAR	905	-	12	-	-
Heat Pump Water Heater – ENERGY STAR	51	-	10	-	-
Refrigerator – ENERGY STAR	1,672	-	14	-	-
Refrigerator – ENERGY STAR MOST EFFICIENT	492	-	14	-	-
Room Air Conditioner – ENERGY STAR	215	-	9	-	-
<b>Total</b>	<b>5,573</b>	<b>3,031</b>		<b>33,341</b>	<b>3,334</b>

## Data Review

ADM reviewed tracking data to ensure that each measure met program qualifications, that each was installed in PY22, and that there were no duplicates or otherwise erroneous entries. The following findings were made.

### *Missing or Incorrect Data*

**Incorrect model number for one Air Purifier.** The model number provided in the tracking data for a single record was not identifiable as an air purifier. All indicators are that this was an isolated occurrence.

### *Opportunity to Improve Realization Rates*

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

**Monitor the realization rate for clothes washers in PY23.** The variance between ex-ante and ex-post savings should close now that utilities are using the FY2021 Protocols for this measure. This recommendation is for ADM to confirm that this is the case in PY23. If the realization rate is still found to be far higher than 100 percent, then a follow-up

recommendation would be to use water heater and dryer fuel shares as found from recent participant surveys if rebate-application-specific values are not known, rather than using default values in the NJ FY2021 Protocols.

**Use product model specification values** to calculate both ex-ante and ex-post savings at the record level whenever available to align accurate ex-ante and ex-post calculations.

# Appendix B. Appliance Recycling Impact Evaluation Detail

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In the discussions that follow, the term “realization rate” without any qualifiers refers to the electric energy realization rate. In almost all cases, resolution of an underlying issue would also push peak demand and gas savings realization rates toward 100 percent. While ADM offers some recommendations to align ex-ante and ex-post reported impacts, we note that the absolute difference between ex-ante and ex-post reported impacts is very small when compared to total portfolio or sector impacts.

## Gross Impact Evaluation Results

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Appliance Recycling program component savings are summarized in Table B-1 and Table B-2.

*Table B-1: PY22 Appliance Recycling Gross Annual Retail kWh Savings*

Measure	Quantity	Ex-ante kWh	Ex-post kWh	RR kWh
Dehumidifier Recycling	356	69,776	69,776	100%
Freezer Recycling	874	624,910	624,910	100%
Refrigerator Recycling	4,349	4,775,202	4,775,202	100%
Room Air Conditioner Recycling	571	50,819	50,819	100%
<b>Total</b>	<b>6,150</b>	<b>5,520,707</b>	<b>5,520,707</b>	<b>100%</b>

*Table B-2: PY22 Appliance Recycling Gross Annual kW Savings*

Measure	Ex-ante kW	Ex-post kW	RR kW
Dehumidifier Recycling	40.58	40.58	100%
Freezer Recycling	93.52	93.52	100%
Refrigerator Recycling	713.24	713.24	100%
Room Air Conditioner Recycling	15.93	51.39	323%
<b>Total</b>	<b>863.27</b>	<b>898.73</b>	<b>104%</b>

## Discussion of Realization Rates

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Energy realization rates were 100 percent for all measures. The verification rates were also 100 percent for all measures. Realization rates were 100 percent for recycled

dehumidifiers, freezers, and refrigerators. The demand realization rates for room AC recycling was 323 percent. The underlying issue was an error in the NJ CML spreadsheet, which applied the Coincidence Factor twice. The ex-post demand reduction was calculated using the correct value. This issue has been resolved by utility companies for PY23, so there are no associated recommendations as of this writing.

## Lifetime Savings

Lifetime savings were calculated for each measure by multiplying ex-post annual savings by the expected measure life. Lifetime savings results are reported in Table B-3 and Table B-4. Measure life values were sourced from the NJ CML.

*Table B-3: Appliance Recycling Lifetime kWh Savings*

Measure	Quantity	Measure Life	Ex-post Annual Saving kWh	Ex-post Lifetime Savings kWh
Dehumidifier Recycling	356	3	69,776	209,328
Freezer Recycling	874	4	624,910	2,499,640
Refrigerator Recycling	4,349	5	4,775,202	23,876,010
Room Air Conditioner Recycling	571	3	50,819	152,457
<b>Total</b>	<b>6,150</b>	<b>-</b>	<b>5,520,707</b>	<b>26,737,435</b>

*Table B-4: Appliance Recycling Lifetime kW Peak Demand Reduction*

Measure	Ex-post Demand Reduction kW	Ex-post Lifetime Demand Reduction kW-years
Dehumidifier Recycling	40.58	121.74
Freezer Recycling	93.52	374.08
Refrigerator Recycling	713.24	3,566.20
Room Air Conditioner Recycling	15.93	47.79
<b>Total</b>	<b>863.27</b>	<b>4,109.81</b>

## Data Review

ADM reviewed tracking data to ensure that there were no duplicates or otherwise erroneous entries.



### ***Missing or Incorrect Data***

No incorrect or missing data were found.

### ***Opportunity to Improve Realization Rates***

Realization rates reflect the ratio of forecasted savings to verified savings. Realization rates close to 100 percent reflect an accurate forecast of program performance. As of this writing the realization rates for energy and demand are expected to be near 100 percent in PY23. The peak demand reduction issue for Room ACs has been corrected.

## Appendix C. Energy Efficiency Kits Impact Evaluation Detail

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The Energy Efficiency Kits program component provides kits with energy-saving products to residential customers who either request a kit (opt-ins) or who move to a new address in the JCP&L service area (new movers). Energy Efficiency Kits contributed 32 percent of portfolio savings during PY22.

Kits included six LED light bulbs, an LED nightlight, a furnace whistle, and an advanced power strip. Customers who indicated they had an electric water heater also received a faucet aerator and a low-flow showerhead (see Table C-1).

Customers received one kit per new account number upon move-in or, for continuing customers, on request through the program website or by calling the implementer. The program implementer mailed kits to customers' home addresses.

*Table C-1: Energy Efficient Kit Contents*

	<b>Standard (For customers with gas water heaters)</b>	<b>Electric (For customers with electric water heaters)</b>
<b>Opt-ins (requested)</b>	LEDs, Smart Strips	LEDs, Smart Strips, and water saving measures
<b>New Movers (unsolicited)</b>	LEDs, Smart Strips	LEDs, Smart Strips, and water saving measures

### Gross Impact Evaluation Results

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Program savings are summarized in Table C-2, Table C-3, and Table C-4.

*Table C-2: PY22 Energy Efficient Kits Gross Annual Retail kWh Savings*

Measure	Quantity	Ex-ante kWh	Ex-post kWh	RR kWh
New Mover Electric	30,414	12,979,859	10,981,556	85%
New Mover Standard	43,629	16,095,890	15,015,342	93%
Opt-in Electric	391	224,472	205,103	91%
Opt-in Standard	1,001	403,352	379,398	94%
<b>Total</b>	<b>75,435</b>	<b>29,703,573</b>	<b>26,581,399</b>	<b>89%</b>

*Table C-3: PY Energy Efficient Kits Gross kW Demand Reduction*

Measure	Ex-ante kW	Ex-post kW	RR kW
New Mover Electric	854.52	745.28	87%
New Mover Standard	1,417.62	1,245.41	88%
Opt-in Electric	11.77	11.21	95%
Opt-in Standard	35.03	33.24	95%
<b>Total</b>	<b>2,318.94</b>	<b>2,035.14</b>	<b>88%</b>

*Table C-4: PY22 Energy Efficient Kits Gross Annual Gas Savings*

Measure	Ex-ante Therms	Ex-post Therms	Ex-Ante MMBtu	Ex-Post MMBtu	RR
New Mover Electric	(106,829.08)	(22,774.00)	(10,682.91)	(2,277.40)	21%
New Mover Standard	(193,132.89)	(384,219.54)	(19,313.29)	(38,421.95)	199%
Opt-in Electric	(7,989.40)	(15,540.00)	(798.94)	(1,554.00)	195%
Opt-in Standard	(21,479.06)	(55,672.68)	(2,147.91)	(5,567.27)	259%
<b>Total</b>	<b>(329,430.43)</b>	<b>(478,206.22)</b>	<b>(32,943.04)</b>	<b>(47,820.62)</b>	<b>145%</b>

## Discussion of Realization Rates

Energy Efficient Kits realization rates were impacted by the following factors:

- Ex-post ISRs, calculated from participant survey results, are lower than ex-ante ISRs included in NJ CML. The NJ CML was informed by benchmarking from similar programs in Pennsylvania. Ex-ante and ex-post ISRs are included in Table C-5.

- The ex-post percentage of electric water heaters, calculated from participant survey results, was lower than the ex-ante percentage, reducing electricity savings for water saving measures. See Table C-6.
- The equation in the NJ Protocols used to calculate ex-ante savings for aerators included an error which was corrected in the equation used to calculate ex-post savings. The correct time variable is minutes, not hours. This increased the realization rate for aerators which offset lower-than-expected savings from other measures included in kits.

Benchmarking research for the PY22 evaluation revealed that the ISRs in Pennsylvania also recently dipped below historical trends. This decrease in ISRs, relative to historical levels, is currently being investigated by ADM in Pennsylvania. JCP&L will soon discontinue the kits program in New Jersey, so a deep investigation is of a lower priority in this state.

*Table C-5: Ex-ante and Ex-post ISR for different Energy Efficient Kit Measures*

Measure	Ex-ante ISR	Ex-post ISR <sup>23</sup>
<b>Opt-in Electric</b>		
4/8/12 watt - 3-way LED	93%	86%
LED (A19 or equivalent) 15 watt	93%	86%
LED (A19 or equivalent) 9 watt	93%	86%
LED Night Lite	20%	20%
Furnace Whistle	15%	15%
Low Flow (1.75gpm) Showerhead	50%	50%
Low Flow Swivel Aerator (1.5 gpm)	46%	46%
Tier 1 Smart Strip	55%	55%
<b>Opt-in Standard</b>		
4/8/12 watt - 3-way LED	93%	86%
LED (A19 or equivalent) 15 watt	93%	86%
LED (A19 or equivalent) 9 watt	93%	86%
LED Night Lite	20%	20%
Furnace Whistle	15%	15%
Tier 1 Smart Strip	55%	55%
<b>New Mover – Electric</b>		
4/8/12 watt – 3-way LED	83%	77%
LED (A19 or equivalent) 15 watt	83%	77%
LED (A19 or equivalent) 9 watt	83%	77%
LED Night Lite	20%	20%
Furnace Whistle	15%	3%
Low Flow (1.75gpm) Showerhead	20%	19%
Low Flow Swivel Aerator (1.5 gpm)	22%	22%
Tier 1 Smart Strip	55%	67%
<b>New Mover Standard</b>		
4/8/12 watt - 3-way LED	83%	77%

<sup>23</sup> For LEDs Ex-post ISR = Ex-ante (from CML) \* Receipt Rate (from survey)

Measure	Ex-ante ISR	Ex-post ISR <sup>23</sup>
LED (A19 or equivalent) 15 watt	83%	77%
LED (A19 or equivalent) 9 watt	83%	77%
LED Night Lite	20%	13%
Furnace Whistle	15%	3%
Tier 1 Smart Strip	55%	67%

*Table C-6: Ex-ante and Ex-post Water Heater Fuel Type Percentages*

Measure	Ex-ante percentage electric water heaters	Ex-ante percentage non-electric water heaters	Ex-post percentage electric water heaters	Ex-post percentage non-electric water heaters
Showerhead	25%	71%	42%	52%
Aerator (lavatory & non-lavatory)	50%	50%	42%	52%

## Lifetime Savings

Lifetime savings were calculated for each measure by multiplying ex-post annual savings by the expected measure life. Lifetime savings results are reported in Table C-7, Table C-8, and Table C-9. Measure life values for kit components were sourced from the NJ CML. Kit measure life is the weighted average of the measure life for kit components (weighted by unit energy savings).

*Table C-7: Energy Efficient Kits Lifetime kWh Savings*

Measure	Quantity	Measure Life	Ex-post Annual Savings kWh	Ex-post Lifetime Savings kWh
New Mover Electric	30,414	11.67	10,981,556	128,143,582
New Mover Standard	43,629	12.56	15,015,342	188,561,280
Opt-in Electric	391	11.39	205,103	2,335,262
Opt-in Standard	1,001	12.74	379,398	4,834,037
<b>Total</b>	<b>75,435</b>	<b>-</b>	<b>26,581,399</b>	<b>323,874,162</b>

*Table C-8: Energy Efficient Kits Lifetime kW Peak Demand Reduction*

Measure	Ex-post Demand Reduction kW	Ex-post Lifetime Demand Reduction kW
New Mover Electric	854.52	9,972.25
New Mover Standard	1,417.62	17,805.31
Opt-in Electric	11.77	134.06

Measure	Ex-post Demand Reduction kW	Ex-post Lifetime Demand Reduction kW
Opt-in Standard	35.03	446.28
<b>Total</b>	<b>2,318.94</b>	<b>28,357.90</b>

Table C-9: Energy Efficient Kits Lifetime Gas Savings

Measure	Quantity	Ex-Post therms	EUL	Lifetime Savings therms	Lifetime Savings MMBtu
New Mover Electric	30,414	(106,829)	11.7	(1,246,587)	(124,659)
New Mover Standard	43,629	(193,133)	12.6	(2,425,345)	(242,535)
Opt-in Electric	391	(7,989)	11.4	(90,966)	(9,097)
Opt-in Standard	1,001	(21,479)	12.7	(273,672)	(27,367)
<b>Total</b>	<b>75,435</b>	<b>(329,430)</b>	<b>-</b>	<b>(4,036,569)</b>	<b>(403,657)</b>

## Data Review

ADM reviewed tracking data for duplicate or otherwise erroneous entries and made the following findings.

### *Missing or Incorrect Data*

**Aerator calculations.** For New Mover and Opt-In Electric, the FY2020 NJ TRM used hours instead of minutes for the aerator calculation.

### *Opportunity to Improve Realization Rates*

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

**Correct the aerator savings calculations** using minutes instead of hours.

ADM would recommend a deeper investigation into kit ISRs, but the program will soon be discontinued so any prospective update is of limited value.

## Appendix D. HVAC Rebate Impact Evaluation Detail

The HVAC Rebates program component provides incentives for residential customers to install qualified high-efficiency air source heat pumps, central air conditioners, ductless mini-split heat pump, geothermal heat pumps, and smart thermostats. Customers can apply for rebates online or can mail in a paper rebate application. The HVAC Rebates program component contributed approximately 1 percent of portfolio savings during PY22.

