

Multifamily Program EM&V Report

Jersey Central Power & Light
PY22: July 1, 2021 - June 30, 2022

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1. Abstract

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

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

delivered to the BPU. This report summarizes findings from an initial evaluation of the Multifamily 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)². 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

The reported and verified annual electric energy, electric demand, and gas energy impacts³ for the program are shown in Table 1 below.

Table 1: Direct Install PY22 Gross Energy and Demand Impacts

Impact	Reported	Verified
Electric Energy (kWh)	22,423.00	25,793.00
Demand (kW)	21.99	18.69
Gas Energy (Therms)	(40.57)	(141.23)

1.2. PY22 Evaluation Results

1.2.1. Gross Verified Impacts and Realization Rates

Gross impact evaluation results for PY22 are reported in Table 2 and Table 3.

Table 2: Multifamily PY22 Gross Annual Retail kWh Savings and kW Demand Reduction

Measure Category	Measure Quantity	Ex-Ante Savings (kWh)	Ex-Post Savings (kWh)	kWh RR	Ex-Ante Demand Reduction (kW)	Ex-Post Savings (kW)	kW RR
LED Lightbulbs	782	22,423	25,793	115%	21.99	18.69	85%
Faucet Aerators	153	0	0	-	0.00	0.00	-
Low Flow Showerheads	42	0	0	-	0.00	0.00	-
Total	977	22,423	25,793	115%	21.99	18.69	85%

² 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."

³ Evaluated therms and MMBtus include heating penalties where included in applicable protocols.

Table 3: Multifamily PY22 Gross Annual Retail Therms and MMBtu Savings⁴

Measure Category	Ex-ante Therms	Ex-post Therms	Ex-ante MMBtu	Ex-post MMBtu	RR
LED Lightbulbs	-203.06	-298.67	-20.31	-29.87	147%
Faucet Aerators	36.24	36.24	3.62	3.62	100%
Low Flow Showerheads	126.25	121.20	12.63	12.12	96%
Total	-40.57	-141.23	-4.06	-14.12	348%

1.2.2. Summary of Key Parameters Collected by the Evaluation Effort

The evaluation effort also collected data on key parameters that are necessary inputs to TRM algorithms used for reporting impacts in PY22. These parameters are reported in Table 4 below and most are provided on a site-specific basis in the tracking and reporting (T&R) data. ADM has separately provided a similar table to the SWE to support the ongoing TRM update process.

Table 4: Summary of Key Measures by Parameters

Measure	Parameter	Data Collection Activity
Faucet Aerator	DHW Fuel	Specified in T&R Data
Faucet Aerator	Housing Type	Specified in T&R Data
Faucet Aerator	GPM Base	Default
Faucet Aerator	GPM Efficient	Default
LED lightbulbs	Baseline Wattage	Specified in T&R Data
LED lightbulbs	Efficient Wattage	Specified in T&R Data to $\pm 1W$
LED lightbulbs	Location (Indoor or outdoor)	Specified in T&R Data
LED lightbulbs	HVACe	Fixed in TRM
LED lightbulbs	HVACd	Fixed in TRM
Low Flow Showerhead	DHW Fuel	Specified in T&R Data
Low Flow Showerhead	Housing Type	Specified in T&R Data
Low Flow Showerhead	GPM Base	Default
Low Flow Showerhead	GPM Efficient	Specified in T&R Data (indirectly in measure name)

⁴ Evaluated therms and MMBtus include heating penalties where included in applicable protocols.

1.2.2.1. Faucet Aerator

For faucet aerator gross savings, the most important parameter for evaluation is the fuel share (e.g., electric vs. gas) for water heating. The existence of electric or gas savings for the measure is dependent on the fuel share (i.e., no gas savings if the project has electric water heating). Since all faucet aerators installed in PY22 were installed in homes with natural gas water heating, there were no electric savings or demand reduction. This measure contributed entirely to the gas savings.

The housing type was also recorded in the T&R data for each faucet aerator installed. TRM default values were instead used for both the baseline and efficient GPM.