### Gross Impact Evaluation Results

HVAC Rebates program component results are summarized in Table D-1, Table D-2, and Table D-3.

*Table D-1: PY22 HVAC Rebates Gross Annual Retail kWh Savings*

Measure	Quantity	Ex-ante kWh	Ex-post kWh	RR kWh
Air Source Heat Pump (SEER >=16, EER>=12.5, HSPF >=9)	14	13,263	11,912	90%
Air Source Heat Pump (SEER >=18, EER>=13, HSPF >=10)	9	13,945	12,974	93%
Central Air Conditioner (SEER >=16, EER >=12.5)	978	285,871	285,792	100%
Central Air Conditioner (SEER >=18, EER >=13)	26	15,423	15,423	100%
Ductless Mini-Split A/C (SEER >=20, EER>=12.5)	5	1,067	1,305	122%
Ductless Mini-Split Heat Pump – Multi Zone (SEER >=18, >=12.5, HSPF >=10)	7	7,818	7,818	100%
Ductless Mini-Split Heat Pump - Single Zone (SEER >=20, >=12.5, HSPF >=10)	143	135,772	135,781	100%
Gas Furnace – Tier 1 AFUE – 95-96.9%	11	-	-	-
Gas Furnace – Tier 2 AFUE >= 97%	2	-	-	-
Geothermal Heat Pump	6	14,139	13,852	98%
Heat Pump Water Heater – ENERGY STAR	5	8,435	8,435	100%
Smart Thermostat – Electric A/C and Elec Heat	21	6,115	6,115	100%
Smart Thermostat – Electric A/C and No Natural Gas	36	5,128	5,128	100%
Smart Thermostat – Gas Heat w/ CAC	194	27,635	27,635	100%
<b>Total</b>	<b>1,457</b>	<b>534,612</b>	<b>532,170</b>	<b>100%</b>

Measure	Quantity	Ex-ante kWh	Ex-post kWh	RR kWh

Table D-2: PY22 HVAC Rebates Gross kW Demand Reduction

Measure	Ex-ante kW	Ex-post kW	RR kW
Air Source Heat Pump (SEER >=16, EER>=12.5, HSPF >=9)	3.71	7.40	199%
Air Source Heat Pump (SEER >=18, EER>=13, HSPF >=10)	3.27	7.20	220%
Central Air Conditioner (SEER >=16, EER >=12.5)	264.71	378.10	143%
Central Air Conditioner (SEER >=18, EER >=13)	9.76	20.40	209%
Ductless Mini-Split A/C (SEER >=20, EER>=12.5)	0.55	1.70	308%
Ductless Mini-Split Heat Pump – Multi Zone (SEER >=18, >=12.5, HSPF >=10)	1.37	3.30	241%
Ductless Mini-Split Heat Pump - Single Zone (SEER >=20, >=12.5, HSPF >=10)	23.67	68.90	291%
Gas Furnace – Tier 1 AFUE – 95-96.9%	-	-	-
Gas Furnace – Tier 2 AFUE >= 97%	-	-	-
Geothermal Heat Pump	2.26	2.30	102%
Heat Pump Water Heater – ENERGY STAR	1.3	1.30	100%
Smart Thermostat – Electric A/C and Elec Heat	-	-	-
Smart Thermostat – Electric A/C and No Natural Gas	-	-	-
Smart Thermostat – Gas Heat w/ CAC	-	-	-
<b>Total</b>	<b>310.60</b>	<b>490.60</b>	<b>158%</b>

Table D-3: PY22 HVAC Rebates Gross Annual Gas Savings

Measure	Ex-ante Therms	Ex-post Therms	Ex-ante MMBtu	Ex-post MMBtu	RR
Air Source Heat Pump (SEER >=16, EER>=12.5, HSPF >=9)	-	-	-	-	-
Air Source Heat Pump (SEER >=18, EER>=13, HSPF >=10)	-	-	-	-	-
Central Air Conditioner (SEER >=16, EER >=12.5)	-	-	-	-	-
Central Air Conditioner (SEER >=18, EER >=13)	-	-	-	-	-
Ductless Mini-Split A/C (SEER >=20, EER>=12C.5)	-	-	-	-	-
Ductless Mini-Split Heat Pump – Multi Zone (SEER >=18, >=12.5, HSPF >=10)	-	-	-	-	-
Ductless Mini-Split Heat Pump - Single Zone (SEER >=20, >=12.5, HSPF >=10)	-	-	-	-	-
Gas Furnace – Tier 1 AFUE – 95-96.9%	1,534.40	1,534.40	153.44	153.44	100%
Gas Furnace – Tier 2 AFUE >= 97%	238.99	238.99	23.90	23.90	100%
Geothermal Heat Pump	-	-	-	-	-
Heat Pump Water Heater – ENERGY STAR	-	-	-	-	-
Smart Thermostat – Electric A/C and Elec Heat	-	-	-	-	-



Measure	Ex-ante Therms	Ex-post Therms	Ex-ante MMBtu	Ex-post MMBtu	RR
Smart Thermostat – Electric A/C and No Natural Gas	-	-	-	-	-
Smart Thermostat – Gas Heat w/ CAC	7,831.78	7,831.80	783.18	783.18	100%
<b>Total</b>	<b>9,605.16</b>	<b>9,605.18</b>	<b>960.52</b>	<b>960.52</b>	<b>100%</b>

## Discussion of Realization Rates

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### *Heat Pumps*

Air source heat pumps realization rates were primarily impacted by differences in the application of the FY2020 NJ TRM. Ex-ante calculations relied on the stated EER of the unit. ADM used the equation  $EER = SEER \times 11.3/13$  as listed in the FY2020 NJ TRM. This equation tends to inflate the EER value, particularly for high-SEER heat pumps. ADM has not conducted dedicated studies in New Jersey to assess whether the SEER or EER correlate more closely with on-peak savings. Indeed, the peak period, as stated in the NJ protocols, 12 PM to 8 PM on weekdays from June to August, is over 500 hours long, and SEER might well be a good performance indicator for such a period. However, in hope of alignment of the peak demand window with the PJM summer peak, ADM recommends that the actual EER from the AHRI certificate is used in the demand reduction calculations for future years. This recommendation does not impact program implementation, tracking, and reporting. Rather, ADM will align the demand calculation method with the implementation team.

### *Central Air Conditioners*

Central air conditioners ex-post savings resulted in a 100 percent realization rate for kWh savings. The demand reduction (kW) realization rate ranged from 143 to 209 percent due to different EER values used in the two sets of calculations, and ADM offers the same recommendation related to subsequent basic-rigor evaluations as discussed for heat pumps above.

### *Gas Furnaces*

Gas furnaces ex-post savings resulted in a 100 percent realization rate.

### *Geothermal Heat Pump*

Geothermal heat pump ex-post savings resulted in a 98 percent realization rate for kWh savings and 102 percent realization rate for kW demand reduction. Ex-post savings were calculated using a lower COP value than the ex-ante value for one record (MLI – 6014416). Both COP values were reported in the AHRI database for the specific model;

however, the ENERGY STAR database lists only the lower value, which was used to calculate ex-post calculations.

### *Heat Pump Water Heater*

Heat pump water heater ex-post savings resulted in a 100 percent realization rate.

### *Smart Thermostats*

Smart thermostats ex-post savings resulted in a 100 percent realization rate.

## **Lifetime Savings**

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HVAC Rebates lifetime savings were calculated by multiplying the annual ex-post savings by measure life. Lifetime savings results are reported below in Table D-4, Table D-5, and Table D-6.

Table D-4: HVAC Rebates Lifetime kWh Savings

Measure	Quantity	Measure Life	Ex-post Annual Saving kWh	Ex-post Lifetime Savings kWh
Air Source Heat Pump (SEER >=16, EER>=12.5, HSPF >=9)	14	15	11,912	178,680
Air Source Heat Pump (SEER >=18, EER>=13, HSPF >=10)	9	15	12,974	194,610
Central Air Conditioner (SEER >=16, EER >=12.5)	978	15	285,792	4,286,880
Central Air Conditioner (SEER >=18, EER >=13)	26	15	15,423	231,345
Ductless Mini-Split A/C (SEER >=20, EER>=12.5)	5	17	1,305	22,185
Ductless Mini-Split Heat Pump – Multi Zone (SEER >=18, >=12.5, HSPF >=10)	7	17	7,818	132,905
Ductless Mini-Split Heat Pump - Single Zone (SEER >=20, >=12.5, HSPF >=10)	143	17	135,781	2,308,277
Gas Furnace – Tier 1 AFUE – 95-96.9%	11	20	0	-
Gas Furnace – Tier 2 AFUE >= 97%	2	20	0	-
Geothermal Heat Pump	6	25	13,852	346,300
Heat Pump Water Heater – ENERGY STAR	5	10	8,435	84,350
Smart Thermostat – Electric A/C and Elec Heat	21	7.5	6,115	45,863
Smart Thermostat – Electric A/C and No Natural Gas	36	7.5	5,128	38,460
Smart Thermostat – Gas Heat w/ CAC	194	7.5	27,635	207,263
<b>Total</b>	<b>1,457</b>	<b>-</b>	<b>532,170</b>	<b>8,077,117</b>

Table D-5: HVAC Rebates Lifetime kW Peak Demand Reduction

Measure	Ex-post Demand Reduction kW	Ex-post Lifetime Demand Reduction kW-years
Air Source Heat Pump (SEER >=16, EER>=12.5, HSPF >=9)	7.40	111.00
Air Source Heat Pump (SEER >=18, EER>=13, HSPF >=10)	7.20	108.00
Central Air Conditioner (SEER >=16, EER >=12.5)	378.10	5,671.50
Central Air Conditioner (SEER >=18, EER >=13)	20.40	306.00
Ductless Mini-Split A/C (SEER >=20, EER>=12.5)	1.70	28.90
Ductless Mini-Split Heat Pump – Multi Zone (SEER >=18, >=12.5, HSPF >=10)	3.30	56.10
Ductless Mini-Split Heat Pump - Single Zone (SEER >=20, >=12.5, HSPF >=10)	68.90	1,171.30

Measure	Ex-post Demand Reduction kW	Ex-post Lifetime Demand Reduction kW-years
Gas Furnace – Tier 1 AFUE – 95-96.9%	-	-
Gas Furnace – Tier 2 AFUE >= 97%	-	-
Geothermal Heat Pump	2.30	57.50
Heat Pump Water Heater – ENERGY STAR	1.30	13.00
Smart Thermostat – Electric A/C and Elec Heat	-	-
Smart Thermostat – Electric A/C and No Natural Gas	-	-
Smart Thermostat – Gas Heat w/ CAC	-	-
<b>Total</b>	<b>490.60</b>	<b>7,523.30</b>

*Table D-6: HVAC Rebates Lifetime Gas Savings*

Measure	Ex-post Annual Savings Therms	Ex-post Lifetime Savings Therms	Ex-post Annual Savings MMBtu	Ex-post Lifetime Savings MMBtu
Air Source Heat Pump (SEER >=16, EER>=12.5, HSPF >=9)	-	-	-	-
Air Source Heat Pump (SEER >=18, EER>=13, HSPF >=10)	-	-	-	-
Central Air Conditioner (SEER >=16, EER >=12.5)	-	-	-	-
Central Air Conditioner (SEER >=18, EER >=13)	-	-	-	-
Ductless Mini-Split A/C (SEER >=20, EER>=12.5)	-	-	-	-
Ductless Mini-Split Heat Pump – Multi Zone (SEER >=18, >=12.5, HSPF >=10)	-	-	-	-
Ductless Mini-Split Heat Pump - Single Zone (SEER >=20, >=12.5, HSPF >=10)	-	-	-	-
Gas Furnace – Tier 1 AFUE – 95-96.9%	1,534.40	30,688.00	-	3,068.80
Gas Furnace – Tier 2 AFUE >= 97%	238.99	4,779.80	-	477.98
Geothermal Heat Pump	-	-	-	-
Heat Pump Water Heater – ENERGY STAR	-	-	-	-
Smart Thermostat – Electric A/C and Elec Heat	-	-	-	-
Smart Thermostat – Electric A/C and No Natural Gas	-	-	-	-
Smart Thermostat – Gas Heat w/ CAC	7,831.80	58,738.50	-	5,873.85
<b>Total</b>	<b>9,605.19</b>	<b>94,206.30</b>		<b>9,420.63</b>

## Data Review

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ADM reviewed HVAC Rebates tracking data to identify data errors or omissions and made the following findings.

### *Missing or Incorrect Data*

**Incorrect AHRI number.** One record included an incorrect AHRI ID number for the measure's model number. This does not appear to be a systematic issue. Overall data entry error rates for this program are on par with similar mature programs that ADM evaluates elsewhere.

### *Opportunity to Improve Realization Rates*

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

**Updated EER Values.** In PY23, ADM will use EER values from the AHRI database, rather than the equation listed in FY2020 NJ TRM. This will bring ex-post savings closer to the expected ex-ante values in PY23.

**Use product model specification values** to calculate both ex-ante and ex-post savings at the record level whenever available to align accurate ex-ante and ex-post calculations.

## Appendix E. Lighting Impact Evaluation Detail

The Lighting program component provides point-of-sale discounts on standard and specialty LED lighting products at participating retailers. The Lighting program component contributed approximately 51 percent of portfolio savings during PY22.

### Gross Impact Evaluation Results

Lighting program component results are summarized in Table E-1, Table E-2, and Table E-3. Note that the quantities correspond to line-items in tracking data rather than lamps or kits.

*Table E-1: PY22 Lighting Gross Annual Retail kWh Savings*

Measure	Quantity	ISR	Ex-ante kWh	Ex-post kWh	RR kWh
Foodbank Kit A	17	1.00	1,604,658	1,698,851	106%
LED – Decorative – 150 – 299 lumens	845	0.95	225,350	232,104	103%
LED – Decorative – 300 – 499 lumens	3,612	0.95	1,531,103	1,576,990	103%
LED – Decorative – 500 – 699 lumens	2,313	0.95	1,197,752	1,233,648	103%
LED – Decorative – 90 – 149 lumens	368	0.95	41,538	42,782	103%
LED – Globe – 350 – 499 lumens	904	0.95	351,251	361,778	103%
LED – Globe – 500 – 574 lumens	902	0.95	267,753	275,778	103%
LED – Other Decorative – 500 – 699 lumens	292	0.95	48,862	50,326	103%
LED – Reflector/Flood – BR30 ->1419 lumens	154	0.95	34,250	98,927	289%
LED – Reflector/Flood – BR30, BR40, ER30, ER40 – 500 – 1419 lumens	8,948	0.95	9,459,576	9,758,450	103%
LED – Reflector/Flood – PAR - >1300 lumens	958	0.95	430,079	1,083,868	252%
LED – Reflector/Flood – PAR – 1000 – 1300 lumens	1,577	0.95	909,126	936,373	103%
LED – Reflector/Flood – PAR – 300 - 599 lumens	1,305	0.95	572,691	602,805	105%
LED – Reflector/Flood – PAR – 600 - 849 lumens	1,031	0.95	325,159	334,904	103%
LED – Reflector/Flood – PAR – 850 - 999 lumens	417	0.95	107,968	111,204	103%
LED – Reflector/Flood – R – 300 - 599 lumens	188	0.95	47,223	48,639	103%
LED – Reflector/Flood – R – 600 - 849 lumens	187	0.95	15,998	16,478	103%

Measure	Quantity	ISR	Ex-ante kWh	Ex-post kWh	RR kWh
LED – Reflector/Flood – R – 200 - 299 lumens	42	0.95	13,782	14,195	103%
LED – Reflector/Flood – R20 -> 715 lumens	794	0.95	469,743	483,822	103%
LED – Reflector/Flood – R20 – 450 – 715 lumens	1,065	0.95	412,219	424,573	103%
LED – Standard – 2550 – 3000 lumens	1,107	0.95	360,761	371,573	103%
LED – Standard – 1100 – 1599 lumens	4,362	0.95	1,837,524	2,026,687	110%
LED – Standard – 1600 – 1900 lumens	5,584	0.95	3,135,488	3,254,558	104%
LED – Standard – 2000 – 2549 lumens	784	0.95	163,317	207,699	127%
LED – Standard – 250 – 449 lumens	181	0.95	7,023	8,356	119%
LED – Standard – 450 – 799 lumens	4,828	0.95	2,314,291	2,383,651	103%
LED – Standard – 800 – 1099 lumens	14,326	0.95	21,235,153	21,871,571	103%
<b>Total</b>	<b>57,091</b>	<b>-</b>	<b>47,119,638</b>	<b>49,510,589</b>	<b>105%</b>

*Table E-2: PY22 Lighting Gross kW Demand Reduction*

Measure	Ex-ante kW	Ex-post kW	RR kW
Foodbank Kit A	139.40	139.65	100%
LED – Decorative – 150 – 299 lumens	16.89	16.07	95%
LED – Decorative – 300 – 499 lumens	114.77	109.19	95%
LED – Decorative – 500 – 699 lumens	89.78	85.42	95%
LED – Decorative – 90 – 149 lumens	3.11	2.96	95%
LED – Globe – 350 – 499 lumens	26.33	25.05	95%
LED – Globe – 500 – 574 lumens	20.07	19.09	95%
LED – Other Decorative – 500 – 699 lumens	3.66	3.48	95%
LED – Reflector/Flood – BR30 ->1419 lumens	2.57	6.85	267%
LED – Reflector/Flood – BR30, BR40, ER30, ER40 – 500 – 1419 lumens	709.06	675.68	95%
LED – Reflector/Flood – PAR - >1300 lumens	32.24	75.05	233%
LED – Reflector/Flood – PAR – 1000 – 1300 lumens	68.15	64.83	95%
LED – Reflector/Flood – PAR – 300 - 599 lumens	42.93	41.74	97%
LED – Reflector/Flood – PAR – 600 - 849 lumens	24.37	23.19	95%

Measure	Ex-ante kW	Ex-post kW	RR kW
LED – Reflector/Flood – PAR – 850 - 999 lumens	8.09	7.70	95%
LED – Reflector/Flood – R – 300 - 599 lumens	3.54	3.37	95%
LED – Reflector/Flood – R – 600 - 849 lumens	1.20	1.14	95%
LED – Reflector/Flood – R – 200 - 299 lumens	1.03	0.98	95%
LED – Reflector/Flood – R20 -> 715 lumens	35.21	33.50	95%
LED – Reflector/Flood – R20 – 450 – 715 lumens	30.90	29.40	95%
LED – Standard – 2550 – 3000 lumens	27.04	25.73	95%
LED – Standard – 1100 – 1599 lumens	137.73	140.33	102%
LED – Standard – 1600 – 1900 lumens	235.02	225.35	96%
LED – Standard – 2000 – 2549 lumens	12.24	14.38	117%
LED – Standard – 250 – 449 lumens	0.53	0.58	110%
LED – Standard – 450 – 799 lumens	173.47	165.04	95%
LED – Standard – 800 – 1099 lumens	1,591.71	1514.39	95%
<b>Total</b>	<b>3,551.04</b>	<b>3,450.13</b>	<b>97%</b>

Table E-3: PY22 Lighting Gross Annual Gas Savings

Measure	Ex-ante Therms	Ex-post Therms	Ex-ante MMBtu	Ex-post MMBtu	RR
Foodbank Kit A	-	-	-	-	-
LED – Decorative – 150 – 299 lumens	(3,532.56)	(3,384.34)	(353.26)	(338.43)	96%
LED – Decorative – 300 – 499 lumens	(24,001.35)	(22,994.30)	(2,400.14)	(2,299.43)	96%
LED – Decorative – 500 – 699 lumens	(18,775.78)	(17,987.98)	(1,877.58)	(1,798.80)	96%
LED – Decorative – 90 – 149 lumens	(651.14)	(623.82)	(65.11)	(62.38)	96%
LED – Globe – 350 – 499 lumens	(5,506.16)	(5,275.13)	(550.62)	(527.51)	96%
LED – Globe – 500 – 574 lumens	(4,197.26)	(4,021.15)	(419.73)	(402.11)	96%
LED – Other Decorative – 500 – 699 lumens	(765.95)	(733.81)	(76.60)	(73.38)	96%
LED – Reflector/Flood – BR30 ->1419 lumens	(536.89)	(1,442.46)	(53.69)	(144.25)	269%
LED – Reflector/Flood – BR30, BR40, ER30, ER40 – 500 – 1419 lumens	(148,286.96)	(142,289.23)	(14,828.70)	(14,228.92)	96%
LED – Reflector/Flood – PAR - >1300 lumens	(6,741.85)	(15,804.02)	(674.19)	(1,580.40)	234%
LED – Reflector/Flood – PAR – 1000 – 1300 lumens	(14,251.33)	(13,653.37)	(1,425.13)	(1,365.34)	96%



Measure	Ex-ante Therms	Ex-post Therms	Ex-ante MMBtu	Ex-post MMBtu	RR
LED – Reflector/Flood – PAR – 300 - 599 lumens	(8,977.41)	(8,789.57)	(897.74)	(878.96)	98%
LED – Reflector/Flood – PAR – 600 - 849 lumens	(5,097.15)	(4,883.29)	(509.72)	(488.33)	96%
LED – Reflector/Flood – PAR – 850 - 999 lumens	(1,692.50)	(1,621.48)	(169.25)	(162.15)	96%
LED – Reflector/Flood – R – 300 - 599 lumens	(740.27)	(709.21)	(74.03)	(70.92)	96%
LED – Reflector/Flood – R – 600 - 849 lumens	(250.79)	(240.26)	(25.08)	(24.03)	96%
LED – Reflector/Flood – R – 200 - 299 lumens	(216.04)	(206.98)	(21.60)	(20.70)	96%
LED – Reflector/Flood – R20 -> 715 lumens	(7,363.63)	(7,054.66)	(736.36)	(705.47)	96%
LED – Reflector/Flood – R20 – 450 – 715 lumens	(6,461.89)	(6,190.76)	(646.19)	(619.08)	96%
LED – Standard – 2550 – 3000 lumens	(5,655.24)	(5,417.96)	(565.52)	(541.80)	96%
LED – Standard – 1100 – 1599 lumens	(28,804.76)	(29,551.39)	(2,880.48)	(2,955.14)	103%
LED – Standard – 1600 – 1900 lumens	(49,151.46)	(47,455.13)	(4,915.15)	(4,745.51)	97%
LED – Standard – 2000 – 2549 lumens	(2,560.14)	(3,028.48)	(256.01)	(302.85)	118%
LED – Standard – 250 – 449 lumens	(110.09)	(121.84)	(11.01)	(12.18)	111%
LED – Standard – 450 – 799 lumens	(36,278.49)	(34,756.32)	(3,627.85)	(3,475.63)	96%
LED – Standard – 800 – 1099 lumens	(332,879.20)	(318,912.23)	(33,287.92)	(31,891.22)	96%
<b>Total</b>	<b>(713,486.29)</b>	<b>(697,149.17)</b>	<b>(71,348.63)</b>	<b>(69,714.92)</b>	<b>98%</b>

## Discussion of Realization Rates

Lighting realization rates were impacted by the following factors:

- Verified ex-post ISR was lower than the ex-ante ISR implied in NJ CML resulting in lower realization rates.
- Ex-ante HOU were based on residential interior installations only. Ex-post HOU included exterior and commercial installation locations with higher HOU which increased realization rates.
- Ex-post baseline wattages were drawn from the NJ CML; ex-post efficient wattages were based on model number specifications. Unless wattage values are drawn from the same sources, realization rate impacts can vary by specific bulb type. Overall, this was not a major driver of realization rates.

## Lifetime Savings

Upstream lighting lifetime savings were calculated by multiplying the annual ex-post savings by the measure life. Lifetime savings results are reported below in Table E-4, Table E-5, and Table E-6.

*Table E-4: Lighting Lifetime kWh Savings*

Measure	Quantity	Measure Life	Ex-post Annual Saving kWh	Ex-post Lifetime Savings kWh
Foodbank Kit A	17	12.48	1,698,851	21,201,665
LED – Decorative – 150 – 299 lumens	845	15	232,104	3,481,559
LED – Decorative – 300 – 499 lumens	3,612	15	1,576,990	23,654,849
LED – Decorative – 500 – 699 lumens	2,313	15	1,233,648	18,504,722
LED – Decorative – 90 – 149 lumens	368	15	42,782	641,737
LED – Globe – 350 – 499 lumens	904	15	361,778	5,426,672
LED – Globe – 500 – 574 lumens	902	15	275,778	4,136,665
LED – Other Decorative – 500 – 699 lumens	292	15	50,326	754,892
LED – Reflector/Flood – BR30 ->1419 lumens	154	15	98,927	1,483,902
LED – Reflector/Flood – BR30, BR40, ER30, ER40 – 500 – 1419 lumens	8,948	15	9,758,450	146,376,745
LED – Reflector/Flood – PAR - >1300 lumens	958	15	1,083,868	16,258,024
LED – Reflector/Flood – PAR – 1000 – 1300 lumens	1,577	15	936,373	14,045,589
LED – Reflector/Flood – PAR – 300 - 599 lumens	1,305	15	602,805	9,042,069
LED – Reflector/Flood – PAR – 600 - 849 lumens	1,031	15	334,904	5,023,566
LED – Reflector/Flood – PAR – 850 - 999 lumens	417	15	111,204	1,668,062
LED – Reflector/Flood – R – 300 - 599 lumens	188	15	48,639	729,581
LED – Reflector/Flood – R – 600 - 849 lumens	187	15	16,478	247,165
LED – Reflector/Flood – R – 200 - 299 lumens	42	15	14,195	212,922
LED – Reflector/Flood – R20 -> 715 lumens	794	15	483,822	7,257,323

Measure	Quantity	Measure Life	Ex-post Annual Saving kWh	Ex-post Lifetime Savings kWh
LED – Reflector/Flood – R20 – 450 – 715 lumens	1,065	15	424,573	6,368,602
LED – Standard – 2550 – 3000 lumens	1,107	15	371,573	5,573,602
LED – Standard – 1100 – 1599 lumens	4,362	15	2,026,687	30,400,303
LED – Standard – 1600 – 1900 lumens	5,584	15	3,254,558	48,818,364
LED – Standard – 2000 – 2549 lumens	784	15	207,699	3,115,478
LED – Standard – 250 – 449 lumens	181	15	8,356	125,338
LED – Standard – 450 – 799 lumens	4,828	15	2,383,651	35,754,758
LED – Standard – 800 – 1099 lumens	14,326	15	21,871,571	328,073,569
<b>Total</b>	<b>57,091</b>	<b>-</b>	<b>49,510,589</b>	<b>738,377,725</b>

*Table E-5: Lighting Lifetime kW Peak Demand Reduction*

Measure	Ex-post Demand Reduction kW	Ex-post Lifetime Demand Reduction kW-years
Foodbank Kit A	139.65	1,742.79
LED – Decorative – 150 – 299 lumens	16.07	241.06
LED – Decorative – 300 – 499 lumens	109.19	1,637.86
LED – Decorative – 500 – 699 lumens	85.42	1,281.27
LED – Decorative – 90 – 149 lumens	2.96	44.43
LED – Globe – 350 – 499 lumens	25.05	375.74
LED – Globe – 500 – 574 lumens	19.09	286.42
LED – Other Decorative – 500 – 699 lumens	3.48	52.27
LED – Reflector/Flood – BR30 ->1419 lumens	6.85	102.75
LED – Reflector/Flood – BR30, BR40, ER30, ER40 – 500 – 1419 lumens	675.68	10,135.13
LED – Reflector/Flood – PAR - >1300 lumens	75.05	1,125.71
LED – Reflector/Flood – PAR – 1000 – 1300 lumens	64.83	972.52
LED – Reflector/Flood – PAR – 300 - 599 lumens	41.74	626.07
LED – Reflector/Flood – PAR – 600 - 849 lumens	23.19	347.83
LED – Reflector/Flood – PAR – 850 - 999 lumens	7.70	115.50

Measure	Ex-post Demand Reduction kW	Ex-post Lifetime Demand Reduction kW-years
LED – Reflector/Flood – R – 300 - 599 lumens	3.37	50.52
LED – Reflector/Flood – R – 600 - 849 lumens	1.14	17.11
LED – Reflector/Flood – R – 200 - 299 lumens	0.98	14.74
LED – Reflector/Flood – R20 -> 715 lumens	33.50	502.50
LED – Reflector/Flood – R20 – 450 – 715 lumens	29.40	440.96
LED – Standard – 2550 – 3000 lumens	25.73	385.92
LED – Standard – 1100 – 1599 lumens	140.33	2,104.92
LED – Standard – 1600 – 1900 lumens	225.35	3,380.19
LED – Standard – 2000 – 2549 lumens	14.38	215.72
LED – Standard – 250 – 449 lumens	0.58	8.68
LED – Standard – 450 – 799 lumens	165.04	2,475.66
LED – Standard – 800 – 1099 lumens	1,514.39	22,715.83
<b>Total</b>	<b>3,375.60</b>	<b>51,400.09</b>