1.2.2.2. LED lightbulbs

For LED bulb savings, the parameter of most importance is the baseline wattage, as this varies most by project. The baseline wattage was recorded in the T&R data for each efficient bulb installed. The efficient wattage was instead reported in the equipment name by wattage range in the T&R data (ex. **LED 5-6W Candelabra**). Because the specific baseline wattage was not available, ADM identified a range of specific products from the ESP program that match the efficient wattage range identified in each Multifamily measure name. ADM then calculated average efficient and baseline wattages using product data from the EnergyStar database.

For the **LED 5-6W Candelabra** example, to calculate the efficient wattage ADM identified all products as specified by ESID included in the Efficient Products Program with efficient wattages between 5 and 6 watts. ADM then averaged the efficient wattages for all of those bulbs to arrive at average wattage values to assign to each measure. Because the wattage ranges were only 2W for most equipment names, the calculated efficient wattage will only differ from the true efficient wattage by 1 watt or less. Thus, the increase uncertainty to the overall measure savings is minimal.

LED bulb location is also specified in the T&R data, according to whether the bulb was installed indoors or out. Heating and cooling interactive HVAC effects were instead fixed in the TRM.

1.2.2.3. Low Flow Showerhead

Like faucet aerators, the most important parameter for the evaluation of low flow showerheads is the fuel share for water heating. Since all faucet aerators installed in PY22 were installed in homes with natural gas water heating, there were no electric savings or demand reduction for this measure.

The efficient GPM was reported within the equipment name for low flow showerheads (and thermostatic valves) in the T&R data. For example, all rebated showerheads with

the equipment name **MF DI Showerhead 1.5gpm w/ thermostatic valve – Tenant**, have a flow rate of 1.5 gpm. TRM default values were used for the baseline GPM.

The housing type was recorded in the T&R data for each low flow shower installed.

1.3. Evaluation Recommendations

ADM has provided the recommendations in Table 5 for continued improvement of tracking and reporting for the Multifamily Program. As of this writing, these recommendations have been accepted by JCP&L and are being incorporated by the implementer. ADM will review the tracking and reporting data to verify updates once they are live.

Table 5: Summary of Tracking and Reporting Recommendations

Recommendations	Status
Per the NJ CML, use HVAC interactive effects from the residential lighting section of the FY2020 NJ protocols	Accepted
For pipe insulation measure: Retain data related to linear length, insulation thickness, and nominal pipe diameter in preparation for M&V data requests. Tracking data for PY22 did not include these values that are required to calculate savings, as indicated in the NJ Protocols.	In process: communicated to implementer
For lighting measures: Retain data related to efficient bulb wattages. The data do not need to be present in the tracking and reporting system if data request responses will contain this information.	In process: communicated to implementer

1.4. TRM Updates

The PY22 evaluation did not result in any recommended changes to the TRM.

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. 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

2.1. Introduction

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 for 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

The Multifamily Program is designed to provide energy audits of multifamily residential buildings that result in the installation of low-cost direct install measures. The program offers measures like those found in energy conservation kits, such as LED bulbs, low flow showerheads, and faucet aerators. Program components are administered by CLEAResult for the Multifamily Program.

2.3. Evaluation Summary

Both reported and verified impacts in this report are constructed with calculation methods prescribed in the NJCML⁵. 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.

Gross impact evaluations for the Multifamily program followed the following process:

- Review program tracking data for accuracy and completeness
- Compute gross impacts in accordance with agreed-upon TRM protocols as specified in the NJ CML
- Calculate gross realization rates as the ratios of reported (ex-ante) and verified (ex-post) impacts for the census of projects

Because the Multifamily program was particularly small (making up about 0.02 percent of PY22 energy savings), ADM primarily focused on ensuring that the tracking and reporting system were accurate and contain sufficient information to support upcoming enhanced-rigor evaluations. To that end, ADM conducted a census level review of the tracking data to ensure that each measure met program qualifications, that each was installed in PY2022, and that there were no duplicate or otherwise erroneous entries. ADM is working with the implementor to confirm the tracking and reporting data includes the necessary measure level attributes so that future enhanced rigor analysis can be completed effectively.