Table E-6: Lighting Lifetime Gas Savings

Measure	Quantity	Ex-Post therms	Measure Life	Lifetime Savings therms	Lifetime Savings MMBtu
Foodbank Kit A	17	0	12.5	-	-
LED – Decorative – 150 – 299 lumens	845	-3,384	15.0	-50,765	-5,077
LED – Decorative – 300 – 499 lumens	3,612	-22,994	15.0	-344,914	-34,491
LED – Decorative – 500 – 699 lumens	2,313	-17,988	15.0	-269,820	-26,982
LED – Decorative – 90 – 149 lumens	368	-624	15.0	-9,357	-936
LED – Globe – 350 – 499 lumens	904	-5,275	15.0	-79,127	-7,913
LED – Globe – 500 – 574 lumens	902	-4,021	15.0	-60,317	-6,032
LED – Other Decorative – 500 – 699 lumens	292	-734	15.0	-11,007	-1,101
LED – Reflector/Flood – BR30 - >1419 lumens	154	-1,442	15.0	-21,637	-2,164

Measure	Quantity	Ex-Post therms	Measure Life	Lifetime Savings therms	Lifetime Savings MMBtu
LED – Reflector/Flood – BR30, BR40, ER30, ER40 – 500 – 1419 lumens	8,948	-142,289	15.0	-2,134,338	-213,434
LED – Reflector/Flood – PAR - >1300 lumens	958	-15,804	15.0	-237,060	-23,706
LED – Reflector/Flood – PAR – 1000 – 1300 lumens	1,577	-13,653	15.0	-204,801	-20,480
LED – Reflector/Flood – PAR – 300 - 599 lumens	1,305	-8,790	15.0	-131,844	-13,184
LED – Reflector/Flood – PAR – 600 - 849 lumens	1,031	-4,883	15.0	-73,249	-7,325
LED – Reflector/Flood – PAR – 850 - 999 lumens	417	-1,621	15.0	-24,322	-2,432
LED – Reflector/Flood – R – 300 - 599 lumens	188	-709	15.0	-10,638	-1,064
LED – Reflector/Flood – R – 600 - 849 lumens	187	-240	15.0	-3,604	-360
LED – Reflector/Flood – R – 200 - 299 lumens	42	-207	15.0	-3,105	-310
LED – Reflector/Flood – R20 -> 715 lumens	794	-7,055	15.0	-105,820	-10,582
LED – Reflector/Flood – R20 – 450 – 715 lumens	1,065	-6,191	15.0	-92,861	-9,286
LED – Standard – 2550 – 3000 lumens	1,107	-5,418	15.0	-81,269	-8,127
LED – Standard – 1100 – 1599 lumens	4,362	-29,551	15.0	-443,271	-44,327
LED – Standard – 1600 – 1900 lumens	5,584	-47,455	15.0	-711,827	-71,183
LED – Standard – 2000 – 2549 lumens	784	-3,028	15.0	-45,427	-4,543
LED – Standard – 250 – 449 lumens	181	-122	15.0	-1,828	-183
LED – Standard – 450 – 799 lumens	4,828	-34,756	15.0	-521,345	-52,134
LED – Standard – 800 – 1099 lumens	14,326	-318,912	15.0	-4,783,683	-478,368
<b>Total</b>	<b>57,091</b>	<b>-697,149</b>	-	<b>-10,457,238</b>	<b>-1,045,724</b>

## Data Review

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ADM reviewed program tracking data for duplicated records, errors and omissions and made the following findings.

### *Missing or Incorrect Data*

Two lightbulb model numbers included in the tracking data could not be verified as lighting products (9290024480 and 9290024479). One lightbulb model number (93129219) identified a product that was not ENERGY STAR certified. The total impact to calculated kWh savings was less than 0.1 percent of lighting savings.

### *Opportunity to Improve Realization Rates*

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

**Use NJ CML baseline wattage values** to align ex-ante and ex-post savings calculations.

**Use product model specification values** to calculate both ex-ante and ex-post savings at the record level whenever available to align accurate ex-ante and ex-post calculations.

## Appendix F. Online Marketplace Impact Evaluation Detail

The Online Marketplace program component offers JCP&L residential customers the opportunity to purchase discounted high-efficiency lighting products, smart thermostats, advanced power strips, and air purifiers from an online store. The Online Marketplace program component contributed 1.6 percent of portfolio savings during PY22.

### Gross Impact Evaluation Results

Online Marketplace program component savings are summarized in Table F-1 and Table F-2.

*Table F-1: PY22 Online Marketplace Gross Annual Retail kWh Savings and Gross kW Demand Reduction*

Measure	Qty	ISR	Ex-ante kWh	Ex-post kWh	RR kWh	Ex-ante kW	Ex-post kW	RR kW
Advanced Power Strip + Multi-sensor 7-outlet Tier 2	6	0.74	2,076	1,536	74%	0.23	0.17	74%
Advanced Power Strip 7-outlet Tier 1	186	0.86	35,877	30,854	86%	4.19	3.60	86%
Air Purifier - (CADR 120)	9	1.0	4,392	4,392	100%	0.5	0.50	100%
Air Purifier - (CADR 230)	21	1.0	23,679	23,679	100%	2.73	2.73	100%
Air Purifier - (CADR 380)	10	1.0	11,792	11,792	100%	1.35	1.35	100%
Holiday 25 Light Cool White C7 LED String Lights, 8" spacing, 17 ft length	1	1.0	66	62	93%	-	-	-
Holiday 25 Light Cool White C9 LED String Lights, 8" spacing, 17 ft length	2	1.0	104	75	72%	-	-	-
Holiday 25 Light Multi-Color C9 LED String Lights, 8" spacing, 17 ft length	4	1.0	155	113	72%	-	-	-
Holiday 70 Light Cool White LED String Lights, 4" spacing, 24 ft long	2	1.0	9	8	97%	-	-	-
Holiday 70 Light Multi-Color LED String Lights, 4" spacing, 24 ft long	1	1.0	9	8	97%	-	-	-
LED 12W LED A-lamp 3-way (2 pack)	86	0.92	20,266	19,384	96%	1.52	1.37	90%
LED 7 watt MR16 Lamp with GU10 base (4 pack)	31	0.92	4,882	6,670	137%	0.37	0.47	128%

Measure	Qty	ISR	Ex-ante kWh	Ex-post kWh	RR kWh	Ex-ante kW	Ex-post kW	RR kW
LED 7 watt MR16 Lamp with GU5.3 base (4 pack)	13	0.92	2,603	3,557	137%	0.2	0.25	128%
LED A19 Lamp - 11 Watt (4 pack)	178	0.92	59,229	53,955	91%	4.44	3.80	86%
LED A19 Lamp - 15 Watt (4 pack)	147	0.92	62,114	56,583	91%	4.66	3.99	86%
LED A19 Lamp - 6 watt (4 pack)	126	0.92	29,827	27,171	91%	2.24	1.91	86%
LED A19 Lamp - 9 watt (4 pack)	179	0.92	55,660	50,703	91%	4.17	3.57	86%
LED BR30 Flood Lamp 11 Watt (4 pack)	111	0.92	35,976	55,302	154%	2.7	3.90	144%
LED BR30 Flood Lamp 8 Watt (4 pack)	2	0.92	621	1,536	247%	0.05	0.11	232%
LED BR40 Flood Lamp 17 Watt (4 pack)	92	0.92	32,662	68,598	210%	2.45	4.83	197%
LED Candelabra Lamp 5 Watt E12 base (4 pack)	150	0.92	31,952	29,713	93%	2.4	2.09	87%
LED Filament Candelabra 4 watt E12 base (4 pack)	139	0.92	35,517	38,517	108%	2.66	2.71	102%
LED G25 Globe 6 Watt E26 base (4 pack)	56	0.92	10,547	15,456	147%	0.79	1.09	138%
LED Night Light 0.3 Watt (2 pack)	68	0.92	6,090	5,603	92%	-	0.00	-
LED Par 38 Dimmable 15 Watt (2 pack)	29	0.92	5,059	6,064	120%	0.38	0.43	113%
Smart Thermostat - Electric A/C and No Natural Gas Not Controlled	30	1.0	5,840	5,773	99%	-	-	-
Smart Thermostat - Electric AC and Electric Heat Not Controlled	25	1.0	4,986	4,928	99%	-	-	-
Smart Thermostat - Electric AC and no Natural Gas	695	1.0	145,157	143,488	99%	-	-	-
Smart Thermostat - Gas Heat Not Controlled with CAC	111	1.0	19,943	19,714	99%	-	-	-
Smart Thermostat - No CAC and Electric Heat Not Controlled	1	-	-	-	-	-	-	-
Smart Thermostat - No Central A/C and Electric Heat	88	1.0	18,593	18,379	99%	-	-	-
Smart Thermostat - No Central A/C and No Natural Gas	415	-	-	-	-	-	-	-
Smart Thermostats - Electric A/C and Elec Heat	290	1.0	119,679	118,303	99%	-	-	-
Smart Thermostats - Gas Heat and no CAC or Muni	562	-	-	-	-	-	-	-



Measure	Qty	ISR	Ex-ante kWh	Ex-post kWh	RR kWh	Ex-ante kW	Ex-post kW	RR kW
Smart Thermostats - Gas Heat Not Controlled and No CAC or Muni	5	-	-	-	-	-	-	-
Smart Thermostats - Gas Heat w/ CAC	3,392	1.0	702,991	694,910	99%	-	-	-
Wall plate	385	-	-	-	-	-	-	-
WiFi Smart A19, 9W CCT+RGB+WiFi, EnergyStar, Gen 2, NOT suitable for use in totally enclosed fixtures (2 pack)	29	0.92	5,197	4,734	91%	0.39	0.33	86%
WiFi Smart BR30, 8W, CCT+RGB+WiFi, EnergyStar, Gen 2 (2 pack)	15	0.92	1,450	3,584	247%	0.11	0.25	232%
<b>Total</b>	<b>7,692</b>	<b>-</b>	<b>1,494,999</b>	<b>1,525,147</b>	<b>102%</b>	<b>38.51</b>	<b>39.47</b>	<b>102%</b>

*Table F-2: PY22 Online Marketplace Gross Annual Gas Savings*

Measure	Ex-ante Therms	Ex-post Therms	Ex-ante MMBtu	Ex-post MMBtu	RR
Advanced Power Strip + Multi-sensor 7-outlet Tier 2	-	-	-	-	-
Advanced Power Strip 7-outlet Tier 1	-	-	-	-	-
Air Purifier - (CADR 120)	-	-	-	-	-
Air Purifier - (CADR 230)	-	-	-	-	-
Air Purifier - (CADR 380)	-	-	-	-	-
Holiday 25 Light Cool White C7 LED String Lights, 8" spacing, 17 ft length	-	-	-	-	-
Holiday 25 Light Cool White C9 LED String Lights, 8" spacing, 17 ft length	-	-	-	-	-
Holiday 25 Light Multi-Color C9 LED String Lights, 8" spacing, 17 ft length	-	-	-	-	-
Holiday 70 Light Cool White LED String Lights, 4" spacing, 24 ft long	-	-	-	-	-
Holiday 70 Light Multi-Color LED String Lights, 4" spacing, 24 ft long	-	-	-	-	-
LED 12W LED A-lamp 3-way (2 pack)	(317.68)	(274.69)	(31.77)	(27.47)	86%
LED 7 watt MR16 Lamp with GU10 base (4 pack)	(76.52)	(94.52)	(7.65)	(9.45)	124%
LED 7 watt MR16 Lamp with GU5.3 base (4 pack)	(40.81)	(50.41)	(4.08)	(5.04)	124%
LED A19 Lamp - 11 Watt (4 pack)	(928.47)	(764.59)	(92.85)	(76.46)	82%
LED A19 Lamp - 15 Watt (4 pack)	(973.69)	(801.83)	(97.37)	(80.18)	82%

Measure	Ex-ante Therms	Ex-post Therms	Ex-ante MMBtu	Ex-post MMBtu	RR
LED A19 Lamp - 6 watt (4 pack)	(467.56)	(385.03)	(46.76)	(38.50)	82%
LED A19 Lamp - 9 watt (4 pack)	(872.51)	(718.51)	(87.25)	(71.85)	82%
LED BR30 Flood Lamp 11 Watt (4 pack)	(563.95)	(783.69)	(56.39)	(78.37)	139%
LED BR30 Flood Lamp 8 Watt (4 pack)	(9.74)	(21.77)	(0.97)	(2.18)	224%
LED BR40 Flood Lamp 17 Watt (4 pack)	(512.01)	(972.10)	(51.20)	(97.21)	190%
LED Candelabra Lamp 5 Watt E12 base (4 pack)	(500.87)	(421.06)	(50.09)	(42.11)	84%
LED Filament Candelabra 4 watt E12 base (4 pack)	(556.76)	(545.82)	(55.68)	(54.58)	98%
LED G25 Globe 6 Watt E26 base (4 pack)	(165.33)	(219.03)	(16.53)	(21.90)	132%
LED Night Light 0.3 Watt (2 pack)	-	-	-	-	-
LED Par 38 Dimmable 15 Watt (2 pack)	(79.31)	(85.93)	(7.93)	(8.59)	108%
Smart Thermostat - Electric A/C and No Natural Gas Not Controlled	-	-	-	-	-
Smart Thermostat - Electric AC and Electric Heat Not Controlled	-	-	-	-	-
Smart Thermostat - Electric AC and no Natural Gas	-	-	-	-	-
Smart Thermostat - Gas Heat Not Controlled with CAC	-	-	-	-	-
Smart Thermostat - No CAC and Electric Heat Not Controlled	-	-	-	-	-
Smart Thermostat - No Central A/C and Electric Heat	-	-	-	-	-
Smart Thermostat - No Central A/C and No Natural Gas	-	-	-	-	-
Smart Thermostats - Electric A/C and Elec Heat	-	-	-	-	-
Smart Thermostats - Gas Heat and no CAC or Muni	31,448.23	31,086.76	3,144.82	3,108.68	99%
Smart Thermostats - Gas Heat Not Controlled and No CAC or Muni	-	-	-	-	-
Smart Thermostats - Gas Heat w/ CAC	199,225.95	196,936.00	19,922.60	19,693.60	99%
Wall plate	-	-	-	-	-
WiFi Smart A19, 9W CCT+RGB+WiFi, EnergyStar, Gen 2, NOT suitable for use in totally enclosed fixtures (2 pack)	(81.47)	(67.09)	(8.15)	(6.71)	82%

Measure	Ex-ante Therms	Ex-post Therms	Ex-ante MMBtu	Ex-post MMBtu	RR
WiFi Smart BR30, 8W, CCT+RGB+WiFi, EnergyStar, Gen 2 (2 pack)	(22.72)	(50.79)	(2.27)	(5.08)	224%
<b>Total</b>	<b>224,504.77</b>	<b>221,765.88</b>	<b>22,450.48</b>	<b>22,176.59</b>	<b>99%</b>

## Discussion of Realization Rates

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### *Advanced Power Strips*

The impact evaluation found that impacts for this measure were correctly tracked and reported. Customer surveys also resulted in a 100 percent verification rate for this measure. However, ADM is proposing a lower than 100 percent realization rate for this measure, based on our review of the NJFY2020 protocols. The protocols omit an explicit ISR term. It is unclear if the protocols imply an ISR of 100 percent, or if they imply that the deemed value is only to be applied if the measure is indeed installed. The latter interpretation seems problematic because it is impractical to track the ISR for any delivery channel except for direct-installation by program allies or contractors. ADM's experience with the measure, through extensive surveying in other states, is that some participants utilize advanced power strips in a manner that does not realize their potential savings. This experience is reflected in the ISR terms in the PA TRM. ADM applied these ISRs to Advanced Power Strips, and recommends that the NJ Protocols are updated to reflect ISRs for different distribution channels.

### *Air purifiers*

In PY22, 40 air purifiers were purchased through the Online Marketplace Program. ADM surveyed 126 out of 5,387 participants, but the simple random sample did not result in any customers that purchased air purifiers. An ISR of 100 percent was assumed for this measure, resulting in a 100 percent realization rate. ADM's experience with similar programs in other states as well as downstream rebate programs offered by JCP&L in PY22 is that ISRs for purchased appliances tend to be near 100 percent.

### *Lighting*

Lighting measure realization rates ranged from 72 to 247 percent. Ex-post savings were calculated using baseline wattages from NJ CLM and efficient wattages specified by product number. The main drivers of the realization rate was differences in baseline

wattage sources, followed by differences in the in-service rates<sup>24</sup>. As one example, an 11 W BR30 LED had ex-ante savings calculated with a 43 W baseline and 100 percent ISR, while the ex-post calculation used a 65 W baseline and a 92 percent ISR.

### Smart Thermostats

Smart thermostats ex-post savings were calculated with heating and cooling types ascertained through participant surveys. Slight differences between tracking data and customer surveys related to heating and cooling types resulted in a small variance between ex-ante and ex-post savings, and a 99 percent realization rate. The correspondence between ex-ante and ex-post savings for this measure is much better than in comparable programs and distribution channels. Two reasons likely account for this:

- Heating fuel types are collected when customers purchase smart thermostats and are propagated into JCP&L’s tracking and reporting system
- The savings algorithm for smart thermostats in New Jersey is relatively simple, resulting in fewer possible savings values for a given installation scenario

## Lifetime Savings

Lifetime savings for Online Marketplace were calculated by multiplying ex-post annual savings by the measure life. These savings are reported in Table F-3, Table F-4, and Table F-5.

*Table F-3: Online Marketplace Lifetime kWh Savings*

Measure	Quantity	Measure Life	Ex-post Annual Saving kWh	Ex-post Lifetime Savings kWh
Advanced Power Strip + Multi-sensor 7-outlet Tier 2		1,536	8	12,290
Advanced Power Strip 7-outlet Tier 1		30,854	8	246,835
Air Purifier - (CADR 120)		4,392	9	39,528
Air Purifier - (CADR 230)		23,679	9	213,111
Air Purifier - (CADR 380)		11,792	9	106,128
Holiday 25 Light Cool White C7 LED String Lights, 8" spacing, 17 ft length		62	10	621

<sup>24</sup> The NJ Protocols for residential lighting do not include an explicit ISR term. This resulted in an implicit 100 percent ISR in impacts as reported by the implementation team. ADM used an ISR of 92 percent in the impact evaluation.

Measure	Quantity	Measure Life	Ex-post Annual Saving kWh	Ex-post Lifetime Savings kWh
Holiday 25 Light Cool White C9 LED String Lights, 8" spacing, 17 ft length		75	10	750
Holiday 25 Light Multi-Color C9 LED String Lights, 8" spacing, 17 ft length		113	10	1,125
Holiday 70 Light Cool White LED String Lights, 4" spacing, 24 ft long		8	10	84
Holiday 70 Light Multi-Color LED String Lights, 4" spacing, 24 ft long		8	10	84
LED 12W LED A-lamp 3-way (2 pack)		19,384	15	290,762
LED 7 watt MR16 Lamp with GU10 base (4 pack)		6,670	15	100,054
LED 7 watt MR16 Lamp with GU5.3 base (4 pack)		3,557	15	53,362
LED A19 Lamp - 11 Watt (4 pack)		53,955	15	809,323
LED A19 Lamp - 15 Watt (4 pack)		56,583	15	848,738
LED A19 Lamp - 6 watt (4 pack)		27,171	15	407,559
LED A19 Lamp - 9 watt (4 pack)		50,703	15	760,543
LED BR30 Flood Lamp 11 Watt (4 pack)		55,302	15	829,536
LED BR30 Flood Lamp 8 Watt (4 pack)		1,536	15	23,043
LED BR40 Flood Lamp 17 Watt (4 pack)		68,598	15	1,028,969
LED Candelabra Lamp 5 Watt E12 base (4 pack)		29,713	15	445,694
LED Filament Candelabra 4 watt E12 base (4 pack)		38,517	15	577,751
LED G25 Globe 6 Watt E26 base (4 pack)		15,456	15	231,842
LED Night Light 0.3 Watt (2 pack)		5,603	15	84,047
LED Par 38 Dimmable 15 Watt (2 pack)		6,064	15	90,958
Smart Thermostat - Electric A/C and No Natural Gas Not Controlled		5,773	8	46,187
Smart Thermostat - Electric AC and Electric Heat Not Controlled		4,928	8	39,428
Smart Thermostat - Electric AC and no Natural Gas		143,488	8	1,147,905
Smart Thermostat - Gas Heat Not Controlled with CAC		19,714	8	157,710
Smart Thermostat - No CAC and Electric Heat Not Controlled		-	8	-
Smart Thermostat - No Central A/C and Electric Heat		18,379	8	147,030
Smart Thermostat - No Central A/C and No Natural Gas		-	8	-

Measure	Quantity	Measure Life	Ex-post Annual Saving kWh	Ex-post Lifetime Savings kWh
Smart Thermostats - Electric A/C and Elec Heat		118,303	8	946,428
Smart Thermostats - Gas Heat and no CAC or Muni		-	8	-
Smart Thermostats - Gas Heat Not Controlled and No CAC or Muni		-	8	-
Smart Thermostats - Gas Heat w/ CAC		694,910	8	5,559,283
Wall plate		-	8	-
WiFi Smart A19, 9W CCT+RGB+WiFi, EnergyStar, Gen 2, NOT suitable for use in totally enclosed fixtures (2 pack)		4,734	8	37,874
WiFi Smart BR30, 8W, CCT+RGB+WiFi, EnergyStar, Gen 2 (2 pack)		3,584	9	32,260
<b>Total</b>		<b>1,525,147</b>	<b>-</b>	<b>15,316,839</b>

*Table F-4: Online Marketplace Lifetime kW Peak Demand Reduction*

Measure	Ex-post Demand Reduction kW	Ex-post Lifetime Demand Reduction kW-years
Advanced Power Strip + Multi-sensor 7-outlet Tier 2	0.17	1.39
Advanced Power Strip 7-outlet Tier 1	3.60	28.81
Air Purifier - (CADR 120)	0.50	4.54
Air Purifier - (CADR 230)	2.73	24.54
Air Purifier - (CADR 380)	1.35	12.18
Holiday 25 Light Cool White C7 LED String Lights, 8" spacing, 17 ft length	-	-
Holiday 25 Light Cool White C9 LED String Lights, 8" spacing, 17 ft length	-	-
Holiday 25 Light Multi-Color C9 LED String Lights, 8" spacing, 17 ft length	-	-
Holiday 70 Light Cool White LED String Lights, 4" spacing, 24 ft long	-	-
Holiday 70 Light Multi-Color LED String Lights, 4" spacing, 24 ft long	-	-
LED 12W LED A-lamp 3-way (2 pack)	1.37	20.49
LED 7 watt MR16 Lamp with GU10 base (4 pack)	0.47	7.05
LED 7 watt MR16 Lamp with GU5.3 base (4 pack)	0.25	3.76
LED A19 Lamp - 11 Watt (4 pack)	3.80	57.02
LED A19 Lamp - 15 Watt (4 pack)	3.99	59.80
LED A19 Lamp - 6 watt (4 pack)	1.91	28.71

Measure	Ex-post Demand Reduction kW	Ex-post Lifetime Demand Reduction kW-years
LED A19 Lamp - 9 watt (4 pack)	3.57	53.58
LED BR30 Flood Lamp 11 Watt (4 pack)	3.90	58.44
LED BR30 Flood Lamp 8 Watt (4 pack)	0.11	1.62
LED BR40 Flood Lamp 17 Watt (4 pack)	4.83	72.50
LED Candelabra Lamp 5 Watt E12 base (4 pack)	2.09	31.40
LED Filament Candelabra 4 watt E12 base (4 pack)	2.71	40.71
LED G25 Globe 6 Watt E26 base (4 pack)	1.09	16.33
LED Night Light 0.3 Watt (2 pack)	-	-
LED Par 38 Dimmable 15 Watt (2 pack)	0.43	6.41
Smart Thermostat - Electric A/C and No Natural Gas Not Controlled	-	-
Smart Thermostat - Electric AC and Electric Heat Not Controlled	-	-
Smart Thermostat - Electric AC and no Natural Gas	-	-
Smart Thermostat - Gas Heat Not Controlled with CAC	-	-
Smart Thermostat - No CAC and Electric Heat Not Controlled	-	-
Smart Thermostat - No Central A/C and Electric Heat	-	-
Smart Thermostat - No Central A/C and No Natural Gas	-	-
Smart Thermostats - Electric A/C and Elec Heat	-	-
Smart Thermostats - Gas Heat and no CAC or Muni	-	-
Smart Thermostats - Gas Heat Not Controlled and No CAC or Muni	-	-
Smart Thermostats - Gas Heat w/ CAC	-	-
Wallplate	-	-
WiFi Smart A19, 9W CCT+RGB+WiFi, EnergyStar, Gen 2, NOT suitable for use in totally enclosed fixtures (2 pack)	0.33	2.67
WiFi Smart BR30, 8W, CCT+RGB+WiFi, EnergyStar, Gen 2 (2 pack)	0.25	2.27
<b>Total</b>	<b>39.47</b>	<b>534.22</b>

Table F-5: Online Marketplace Lifetime Gas Savings

Measure	Quantity	Ex-post therms	Measure Life	Lifetime Savings therms	Lifetime Savings MMBtu
Advanced Power Strip + Multi-sensor 7-outlet Tier 2	6	-	8	-	-
Advanced Power Strip 7-outlet Tier 1	186	-	8	-	-

Measure	Quantity	Ex-post therms	Measure Life	Lifetime Savings therms	Lifetime Savings MMBtu
Air Purifier - (CADR 120)	9	-	9	-	-
Air Purifier - (CADR 230)	21	-	9	-	-
Air Purifier - (CADR 380)	10	-	9	-	-
Holiday 25 Light Cool White C7 LED String Lights, 8" spacing, 17 ft length	1	-	10	-	-
Holiday 25 Light Cool White C9 LED String Lights, 8" spacing, 17 ft length	2	-	10	-	-
Holiday 25 Light Multi-Color C9 LED String Lights, 8" spacing, 17 ft length	4	-	10	-	-
Holiday 70 Light Cool White LED String Lights, 4" spacing, 24 ft long	2	-	10	-	-
Holiday 70 Light Multi-Color LED String Lights, 4" spacing, 24 ft long	1	-	10	-	-
LED 12W LED A-lamp 3-way (2 pack)	86	-275	15	(4,120)	(412)
LED 7 watt MR16 Lamp with GU10 base (4 pack)	31	-95	15	(1,418)	(142)
LED 7 watt MR16 Lamp with GU5.3 base (4 pack)	13	-50	15	(756)	(76)
LED A19 Lamp - 11 Watt (4 pack)	178	-765	15	(11,469)	(1,147)
LED A19 Lamp - 15 Watt (4 pack)	147	-802	15	(12,027)	(1,203)
LED A19 Lamp - 6 watt (4 pack)	126	-385	15	(5,776)	(578)
LED A19 Lamp - 9 watt (4 pack)	179	-719	15	(10,778)	(1,078)
LED BR30 Flood Lamp 11 Watt (4 pack)	111	-784	15	(11,755)	(1,176)
LED BR30 Flood Lamp 8 Watt (4 pack)	2	-22	15	(327)	(33)
LED BR40 Flood Lamp 17 Watt (4 pack)	92	-972	15	(14,581)	(1,458)
LED Candelabra Lamp 5 Watt E12 base (4 pack)	150	-421	15	(6,316)	(632)
LED Filament Candelabra 4 watt E12 base (4 pack)	139	-546	15	(8,187)	(819)
LED G25 Globe 6 Watt E26 base (4 pack)	56	-219	15	(3,285)	(329)
LED Night Light 0.3 Watt (2 pack)	68	0	15	-	-
LED Par 38 Dimmable 15 Watt (2 pack)	29	-86	15	(1,289)	(129)
Smart Thermostat - Electric A/C and No Natural Gas Not Controlled	30	-	8	-	-
Smart Thermostat - Electric AC and Electric Heat Not Controlled	25	-	8	-	-
Smart Thermostat - Electric AC and no Natural Gas	695	-	8	-	-
Smart Thermostat - Gas Heat Not Controlled with CAC	111	-	8	-	-



Measure	Quantity	Ex-post therms	Measure Life	Lifetime Savings therms	Lifetime Savings MMBtu
Smart Thermostat - No CAC and Electric Heat Not Controlled	1	-	8	-	-
Smart Thermostat - No Central A/C and Electric Heat	88	-	8	-	-
Smart Thermostat - No Central A/C and No Natural Gas	415	-	8	-	-
Smart Thermostats - Electric A/C and Elec Heat	290	-	8	-	-
Smart Thermostats - Gas Heat and no CAC or Muni	562	31087	8	248,694	24,869
Smart Thermostats - Gas Heat Not Controlled and No CAC or Muni	5	0	8	-	-
Smart Thermostats - Gas Heat w/ CAC	3,392	196936	8	1,575,488	157,549
Wallplate	385	-	8	-	-
WiFi Smart A19, 9W CCT+RGB+WiFi, EnergyStar, Gen 2, NOT suitable for use in totally enclosed fixtures (2 pack)	29	-67	8	(537)	(54)
WiFi Smart BR30, 8W, CCT+RGB+WiFi, EnergyStar, Gen 2 (2 pack)	15	-51	9	(457)	(46)
<b>Total</b>	<b>7,692</b>	<b>221766</b>	<b>-</b>	<b>1,731,103</b>	<b>173,110</b>

## Data Review

ADM reviewed Online Marketplace program tracking data for measures included in PY22.