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:

- 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 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

⁵ 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."

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

Savings for all measures in this program were calculated according to the NJ CML, where partially deemed savings protocols or a prescriptive algorithm were provided for each measure. The JCP&L Tracking and Reporting database was the primary source of measure-specific data such as baseline wattage and installation location.

2.3.1.1. Process Evaluation Approach

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

2.4. Evaluation Results

Gross impact evaluation results for PY22 are reported in Table 6 and Table 7.

Table 6: Multifamily PY22 Gross Annual Retail kWh Savings and kW Demand Reduction

Measure Category	Measure Quantity	Ex-ante kWh	Ex-post kWh	RR kWh	Ex-ante kW	Ex-post kW	RR kW
LED Lightbulbs	782	22,423	25,793	115%	21.99	18.69	85%
Faucet Aerators	153	0	0	-	0.00	0.00	-
Low Flow Showerheads	42	0	0	-	0.00	0.00	-
Total	977	22,423	25,793	115%	21.99	18.69	85%

Table 7: Multifamily PY22 Gross Annual Retail Therms and MMBtu Savings⁶

Measure Category	Ex-ante Therms	Ex-post Therms	Ex-ante MMBtu	Ex-post MMBtu	RR
LED Lightbulbs	-203.06	-298.67	-20.31	-29.87	147%
Faucet Aerators	36.24	36.24	3.62	3.62	100%
Low Flow Showerheads	126.25	121.20	12.63	12.12	96%
Total	-40.57	-141.23	-4.06	-14.12	348%

The evaluation effort also collected data on key parameters that are necessary inputs to TRM algorithms used for reporting impacts in PY22. These parameters are reported in Table 8 below. ADM has separately provided a similar table to the SWE to support the ongoing TRM update process.

Table 8: Summary of Key Measures by Parameters

Measure	Parameter	Data Collection Activity
Faucet Aerator	DHW Fuel	Specified in T&R Data
Faucet Aerator	Housing Type	Specified in T&R Data
Faucet Aerator	GPM Base	Default
Faucet Aerator	GPM Efficient	Default
LED Bulb	Baseline Wattage	Specified in T&R Data
LED Bulb	Efficient Wattage	Specified in T&R Data to $\pm 1W$
LED Bulb	Location (Indoor or outdoor)	Specified in T&R Data
LED Bulb	HVACe	Fixed in TRM
LED Bulb	HVACd	Fixed in TRM
Low Flow Showerhead	DHW Fuel	Specified in T&R Data
Low Flow Showerhead	Housing Type	Specified in T&R Data
Low Flow Showerhead	GPM Base	Default
Low Flow Showerhead	GPM Efficient	Specified in T&R Data (indirectly in measure name)

2.4.1.1. Faucet Aerator

For faucet aerator gross savings, the most important parameter for evaluation is the fuel share (e.g., electric vs. gas) for water heating. The existence of electric or gas savings for the measure is dependent on the fuel share (i.e., 0 gas savings if the project has electric water heating). Since all faucet aerators installed in PY22 were installed in homes

⁶ Evaluated therms and MMBtus include heating penalties where included in applicable protocols.

with natural gas water heating, there were no electric savings or demand reduction for this measure. This measure contributed entirely to the gas savings.

The housing type was also recorded in the T&R data for each faucet aerator installed. TRM default values were instead used for both the baseline and efficient GPM.

2.4.1.2. LED Bulbs

For LED bulb savings, the parameter of most importance is the baseline wattage, as this varies most by project. The baseline wattage was recorded in the T&R data for each efficient bulb installed. The efficient wattage was instead reported in the equipment name by wattage range in the T&R data (ex. **LED 5-6W Candelabra**). Because the specific baseline wattage was not available, ADM identified a range of specific products from the ESP program that match the efficient wattage range identified in each Multifamily measure name. ADM then calculated average efficient and baseline wattages using product data from the EnergyStar database.