### *Missing or Incorrect Data*

ADM reviewed program tracking data for duplicated records, errors and omissions and made the following findings.

### *Opportunity to Improve Realization Rates*

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

**Use NJ CML baseline wattage values** to align ex-ante and ex-post savings calculations for lighting measures.

**Use product model specification values** to calculate both ex-ante and ex-post savings at the record level whenever available to align accurate ex-ante and ex-post calculations.

**Add distribution-channel-specific ISRs to the NJ Protocols** for lamps and advanced power strips.

# Appendix G. Process Evaluation Research Questions for PY23

The following research questions will be addressed through process evaluation activities in PY23.

## Appliance Rebates

*Table G-1: Appliance Rebates Researchable Questions and Activities*

Researchable Question	Activity to support the question
<b>Program infrastructure</b>	
How are program processes working between the new implementer and JCP&L? How are communication channels between partner utilities, ICSPs, and SWE? Do program materials accurately reflect the program design and processes?	<ul style="list-style-type: none"> <li>▪ Program staff interviews</li> </ul>
Is there a sufficient number of participating trade allies to reach program goals? What are the barriers to trade ally participation?	<ul style="list-style-type: none"> <li>▪ Program staff interviews</li> </ul>
Has the supply of high-efficient equipment changed? If so, in what ways? How long is this expected to last? What strategies are being considered to mitigate difficulties?	<ul style="list-style-type: none"> <li>▪ Program staff interviews</li> <li>▪ Trade ally interviews (PY23)</li> <li>▪ Retailer surveys (PY23)</li> </ul>
What impact has the program had on trade allies' recommendations and equipment sales to their customers?	<ul style="list-style-type: none"> <li>▪ Trade ally interviews (PY23)</li> <li>▪ Participant surveys (PY23)</li> </ul>
Has the program changed stocking and pricing practices?	<ul style="list-style-type: none"> <li>▪ Trade ally interviews (PY23)</li> <li>▪ Retailer interviews (PY23)</li> </ul>
How has the program impacted sales of energy-efficient equipment?	<ul style="list-style-type: none"> <li>▪ Trade ally interviews (PY23)</li> </ul>
(Appliances and electronics) How have the program affected retailers' sales and promotion practices? Do retailers use displays or price stickers to promote the program? Do the displays or price stickers indicate JCP&L provides the discounts?	<ul style="list-style-type: none"> <li>▪ Retailer interviews (PY23)</li> <li>▪ Participant surveys</li> </ul>
<b>Program communication, marketing, and coordination with trade allies</b>	
What impact has the program had on trade allies' recommendations and equipment sales to their customers?	<ul style="list-style-type: none"> <li>▪ Trade ally interviews (PY23)</li> <li>▪ Retailer surveys (PY23)</li> </ul>

Researchable Question	Activity to support the question
How effective are external communications? Do trade allies feel adequately informed of program operations?	<ul style="list-style-type: none"> <li>▪ Program staff interviews</li> <li>▪ Trade ally interviews (PY23)</li> <li>▪ Retailer surveys (PY23)</li> </ul>
How well are program marketing efforts working? What marketing tools are most effective? Are there differences in the effectiveness of the marketing by sector and by the size of the customer?	<ul style="list-style-type: none"> <li>▪ Program staff interviews</li> <li>▪ Trade ally interviews (PY23)</li> <li>▪ Retailer surveys (PY23)</li> <li>▪ Participant surveys (PY23)</li> </ul>
Are incentive values optimal from all perspectives (e.g., trade allies, customers, distributors)?	<ul style="list-style-type: none"> <li>▪ Trade ally interviews (PY23)</li> <li>▪ Retailer surveys (PY23)</li> <li>▪ Participant surveys (PY23)</li> </ul>
Has the transition to a new implementer been noticed, and what opinion or recommendations do trade allies have?	<ul style="list-style-type: none"> <li>▪ Trade ally interviews (PY23)</li> <li>▪ Retailer surveys (PY23)</li> </ul>
How has the program impacted sales of energy-efficient equipment?	<ul style="list-style-type: none"> <li>▪ Trade ally interviews (PY23)</li> <li>▪ Retailer surveys (PY23)</li> </ul>
How has the program changed stocking and pricing practices?	<ul style="list-style-type: none"> <li>▪ Trade ally interviews (PY23)</li> <li>▪ Retailer surveys (PY23)</li> </ul>
Are customers aware JCP&L offers equipment at a discounted price through retailers?	<ul style="list-style-type: none"> <li>▪ Trade ally interviews (PY23)</li> <li>▪ Retailer surveys (PY23)</li> </ul>
What are the levels of program satisfaction among trade allies/retailers? How could this be improved?	<ul style="list-style-type: none"> <li>▪ Trade ally interviews (PY23)</li> <li>▪ Retailer surveys (PY23)</li> </ul>
Has the supply of high-efficient equipment changed? If so, in what ways? How long is this expected to last? What strategies are being considered to mitigate difficulties?	<ul style="list-style-type: none"> <li>▪ Trade ally interviews (PY23)</li> <li>▪ Retailer surveys (PY23)</li> </ul>
<b>Customer awareness and experiences</b>	
What are the characteristics of the participating/nonparticipating customer population? Are there any eligible groups not being reached by the program?	<ul style="list-style-type: none"> <li>▪ Participant surveys</li> <li>▪ General population survey</li> </ul>
Are customers aware of the Efficient Products program offerings?	<ul style="list-style-type: none"> <li>▪ General population survey</li> </ul>
What energy-efficient equipment has been purchased in the past year? What is the likelihood of replacing/purchasing Efficient Products program-eligible products in the next year?	<ul style="list-style-type: none"> <li>▪ General population survey</li> </ul>

Researchable Question	Activity to support the question
What is the level of program satisfaction among customers? What specific subprograms have the most and least customer satisfaction?	<ul style="list-style-type: none"> <li>▪ Participant surveys</li> </ul>
Are program requirements clearly understood? Are the procedures for application and rebates easy to follow?	<ul style="list-style-type: none"> <li>▪ Participant surveys</li> <li>▪ Documentation review</li> </ul>
How has the transition to a utility lead program affected customer experiences, if at all? Do they have recommendations?	<ul style="list-style-type: none"> <li>▪ Trade ally interviews (PY23)</li> <li>▪ Retailer surveys (PY23)</li> <li>▪ Participant surveys</li> </ul>
How did customers find out about the program? What are the most (and least) effective methods for communicating program updates? How would customers like to learn about program offerings?	<ul style="list-style-type: none"> <li>▪ Participant surveys</li> <li>▪ General population survey</li> </ul>
Were the application and rebate processed in a timely manner? Was the online application process valuable?	<ul style="list-style-type: none"> <li>▪ Trade ally interviews (PY23)</li> <li>▪ Retailer surveys (PY23)</li> <li>▪ Participant surveys</li> </ul>
What do customers believe could be offered to improve program services?	<ul style="list-style-type: none"> <li>▪ Trade ally interviews (PY23)</li> <li>▪ Participant survey</li> </ul>
Has the availability or pricing of high-efficiency equipment affected customer interest or ability to participate in the program?	<ul style="list-style-type: none"> <li>▪ Participant survey</li> </ul>
<b>Customer decision-making</b>	
What impact did the program have on participants' decisions to install eligible energy-efficient measures?	<ul style="list-style-type: none"> <li>▪ Participant surveys</li> </ul>
What barriers exist for customers' participation in the program?	<ul style="list-style-type: none"> <li>▪ Participant surveys</li> <li>▪ General population survey</li> </ul>
Do measures remain installed, and if not, why not?	<ul style="list-style-type: none"> <li>▪ Participant surveys</li> </ul>
Did participating in the program lead to installing other energy-efficient measures not rebated by JCP&L programs?	<ul style="list-style-type: none"> <li>▪ Participant surveys</li> </ul>
<b>Program performance indicators</b>	
Is the program delivering the intended benefits to participants, and are they achieving planned energy impacts?	<ul style="list-style-type: none"> <li>▪ Trade ally interviews</li> <li>▪ Participant survey</li> </ul>
Is the appropriate information being collected to support future evaluation activities (i.e., impact evaluation)?	<ul style="list-style-type: none"> <li>▪ Program documentation review</li> </ul>

Researchable Question	Activity to support the question
Are there differences in participation by measure? If so, what is driving those differences?	<ul style="list-style-type: none"> <li>Database review</li> </ul>

## Appliance Recycling

Table G-2: Appliance Recycling Researchable Questions and Activities

Researchable Question	Activity to support the question
<b>Program infrastructure and processes</b>	
How is the program working from a process perspective? How are communication channels between implementation, partner utilities, ICSPs, and SWE? Do the program materials accurately reflect the program design?	<ul style="list-style-type: none"> <li>Program and implementer staff interviews</li> </ul>
What changes to program design and delivery would improve program performance?	<ul style="list-style-type: none"> <li>Program and implementer staff interviews</li> </ul>
How is the program tracking system being managed? Is the tracking system capturing all necessary information for program implementation and evaluation?	<ul style="list-style-type: none"> <li>Program and implementer staff interviews</li> </ul>
What is the vintage of appliance collected through the program? How does the vintage compare to other markets and relevant savings potential?	<ul style="list-style-type: none"> <li>Tracking Data Review</li> <li>Program and implementer Staff Interviews</li> <li>Market Research</li> </ul>
Are there other opportunities to collaborate with market actors (e.g., retailers) to promote the program?	<ul style="list-style-type: none"> <li>Program and implementer Staff Interviews</li> </ul>
How have pick-up practices changed, if at all, throughout the pandemic, and will the pandemic have lasting implications for pick-up strategies? How, if at all, do the health and safety concerns from the pandemic affect interest and barriers to participation?	<ul style="list-style-type: none"> <li>Program and implementer Staff Interviews</li> </ul>
<b>Customer awareness and experiences</b>	
Are program requirements clearly understood? Are the procedures for application and rebates easy to follow?	<ul style="list-style-type: none"> <li>Participant survey</li> </ul>
How did customers find out about the program? What are the most (or least) effective methods for communicating program updates? Are frequently cited sources of information consistent with program marketing plans?	<ul style="list-style-type: none"> <li>Participant survey</li> </ul>
Were the application and rebate processed in a timely manner?	<ul style="list-style-type: none"> <li>Participant survey</li> </ul>

Researchable Question	Activity to support the question
What are the levels of customer satisfaction? What suggestions do customers offer for improving the program?	<ul style="list-style-type: none"> <li>Participant survey</li> </ul>
What would make the program more convenient for customers?	<ul style="list-style-type: none"> <li>Participant survey</li> </ul>
Has the availability or pricing of high-efficiency equipment affected customer interest or ability to participate in the program?	<ul style="list-style-type: none"> <li>Participant survey</li> </ul>
What affects customer decisions to recycle their appliance, and how can this information be applied to marketing efforts?	<ul style="list-style-type: none"> <li>Participant survey</li> </ul>
<b>Program performance indicators</b>	
To what extent are participants free riders? How many replace their appliance with either standard or ENERGY STAR?	<ul style="list-style-type: none"> <li>Participant survey</li> <li>Program documentation materials</li> </ul>
Are there geographic/economic trends in participation or appliance stock? Are certain geographies performing better than others? Why?	<ul style="list-style-type: none"> <li>Program and implementer staff interviews</li> <li>Participant survey</li> <li>Program data analyses</li> </ul>

### Energy Efficient Kits

Table G-3: Energy Efficient Kits Researchable Questions and Activities

Researchable Question	Activity to support the question
<b>Program infrastructure</b>	
How are program processes working between the new implementer and JCP&L? How are communication channels between partner utilities, ICSPs, and SWE? Do program materials accurately reflect the program design and processes?	<ul style="list-style-type: none"> <li>Program staff interviews</li> </ul>
Is there a sufficient number of participating trade allies to reach program goals? What are the barriers to trade ally participation?	<ul style="list-style-type: none"> <li>Program staff interviews</li> </ul>
Has the supply of high-efficient equipment changed? If so, in what ways? How long is this expected to last? What strategies are being considered to mitigate difficulties?	<ul style="list-style-type: none"> <li>Program staff interviews</li> <li>Trade ally interviews</li> <li>Retailer surveys</li> </ul>
What impact has the program had on trade allies' recommendations and equipment sales to their customers?	<ul style="list-style-type: none"> <li>Trade ally interviews</li> <li>Participant surveys</li> </ul>
Has the program changed stocking and pricing practices?	<ul style="list-style-type: none"> <li>Trade ally interviews</li> </ul>

Researchable Question	Activity to support the question
	<ul style="list-style-type: none"> <li>▪ Retailer interviews</li> </ul>
How has the program impacted sales of energy-efficient equipment?	<ul style="list-style-type: none"> <li>▪ Trade ally interviews</li> </ul>
<b>Program communication, marketing, and coordination with trade allies</b>	
What impact has the program had on trade allies' recommendations and equipment sales to their customers?	<ul style="list-style-type: none"> <li>▪ Trade ally interviews</li> <li>▪ Retailer surveys</li> </ul>
How effective are external communications? Do trade allies feel adequately informed of program operations?	<ul style="list-style-type: none"> <li>▪ Program staff interviews</li> <li>▪ Trade ally interviews</li> <li>▪ Retailer surveys</li> </ul>
How well are program marketing efforts working? What marketing tools are most effective? Are there differences in the effectiveness of the marketing by sector and by the size of the customer?	<ul style="list-style-type: none"> <li>▪ Program staff interviews</li> <li>▪ Trade ally interviews</li> <li>▪ Retailer surveys</li> <li>▪ Participant surveys</li> </ul>
Are incentive values optimal from all perspectives (e.g., trade allies, customers, distributors)?	<ul style="list-style-type: none"> <li>▪ Trade ally interviews</li> <li>▪ Retailer surveys</li> <li>▪ Participant surveys</li> </ul>
Has the transition to a new implementer been noticed, and what opinion or recommendations do trade allies have?	<ul style="list-style-type: none"> <li>▪ Trade ally interviews</li> <li>▪ Retailer surveys</li> </ul>
How has the program impacted sales of energy-efficient equipment?	<ul style="list-style-type: none"> <li>▪ Trade ally interviews</li> <li>▪ Retailer surveys</li> </ul>
How has the program changed stocking and pricing practices?	<ul style="list-style-type: none"> <li>▪ Trade ally interviews</li> <li>▪ Retailer surveys</li> </ul>
Are customers aware JCP&L offers equipment at a discounted price through retailers?	<ul style="list-style-type: none"> <li>▪ Trade ally interviews</li> <li>▪ Retailer surveys</li> </ul>
What are the levels of program satisfaction among trade allies/retailers? How could this be improved?	<ul style="list-style-type: none"> <li>▪ Trade ally interviews</li> <li>▪ Retailer surveys</li> </ul>
Has the supply of high-efficient equipment changed? If so, in what ways? How long is this expected to last? What strategies are being considered to mitigate difficulties?	<ul style="list-style-type: none"> <li>▪ Trade ally interviews</li> <li>▪ Retailer surveys</li> </ul>
<b>Customer awareness and experiences</b>	
What are the characteristics of the participating/nonparticipating customer population? Are there any eligible groups not being reached by the program?	<ul style="list-style-type: none"> <li>▪ Participant surveys</li> <li>▪ General population survey</li> </ul>



<b>Researchable Question</b>	<b>Activity to support the question</b>
Are customers aware of the Efficient Products program offerings?	<ul style="list-style-type: none"> <li>▪ General population survey</li> </ul>
What energy-efficient equipment has been purchased in the past year? What is the likelihood of replacing/purchasing Efficient Products program-eligible products in the next year?	<ul style="list-style-type: none"> <li>▪ General population survey</li> </ul>
What is the level of program satisfaction among customers? What specific subprograms have the most and least customer satisfaction?	<ul style="list-style-type: none"> <li>▪ Participant surveys</li> </ul>
Are program requirements clearly understood? Are the procedures for application and rebates easy to follow?	<ul style="list-style-type: none"> <li>▪ Participant surveys</li> <li>▪ Documentation review</li> </ul>
How has the transition to a utility lead program affected customer experiences, if at all? Do they have recommendations?	<ul style="list-style-type: none"> <li>▪ Trade ally interviews</li> <li>▪ Retailer surveys</li> <li>▪ Participant surveys</li> </ul>
How did customers find out about the program? What are the most (and least) effective methods for communicating program updates? How would customers like to learn about program offerings?	<ul style="list-style-type: none"> <li>▪ Participant surveys</li> <li>▪ General population survey</li> </ul>
Were the application and rebate processed in a timely manner? Was the online application process valuable?	<ul style="list-style-type: none"> <li>▪ Trade ally interviews</li> <li>▪ Retailer surveys</li> <li>▪ Participant surveys</li> </ul>
What do customers believe could be offered to improve program services?	<ul style="list-style-type: none"> <li>▪ Trade ally interviews</li> <li>▪ Participant survey</li> </ul>
Has the availability or pricing of high-efficiency equipment affected customer interest or ability to participate in the program?	<ul style="list-style-type: none"> <li>▪ Participant survey</li> </ul>
<b>Customer decision-making</b>	
What impact did the program have on participants' decisions to install eligible energy-efficient measures?	<ul style="list-style-type: none"> <li>▪ Participant surveys</li> </ul>
What barriers exist for customers' participation in the program?	<ul style="list-style-type: none"> <li>▪ Participant surveys</li> <li>▪ General population survey</li> </ul>
Do measures remain installed, and if not, why not?	<ul style="list-style-type: none"> <li>▪ Participant surveys</li> </ul>
Did participating in the program lead to installing other energy-efficient measures not rebated by JCP&L programs?	<ul style="list-style-type: none"> <li>▪ Participant surveys</li> </ul>
<b>Energy Efficient Kits</b>	
What are customer experiences with the kit measures? Do customers install the measures? Do customers remove the measures? If so, why?	<ul style="list-style-type: none"> <li>▪ Participant surveys</li> </ul>
What proportion of kits are reaching fuel ineligible customers? Are there needs or opportunities to refine	<ul style="list-style-type: none"> <li>▪ Participant surveys</li> </ul>

Researchable Question	Activity to support the question
targeting and implementation to maximize savings for cost related to fuel?	
What kit components are most valuable to customers?	<ul style="list-style-type: none"> <li>Participant surveys</li> </ul>
Are kit components redundant with, or complimentary to, equipment already purchased and/or installed in new homes?	<ul style="list-style-type: none"> <li>Participant surveys</li> </ul>
How effectively does the kit educate and inform customers about the benefit and value of using the equipment?	<ul style="list-style-type: none"> <li>Participant surveys</li> </ul>
What kit components have the highest realization rate (savings realized)? What are the barriers to effective adoption of kit components? How can these barriers be removed? What drives installation rates?	<ul style="list-style-type: none"> <li>Participant surveys</li> </ul>
<b>Program performance indicators</b>	
Is the program delivering the intended benefits to participants, and are they achieving planned energy impacts?	<ul style="list-style-type: none"> <li>Trade ally interviews</li> <li>Participant survey</li> </ul>
Is the appropriate information being collected to support future evaluation activities (i.e., impact evaluation)?	<ul style="list-style-type: none"> <li>Program documentation review</li> </ul>
Are there differences in participation by measure? If so, what is driving those differences?	<ul style="list-style-type: none"> <li>Database review</li> </ul>

## HVAC Rebates

Table G-4: HVAC Rebates Researchable Questions and Activities

Researchable Question	Activity to support the question
<b>Program infrastructure</b>	
How are program processes working between the new implementer and JCP&L? How are communication channels between partner utilities, ICSPs, and SWE? Do program materials accurately reflect the program design and processes?	<ul style="list-style-type: none"> <li>Program staff interviews</li> </ul>
Is there a sufficient number of participating trade allies to reach program goals? What are the barriers to trade ally participation?	<ul style="list-style-type: none"> <li>Program staff interviews</li> </ul>
Has the supply of high-efficient equipment changed? If so, in what ways? How long is this expected to last? What strategies are being considered to mitigate difficulties?	<ul style="list-style-type: none"> <li>Program staff interviews</li> <li>Trade ally interviews</li> <li>Retailer surveys</li> </ul>
What impact has the program had on trade allies' recommendations and equipment sales to their customers?	<ul style="list-style-type: none"> <li>Trade ally interviews</li> <li>Participant surveys</li> </ul>

Researchable Question	Activity to support the question
Has the program changed stocking and pricing practices?	<ul style="list-style-type: none"> <li>▪ Trade ally interviews</li> <li>▪ Retailer interviews</li> </ul>
How has the program impacted sales of energy-efficient equipment?	<ul style="list-style-type: none"> <li>▪ Trade ally interviews</li> </ul>
(HVAC) How has the pandemic affected trade ally interactions with customers (e.g., being allowed in the home, level of personal protective equipment (PPE), etc.)? How has that changed over time, and what do trade allies anticipate in the future? To what extent is the program affecting trade allies' stocking and sales practices?	<ul style="list-style-type: none"> <li>▪ Trade ally interviews</li> </ul>
<b>Program communication, marketing, and coordination with trade allies</b>	
What impact has the program had on trade allies' recommendations and equipment sales to their customers?	<ul style="list-style-type: none"> <li>▪ Trade ally interviews</li> <li>▪ Retailer surveys</li> </ul>
How effective are external communications? Do trade allies feel adequately informed of program operations?	<ul style="list-style-type: none"> <li>▪ Program staff interviews</li> <li>▪ Trade ally interviews</li> <li>▪ Retailer surveys</li> </ul>
How well are program marketing efforts working? What marketing tools are most effective? Are there differences in the effectiveness of the marketing by sector and by the size of the customer?	<ul style="list-style-type: none"> <li>▪ Program staff interviews</li> <li>▪ Trade ally interviews</li> <li>▪ Retailer surveys</li> <li>▪ Participant surveys</li> </ul>
Are incentive values optimal from all perspectives (e.g., trade allies, customers, distributors)?	<ul style="list-style-type: none"> <li>▪ Trade ally interviews</li> <li>▪ Retailer surveys</li> <li>▪ Participant surveys</li> </ul>
Has the transition to a new implementer been noticed, and what opinion or recommendations do trade allies have?	<ul style="list-style-type: none"> <li>▪ Trade ally interviews</li> <li>▪ Retailer surveys</li> </ul>
How has the program impacted sales of energy-efficient equipment?	<ul style="list-style-type: none"> <li>▪ Trade ally interviews</li> <li>▪ Retailer surveys</li> </ul>
How has the program changed stocking and pricing practices?	<ul style="list-style-type: none"> <li>▪ Trade ally interviews</li> <li>▪ Retailer surveys</li> </ul>
Are customers aware JCP&L offers equipment at a discounted price through retailers?	<ul style="list-style-type: none"> <li>▪ Trade ally interviews</li> <li>▪ Retailer surveys</li> </ul>
What are the levels of program satisfaction among trade allies/retailers? How could this be improved?	<ul style="list-style-type: none"> <li>▪ Trade ally interviews</li> <li>▪ Retailer surveys</li> </ul>

Researchable Question	Activity to support the question
Has the supply of high-efficient equipment changed? If so, in what ways? How long is this expected to last? What strategies are being considered to mitigate difficulties?	<ul style="list-style-type: none"> <li>▪ Trade alley interviews</li> <li>▪ Retailer surveys</li> </ul>
<b>Customer awareness and experiences</b>	
What are the characteristics of the participating/nonparticipating customer population? Are there any eligible groups not being reached by the program?	<ul style="list-style-type: none"> <li>▪ Participant surveys</li> <li>▪ General population survey</li> </ul>
Are customers aware of the Efficient Products program offerings?	<ul style="list-style-type: none"> <li>▪ General population survey</li> </ul>
What energy-efficient equipment has been purchased in the past year? What is the likelihood of replacing/purchasing Efficient Products program-eligible products in the next year?	<ul style="list-style-type: none"> <li>▪ General population survey</li> </ul>
What is the level of program satisfaction among customers? What specific subprograms have the most and least customer satisfaction?	<ul style="list-style-type: none"> <li>▪ Participant surveys</li> </ul>
Are program requirements clearly understood? Are the procedures for application and rebates easy to follow?	<ul style="list-style-type: none"> <li>▪ Participant surveys</li> <li>▪ Documentation review</li> </ul>
What is customer perception of financing options? Did they remove barriers to participation? (HVAC & Water Heating)	<ul style="list-style-type: none"> <li>▪ Participant surveys</li> </ul>
How has the transition to a utility lead program affected customer experiences, if at all? Do they have recommendations?	<ul style="list-style-type: none"> <li>▪ Trade ally interviews</li> <li>▪ Retailer surveys</li> <li>▪ Participant surveys</li> </ul>
How did customers find out about the program? What are the most (and least) effective methods for communicating program updates? How would customers like to learn about program offerings?	<ul style="list-style-type: none"> <li>▪ Participant surveys</li> <li>▪ General population survey</li> </ul>
Were the application and rebate processed in a timely manner? Was the online application process valuable?	<ul style="list-style-type: none"> <li>▪ Trade ally interviews</li> <li>▪ Retailer surveys</li> <li>▪ Participant surveys</li> </ul>
What do customers believe could be offered to improve program services?	<ul style="list-style-type: none"> <li>▪ Trade ally interviews</li> <li>▪ Participant survey</li> </ul>
Has the availability or pricing of high-efficiency equipment affected customer interest or ability to participate in the program?	<ul style="list-style-type: none"> <li>▪ Participant survey</li> </ul>
<b>Customer decision-making</b>	
What impact did the program have on participants' decisions to install eligible energy-efficient measures?	<ul style="list-style-type: none"> <li>▪ Participant surveys</li> </ul>
What barriers exist for customers' participation in the program?	<ul style="list-style-type: none"> <li>▪ Participant surveys</li> </ul>

Researchable Question	Activity to support the question
	<ul style="list-style-type: none"> <li>General population survey</li> </ul>
Do measures remain installed, and if not, why not?	<ul style="list-style-type: none"> <li>Participant surveys</li> </ul>
Did participating in the program lead to installing other energy-efficient measures not rebated by JCP&L programs?	<ul style="list-style-type: none"> <li>Participant surveys</li> </ul>
<b>Program performance indicators</b>	
Is the program delivering the intended benefits to participants, and are they achieving planned energy impacts?	<ul style="list-style-type: none"> <li>Trade ally interviews</li> <li>Participant survey</li> </ul>
Is the appropriate information being collected to support future evaluation activities (i.e., impact evaluation)?	<ul style="list-style-type: none"> <li>Program documentation review</li> </ul>
Are there differences in participation by measure? If so, what is driving those differences?	<ul style="list-style-type: none"> <li>Database review</li> </ul>

## Lighting

Table G-5: Lighting Researchable Questions and Activities

Researchable Question	Activity to support the question
<b>Program infrastructure</b>	
How are program processes working between the new implementer and JCP&L? How are communication channels between partner utilities, ICSPs, and SWE? Do program materials accurately reflect the program design and processes?	<ul style="list-style-type: none"> <li>Program staff interviews</li> </ul>
Is there a sufficient number of participating trade allies to reach program goals? What are the barriers to trade ally participation?	<ul style="list-style-type: none"> <li>Program staff interviews</li> </ul>
Has the supply of high-efficient equipment changed? If so, in what ways? How long is this expected to last? What strategies are being considered to mitigate difficulties?	<ul style="list-style-type: none"> <li>Program staff interviews</li> <li>Trade ally interviews</li> <li>Retailer surveys</li> </ul>
What impact has the program had on trade allies' recommendations and equipment sales to their customers?	<ul style="list-style-type: none"> <li>Trade ally interviews</li> <li>Participant surveys</li> </ul>
Has the program changed stocking and pricing practices?	<ul style="list-style-type: none"> <li>Trade ally interviews</li> <li>Retailer interviews</li> </ul>
How has the program impacted sales of energy-efficient equipment?	<ul style="list-style-type: none"> <li>Trade ally interviews</li> </ul>