For the **LED 5-6W Candelabra** example, to calculate the efficient wattage ADM identified all products as specified by ESID included in the ESP program with efficient wattages between 5 and 6 watts. ADM then averaged the efficient wattages for all of those bulbs to arrive at average wattage values to assign to each measure. Because the wattage ranges were only 2W for most equipment names, the calculated efficient wattage will only differ from the true efficient wattage by 1 watt or less. Thus, the increase uncertainty to the overall measure savings is minimal.

LED bulb location is also specified in the T&R data, according to whether the bulb was installed indoors or out. Heating and cooling interactive HVAC effects were instead fixed in the TRM.

2.4.1.3. Low Flow Showerhead

Like faucet aerators, the most important parameter for the evaluation of low flow showerheads is the fuel share for water heating. Since all faucet aerators installed in PY22 were installed in homes with natural gas water heating, there were no electric savings or demand reduction and this measure contributed entirely to the gas savings.

The efficient GPM was reported within the equipment name for low flow showerheads (and thermostatic valves) in the T&R data. For example, all rebated showerheads with the equipment name **MF DI Showerhead 1.5gpm w/ thermostatic valve – Tenant**, have a flow rate of 1.5 gpm. TRM default values were instead used for the baseline GPM.

The housing type was recorded in the T&R data for each low flow shower installed.

2.5. Recommendations and Next Steps

2.5.1. Tracking and Reporting Updates

ADM has provided the recommendations in Table 9 for continued improvement of tracking and reporting for the Multifamily Program. As of this writing, these recommendations have been accepted by JCP&L and are being incorporated by the implementer. ADM will review the T&R data to verify updates once they are live.

Table 9: Summary of Tracking and Reporting Recommendations

Recommendations	Status
Per the NJ CML, use HVAC interactive effects from the residential lighting section of the FY2020 NJ protocols	Accepted
For pipe insulation measure: Retain data related to linear length, insulation thickness, and nominal pipe diameter in preparation for M&V data requests. Tracking data for PY22 did not include these values that are required to calculate savings, as indicated in the NJ Protocols.	In process: communicated to implementer
For lighting measures: Retain data related to efficient bulb wattages. The data do not need to be present in the tracking and reporting system if data request responses will contain this information.	In process: communicated to implementer

2.5.2. TRM Updates

The PY22 evaluation did not result in any recommended changes to the TRM.

2.5.3. Next Steps

The ADM team is carrying out a second round of basic rigor evaluation for the Multifamily program. In PY23, the ADM team will also conduct process evaluations and an enhanced rigor study.

3. Evaluation Methods

This section discusses gross impact evaluation approaches and process evaluation activities for the Multifamily program. The ADM team relied primarily on T&R data for measure verification and determination of key parameter values.

Both reported (or *ex ante*) and verified (or *ex post*) impacts in this report are constructed with calculation methods prescribed in the NJ CML. The NJ CML 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 Multifamily Program

The Multifamily Program is designed to provide energy audits of multifamily residential buildings that result in the installation of low-cost direct install measures. The program offers measures like those found in energy conservation kits, such as LED bulbs and faucet aerators. Program components are administered CLEAResult for the Multifamily Program.

Participating properties vary from a minimum of three-unit structures to multi-story, high-rise buildings. Measures can be installed in both residential units and in common areas (see Table 10). JCP&L coordinates with gas companies that provide services to participating customers to provide both electricity and gas saving measures.

Table 10: Multifamily Program Delivery

Measure	Delivery Stream	Energy Efficiency Eligibility/Description
MF - Tenant - DI	Direct Install	Multi-Family Tenant Space Audit w/ direct install measures.
MF - Common - DI	Direct Install	Multi-Family Common Space Audit w/ direct install measures.

3.2. Gross and Net Savings

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 did not 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 New Jersey Board of Public Utilities has stipulated that NTG is set to 1.0⁷ for the first triennium of the utility-run efficiency programs. Note that multifamily programs that serve low-income customers are often evaluated using an NTG of 1.0 to reflect the fact that the programs exist to provide energy-efficient measures to customers who likely would not otherwise have access to them; therefore, free ridership and spillover are typically zero.

3.3. Data Review

ADM reviewed program tracking data for all measures installed during PY22 to verify that each measure meets program qualifications, was installed in the PY22 project year, and that there were no duplicates or otherwise erroneous entries. ADM confirmed that the participant tracking data contains enough detail for the impact evaluation to be completed.

3.4. 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. The impact calculations rely primarily on the T&R data such as baseline wattages and the water heating fuel share.

The relevant TRM protocols also supply parameters such as annual hours of use, heating factor, 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 calculated measure level savings based on NJCML algorithms.

3.5. 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 B includes PY23 process evaluation research questions.

⁷ [BPU Docket Nos. QO1901040, QO19060748 & QO17091004](#) pg. 31.

4. Process Evaluation

For PY22, the process evaluation primarily consisted of in-depth interviews with JCP&L's program manager and related staff to better understand program operations, goals, and to identify relevant research topics and issues for PY23. Additionally, a detailed review of the data tracking and reporting system, savings calculations, and reporting procedures was conducted to ensure the program is properly reporting impacts and that all necessary data is available to ensure evaluability for enhanced rigor studies in PY23.

4.1. Program Design and Implementation

The Multifamily Program is designed to provide energy audits of multifamily residential buildings that result in the installation of low-cost direct install measures. The program offers measures like those found in energy conservation kits, such as LED bulbs and faucet aerators. Measures can be installed in both residential units and in common areas. Participating properties vary from a minimum of three-unit structures to multi-story, high-rise buildings.

4.2. Marketing

The marketing strategy for the Multifamily Program focused on informing property owners, managers, associations, tenant groups, municipalities, and community organizations about the availability and benefits of the program and how to participate. Outreach is primarily done through e-mails, web content, and direct mailers. Marketing activities also targeted the low and moderate income multifamily sector.

4.3. Implementation and Barriers to Participation

The primary market barriers that impact this program include:

- **Business/Operation Constraints:** Multifamily properties often have unique operational and time constraints that act as a barrier to implementing energy efficiency projects. This barrier is addressed by ensuring the program operates cooperatively with participants, provides program participation and technical assistance, and offers timely incentives and financing support.
- **Customer Awareness and Engagement:** Eligible participants may be unaware of energy efficiency opportunities and programs because the segment has historically not been well served by traditional energy efficiency programs. To address this barrier, this program was designed specifically to support the multifamily segment. JCP&L executes targeted outreach strategies to ensure

that relevant customers are aware of program opportunities and consider energy efficiency in equipment investments and long-term planning.

- **Cost Effectiveness:** Efficiency upgrades require an initial investment that is recovered by lower long run operating costs and non-energy benefits. Multifamily projects may carry longer payback periods than traditional energy efficiency projects due to the unique needs of the segment. To address this barrier, incentives and access to OBPR or similar financing options were provided to the customer to reduce the initial cost. JCP&L also communicated the non-energy benefits offered by many efficiency upgrades that may not be captured in the cost/benefit analysis to further promote efficiency upgrades to customers.
- **Covid related labor shortages:** Direct install programs have been particularly hard hit by pandemic related labor shortages, leading to high labor-to-kWh ratios. This barrier has naturally lifted somewhat as the market settles.

5. Key Findings and Recommendations

5.1. Energy Impacts Achieved in PY22

Program savings are reported in Table 11 and

Table 12.

Table 11: Multifamily PY22 Gross Annual Retail kWh Savings and kW Demand Reduction

Measure Category	Measure Quantity ⁸	Ex-ante kWh	Ex-post kWh	RR kWh	Ex-ante kW	Ex-post kW	RR kW
LED Lightbulbs	782	22,423	25,793	115%	21.99	18.69	85%
Faucet Aerators	153	0	0	-	0.00	0.00	-
Low Flow Showerheads	42	0	0	-	0.00	0.00	-
Total	977	22,423	25,793	115%	21.99	18.69	85%

Table 12: Multifamily PY22 Gross Annual Retail Therms and MMBtu Savings

Measure Category	Ex-ante Therms	Ex-post Therms	Ex-ante MMBtu	Ex-post MMBtu	RR
LED Lightbulbs	-203.06	-298.67	-20.31	-29.87	147%
Faucet Aerators	36.24	36.24	3.62	3.62	100%
Low Flow Showerheads	126.25	121.20	12.63	12.12	96%
Total	-40.57	-141.23	-4.06	-14.12	348%

The Multifamily Program accounted for 0.02 percent of the total portfolio during the first year of operation. Detailed information for each offered measure is included below.