Researchable Question	Activity to support the question
<b>Program communication, marketing, and coordination with trade allies</b>	
What impact has the program had on trade allies' recommendations and equipment sales to their customers?	<ul style="list-style-type: none"> <li>▪ Trade ally interviews</li> <li>▪ Retailer surveys</li> </ul>
How effective are external communications? Do trade allies feel adequately informed of program operations?	<ul style="list-style-type: none"> <li>▪ Program staff interviews</li> <li>▪ Trade ally interviews</li> <li>▪ Retailer surveys</li> </ul>
How well are program marketing efforts working? What marketing tools are most effective? Are there differences in the effectiveness of the marketing by sector and by the size of the customer?	<ul style="list-style-type: none"> <li>▪ Program staff interviews</li> <li>▪ Trade ally interviews</li> <li>▪ Retailer surveys</li> <li>▪ Participant surveys</li> </ul>
Are incentive values optimal from all perspectives (e.g., trade allies, customers, distributors)?	<ul style="list-style-type: none"> <li>▪ Trade ally interviews</li> <li>▪ Retailer surveys</li> <li>▪ Participant surveys</li> </ul>
Has the transition to a new implementer been noticed, and what opinion or recommendations do trade allies have?	<ul style="list-style-type: none"> <li>▪ Trade ally interviews</li> <li>▪ Retailer surveys</li> </ul>
How has the program impacted sales of energy-efficient equipment?	<ul style="list-style-type: none"> <li>▪ Trade ally interviews</li> <li>▪ Retailer surveys</li> </ul>
How has the program changed stocking and pricing practices?	<ul style="list-style-type: none"> <li>▪ Trade ally interviews</li> <li>▪ Retailer surveys</li> </ul>
Are customers aware JCP&L offers equipment at a discounted price through retailers?	<ul style="list-style-type: none"> <li>▪ Trade ally interviews</li> <li>▪ Retailer surveys</li> </ul>
What are the levels of program satisfaction among trade allies/retailers? How could this be improved?	<ul style="list-style-type: none"> <li>▪ Trade ally interviews</li> <li>▪ Retailer surveys</li> </ul>
Has the supply of high-efficient equipment changed? If so, in what ways? How long is this expected to last? What strategies are being considered to mitigate difficulties?	<ul style="list-style-type: none"> <li>▪ Trade ally interviews</li> <li>▪ Retailer surveys</li> </ul>
<b>Customer awareness and experiences</b>	
What are the characteristics of the participating/nonparticipating customer population? Are there any eligible groups not being reached by the program?	<ul style="list-style-type: none"> <li>▪ Participant surveys</li> <li>▪ General population survey</li> </ul>
Are customers aware of the Efficient Products program offerings?	<ul style="list-style-type: none"> <li>▪ General population survey</li> </ul>

<b>Researchable Question</b>	<b>Activity to support the question</b>
What energy-efficient equipment has been purchased in the past year? What is the likelihood of replacing/purchasing Efficient Products program-eligible products in the next year?	<ul style="list-style-type: none"> <li>▪ General population survey</li> </ul>
What is the level of program satisfaction among customers? What specific subprograms have the most and least customer satisfaction?	<ul style="list-style-type: none"> <li>▪ Participant surveys</li> </ul>
Are program requirements clearly understood? Are the procedures for application and rebates easy to follow?	<ul style="list-style-type: none"> <li>▪ Participant surveys</li> <li>▪ Documentation review</li> </ul>
How has the transition to a utility lead program affected customer experiences, if at all? Do they have recommendations?	<ul style="list-style-type: none"> <li>▪ Trade ally interviews</li> <li>▪ Retailer surveys</li> <li>▪ Participant surveys</li> </ul>
How did customers find out about the program? What are the most (and least) effective methods for communicating program updates? How would customers like to learn about program offerings?	<ul style="list-style-type: none"> <li>▪ Participant surveys</li> <li>▪ General population survey</li> </ul>
Were the application and rebate processed in a timely manner? Was the online application process valuable?	<ul style="list-style-type: none"> <li>▪ Trade ally interviews</li> <li>▪ Retailer surveys</li> <li>▪ Participant surveys</li> </ul>
What do customers believe could be offered to improve program services?	<ul style="list-style-type: none"> <li>▪ Trade ally interviews</li> <li>▪ Participant survey</li> </ul>
Has the availability or pricing of high-efficiency equipment affected customer interest or ability to participate in the program?	<ul style="list-style-type: none"> <li>▪ Participant survey</li> </ul>
<b>Customer decision-making</b>	
What impact did the program have on participants' decisions to install eligible energy-efficient measures?	<ul style="list-style-type: none"> <li>▪ Participant surveys</li> </ul>
What barriers exist for customers' participation in the program?	<ul style="list-style-type: none"> <li>▪ Participant surveys</li> <li>▪ General population survey</li> </ul>
Do measures remain installed, and if not, why not?	<ul style="list-style-type: none"> <li>▪ Participant surveys</li> </ul>
Did participating in the program lead to installing other energy-efficient measures not rebated by JCP&L programs?	<ul style="list-style-type: none"> <li>▪ Participant surveys</li> </ul>
<b>Specific to Lighting</b>	
Do retailers actively promote program-eligible equipment?	<ul style="list-style-type: none"> <li>▪ Retailer surveys</li> </ul>

Researchable Question	Activity to support the question
Do retailers use displays or price stickers to promote the program? Do the displays or price stickers indicate JCP&L provides the discounts?	<ul style="list-style-type: none"> <li>▪ Retailer surveys</li> </ul>
What other measures could be offered through the midstream channel? Why are they currently not being offered through the midstream channel?	<ul style="list-style-type: none"> <li>▪ Program staff interviews</li> <li>▪ Trade ally interviews</li> <li>▪ Retailer surveys</li> </ul>
How effective are discounts in increasing sales of qualifying lighting?	<ul style="list-style-type: none"> <li>▪ Retailer surveys</li> <li>▪ Participant surveys</li> </ul>
What efforts are in place to drive customer participation and awareness? Are there potential service gaps in offerings based on participating retailers, what are those gaps in service, and potential opportunities for closing those gaps?	<ul style="list-style-type: none"> <li>▪ Retailer surveys</li> <li>▪ Participant surveys</li> </ul>
Are customers aware of the discount and, if so, how are they aware?	<ul style="list-style-type: none"> <li>▪ Participant surveys</li> </ul>
Are there opportunities to focus on different lamp types or increase discounts to maximize energy savings?	<ul style="list-style-type: none"> <li>▪ Retailer surveys</li> <li>▪ Participant surveys</li> </ul>
What was influential in customers' purchasing decisions (monetary discount, stocking location, type of bulb, etc.)?	<ul style="list-style-type: none"> <li>▪ Participant surveys</li> </ul>
<b>Program performance indicators</b>	
Is the program delivering the intended benefits to participants, and are they achieving planned energy impacts?	<ul style="list-style-type: none"> <li>▪ Trade ally interviews</li> <li>▪ Participant survey</li> </ul>
Is the appropriate information being collected to support future evaluation activities (i.e., impact evaluation)?	<ul style="list-style-type: none"> <li>▪ Program documentation review</li> </ul>
Are there differences in participation by measure? If so, what is driving those differences?	<ul style="list-style-type: none"> <li>▪ Database review</li> </ul>

## Online Marketplace

*Table G-6: Online Marketplace Researchable Questions and Activities*

Researchable Question	Activity to support the question
<b>Program infrastructure</b>	
How are program processes working between the new implementer and JCP&L? How are communication channels between partner utilities, ICSPs, and SWE? Do program materials accurately reflect the program design and processes?	<ul style="list-style-type: none"> <li>▪ Program staff interviews</li> </ul>



Researchable Question	Activity to support the question
Is there a sufficient number of participating trade allies to reach program goals? What are the barriers to trade ally participation?	<ul style="list-style-type: none"> <li>▪ Program staff interviews</li> </ul>
Has the supply of high-efficient equipment changed? If so, in what ways? How long is this expected to last? What strategies are being considered to mitigate difficulties?	<ul style="list-style-type: none"> <li>▪ Program staff interviews</li> <li>▪ Trade ally interviews</li> <li>▪ Retailer surveys</li> </ul>
What impact has the program had on trade allies' recommendations and equipment sales to their customers?	<ul style="list-style-type: none"> <li>▪ Trade ally interviews</li> <li>▪ Participant surveys</li> </ul>
Has the program changed stocking and pricing practices?	<ul style="list-style-type: none"> <li>▪ Trade ally interviews</li> <li>▪ Retailer interviews</li> </ul>
How has the program impacted sales of energy-efficient equipment?	<ul style="list-style-type: none"> <li>▪ Trade ally interviews</li> </ul>
<b>Program communication, marketing, and coordination with trade allies</b>	
What impact has the program had on trade allies' recommendations and equipment sales to their customers?	<ul style="list-style-type: none"> <li>▪ Trade ally interviews</li> <li>▪ Retailer surveys</li> </ul>
How effective are external communications? Do trade allies feel adequately informed of program operations?	<ul style="list-style-type: none"> <li>▪ Program staff interviews</li> <li>▪ Trade ally interviews</li> <li>▪ Retailer surveys</li> </ul>
How well are program marketing efforts working? What marketing tools are most effective? Are there differences in the effectiveness of the marketing by sector and by the size of the customer?	<ul style="list-style-type: none"> <li>▪ Program staff interviews</li> <li>▪ Trade ally interviews</li> <li>▪ Retailer surveys</li> <li>▪ Participant surveys</li> </ul>
Are incentive values optimal from all perspectives (e.g., trade allies, customers, distributors)?	<ul style="list-style-type: none"> <li>▪ Trade ally interviews</li> <li>▪ Retailer surveys</li> <li>▪ Participant surveys</li> </ul>
Has the transition to a new implementer been noticed, and what opinion or recommendations do trade allies have?	<ul style="list-style-type: none"> <li>▪ Trade ally interviews</li> <li>▪ Retailer surveys</li> </ul>
How has the program impacted sales of energy-efficient equipment?	<ul style="list-style-type: none"> <li>▪ Trade ally interviews</li> <li>▪ Retailer surveys</li> </ul>
How has the program changed stocking and pricing practices?	<ul style="list-style-type: none"> <li>▪ Trade ally interviews</li> <li>▪ Retailer surveys</li> </ul>
Are customers aware JCP&L offers equipment at a discounted price through retailers?	<ul style="list-style-type: none"> <li>▪ Trade ally interviews</li> <li>▪ Retailer surveys</li> </ul>

<b>Researchable Question</b>	<b>Activity to support the question</b>
What are the levels of program satisfaction among trade allies/retailers? How could this be improved?	<ul style="list-style-type: none"> <li>▪ Trade ally interviews</li> <li>▪ Retailer surveys</li> </ul>
Has the supply of high-efficient equipment changed? If so, in what ways? How long is this expected to last? What strategies are being considered to mitigate difficulties?	<ul style="list-style-type: none"> <li>▪ Trade ally interviews</li> <li>▪ Retailer surveys</li> </ul>
<b>Customer awareness and experiences</b>	
What are the characteristics of the participating/nonparticipating customer population? Are there any eligible groups not being reached by the program?	<ul style="list-style-type: none"> <li>▪ Participant surveys</li> <li>▪ General population survey</li> </ul>
Are customers aware of the Efficient Products program offerings?	<ul style="list-style-type: none"> <li>▪ General population survey</li> </ul>
What energy-efficient equipment has been purchased in the past year? What is the likelihood of replacing/purchasing Efficient Products program-eligible products in the next year?	<ul style="list-style-type: none"> <li>▪ General population survey</li> </ul>
What is the level of program satisfaction among customers? What specific subprograms have the most and least customer satisfaction?	<ul style="list-style-type: none"> <li>▪ Participant surveys</li> </ul>
Are program requirements clearly understood? Are the procedures for application and rebates easy to follow?	<ul style="list-style-type: none"> <li>▪ Participant surveys</li> <li>▪ Documentation review</li> </ul>
How has the transition to a utility lead program affected customer experiences, if at all? Do they have recommendations?	<ul style="list-style-type: none"> <li>▪ Trade ally interviews</li> <li>▪ Retailer surveys</li> <li>▪ Participant surveys</li> </ul>
How did customers find out about the program? What are the most (and least) effective methods for communicating program updates? How would customers like to learn about program offerings?	<ul style="list-style-type: none"> <li>▪ Participant surveys</li> <li>▪ General population survey</li> </ul>
Were the application and rebate processed in a timely manner? Was the online application process valuable?	<ul style="list-style-type: none"> <li>▪ Trade ally interviews</li> <li>▪ Retailer surveys</li> <li>▪ Participant surveys</li> </ul>
What do customers believe could be offered to improve program services?	<ul style="list-style-type: none"> <li>▪ Trade ally interviews</li> <li>▪ Participant survey</li> </ul>
Has the availability or pricing of high-efficiency equipment affected customer interest or ability to participate in the program?	<ul style="list-style-type: none"> <li>▪ Participant survey</li> </ul>
<b>Customer decision-making</b>	
What impact did the program have on participants' decisions to install eligible energy-efficient measures?	<ul style="list-style-type: none"> <li>▪ Participant surveys</li> </ul>

Researchable Question	Activity to support the question
What barriers exist for customers' participation in the program?	<ul style="list-style-type: none"> <li>▪ Participant surveys</li> <li>▪ General population survey</li> </ul>
Do measures remain installed, and if not, why not?	<ul style="list-style-type: none"> <li>▪ Participant surveys</li> </ul>
Did participating in the program lead to installing other energy-efficient measures not rebated by JCP&L programs?	<ul style="list-style-type: none"> <li>▪ Participant surveys</li> </ul>
<b>Online Marketplace</b>	
Why are customers visiting the online marketplace, and did the visit meet customers' needs and expectations?	<ul style="list-style-type: none"> <li>▪ Participant surveys</li> </ul>
What behaviors and actions, if any, does the online marketplace influence? What components of the online marketplace are most influential in customers' decisions?	<ul style="list-style-type: none"> <li>▪ Participant surveys</li> </ul>
How intuitive and effective were the various components of the online marketplace to navigate? What areas of the platform, if any, could be revised to improve customers' interaction and experience?	<ul style="list-style-type: none"> <li>▪ Participant surveys</li> </ul>
What are the most prevalent products referenced and purchased on the platform? Are there other products that JCP&L may want to consider for inclusion?	<ul style="list-style-type: none"> <li>▪ Tracking data review</li> <li>▪ Participant surveys</li> <li>▪ Staff interviews</li> </ul>
<b>Program performance indicators</b>	
Is the program delivering the intended benefits to participants, and are they achieving planned energy impacts?	<ul style="list-style-type: none"> <li>▪ Trade ally interviews</li> <li>▪ Participant survey</li> </ul>
Is the appropriate information being collected to support future evaluation activities (i.e., impact evaluation)?	<ul style="list-style-type: none"> <li>▪ Program documentation review</li> </ul>
Are there differences in participation by measure? If so, what is driving those differences?	<ul style="list-style-type: none"> <li>▪ Database review</li> </ul>