⁸ 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.

5.2. Program Launch

The Multifamily program was launched relatively late in PY22, with measure installations beginning in May 2022. The first few months of the program year involved establishing program eligibility requirements, data needs, and tracking and reporting processes. Though program savings fell below JCP&L’s Energy Efficiency and Conservation (EE&C) plan for PY22, the program is rapidly expanding in PY23. As of this writing, the program is on track for a 15-fold energy savings increase in PY23, relative to PY22.

Utility evaluators benchmarked several comparable programs to the ones offered by utilities participating in the NJ CEA in PY22. Table 13 compares gross realization rates between JCP&L’s Multifamily program and several similar programs.

Table 13: Gross MWh Realization Rates for JCP&L and Peer Utilities' Multifamily Program

Utility	Number of Customers Served	Gross MWh Realization Rate
Jersey Central Power & Light	1,100,000 customers	115%
FirstEnergy Pennsylvania Companies	600,000 customers	136%
Michigan Public Service Commission	1,630,424 residential customers	84%
Commonwealth Edison Company	3,681,929 residential customers	99%
Public Service Company of Oklahoma	483,536 residential customers	102%

While JCP&L’s first year’s energy savings were generally in line with all of the benchmarked programs, JCP&L’s Multifamily program launch was particularly similar to FirstEnergy Pennsylvania, which was also in its first year. Like JCP&L, the program was lean (compared to later project year) and launched later in the first year. This is typical for small programs like Multifamily, which the utility may delay in order to prioritize the launch of higher impact programs. In JCP&L, the EE Products Program (accounting for 92% of the total portfolio kWh savings) was launched first and ramped up quickly, allowing the smaller programs to launch as the program settled into a routine. JCP&L was able to launch the Multifamily program slightly faster than in Pennsylvania, with program savings of about 22 MWh compared to Pennsylvania’s 1 MWh. This can likely be attributed to institutional knowledge, business practices, and data infrastructure developed by FirstEnergy staff from the program launch in Pennsylvania in 2021.

5.3. Key Evaluation Findings

The following summarizes the key findings of the evaluation of the Multifamily Program for PY2022:

- **The program resulted in positive electricity savings** of 25,793 kWh savings, 18.69 kW demand reduction, and -141.23 therms savings.
- 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
- 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

5.4. Recommendations

ADM provides the following recommendations to improve future program implementation.

- Per the NJ CML, use HVAC interactive effects from the residential lighting section of the FY2020 NJ protocols
- **Retain LED wattages to supplement tracking data:** While baseline lamp wattage is tracked for the program, efficient lamp wattage is given in a narrow range (e.g., 7 to 9 watt general service LED). This is done to avoid numerous degenerate measure items, each corresponding to a particular wattage. While this does not cause significant uncertainty in savings calculations, we recommend that the actual efficient lamp wattage are retained and made available to the evaluator upon a data request.
- **Retain showerhead flow rates to supplement tracking data:** Similarly to LED wattages, we recommend that the ICSP retains the flow rates for showerheads and makes them available upon request.

Appendix A Multifamily Impact Evaluation Detail

The Multifamily Program is designed to provide energy audits of multifamily residential buildings that result in the installation of low-cost direct install measures. The program offers measures like those found in energy conservation kits, such as LED bulbs and faucet aerators.

Gross Impact Evaluation Results

Program savings are reported in Table 14 and Table 15.

Table 14: Multifamily PY22 Gross Annual Retail kWh Savings and kW Demand Reduction

Measure Category	Measure Quantity	Ex-ante kWh	Ex-post kWh	RR kWh	Ex-ante kW	Ex-post kW	RR kW
LED Lightbulbs	782	22,423	25,793	115%	21.99	18.69	85%
Faucet Aerators	153	0	0	-	0.00	0.00	-
Low Flow Showerheads	42	0	0	-	0.00	0.00	-
Total	977	22,423	25,793	115%	21.99	18.69	85%

Table 15: Multifamily PY22 Gross Annual Retail Therms and MMBtu Savings

Measure Category	Ex-ante Therms	Ex-post Therms	Ex-ante MMBtu	Ex-post MMBtu	RR
LED Lightbulbs	-203.06	-298.67	-20.31	-29.87	147%
Faucet Aerators	36.24	36.24	3.62	3.62	100%
Low Flow Showerheads	126.25	121.20	12.63	12.12	96%
Total	-40.57	-141.23	-4.06	-14.12	348%

Discussion of Realization Rates

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%. 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.

LED Bulb

LED lightbulbs realization rates were primarily impacted by the discrepancy in HVAC interactive effects chosen for ex-ante and ex-post savings. For energy savings and demand reduction, ex-ante calculations assumed all bulbs were installed in homes with electric resistance heating and used multifamily HVAC interactive effect values. In contrast, ex-post savings used HVAC interactive effect values from the Residential Lighting section of the TRM, in accordance with the NJCML. This led to higher energy savings and a realization rate of 115%. However, the demand reduction was lower using the correct HVAC interactive effect, resulting in a realization rate of 85%.

Faucet Aerator

The gas savings realization rate for faucet aerators was 100 percent. Since all PY23 projects were homes with gas water heaters, there were no electric or peak demand savings resulting from the installation of faucet aerators.

Low Flow Showerhead

For low-flow showerheads, the 96 percent realization rate resulted from a difference in gallons per minute used in ex-ante and ex-post calculations for one project. Since the GPM reported by the implementer was unavailable, ex-post calculations pulled GPM data from the equipment name in the Tracking and Reporting database. For instance, for measures with the equipment name **MF DI Showerhead 1.5gpm w/ thermostatic valve**, ex-post savings was calculated using a GPM of 1.5. However, for one project, while the equipment name suggested a GPM of 1.5 but ex-ante calculations were high, matching savings for a 2.0 gpm low-flow showerhead.

Lifetime Savings

Lifetime electricity and therms savings were calculated for each measure by multiplying ex-post annual values by the expected useful lifetime (EUL). Lifetime savings are reported in Table 16 and Table 17. EUL were sourced from the NJ CML.

Table 16: Multifamily Lifetime kWh and kW Demand Savings

Measure Category	EUL	Ex-post Annual kWh	Ex-post Lifetime kWh	Ex-post kW	Ex-post Lifetime kW
LED Lightbulbs	15	25,793	386,901	21.69	325.28
Faucet Aerators	10	0.00	0.00	0.00	0.00
Low Flow Showerheads	10	0.00	0.00	0.00	0.00
Total		25,793	386,901	21.69	325.28

Table 17: Multifamily Lifetime Therms and MMBtu

Measure Category	EUL	Ex-post Therms	Ex-post Lifetime Therms	Ex-post Lifetime MMBtu
LED Lightbulbs	15	-298.67	-4,479.99	-448.01
Faucet Aerators	10	36.24	362.43	36.24
Low Flow Showerheads	10	121.20	1,212.00	121.20
Total		-141.22	-2,905.55	-290.57

Data Review

ADM reviewed program tracking data for all measures included in PY2022 as part of its first year in a multi-year evaluation cycle. ADM provides the following findings as part of its review of program tracking data.

Missing or Incorrect Data

For the Multifamily Program, LED lightbulb measures were missing efficient wattage data in the Tracking and Reporting database in PY22. Low flow showerhead measures were also missing the efficient GPM in the Tracking and Reporting database.

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 recommendation to improve realization rates:

- Use HVAC interactive effects for the residential sector for lamps installed within tenant spaces.

Appendix B Process Evaluation Research Questions for PY23

Table 18 provides a list of research questions to be addressed through process evaluation activities in PY2023. The researchable issues are stated broadly to incorporate all issues identified by ADM, JCP&L, and the program implementers. This matrix provides questions the evaluation team will address throughout the evaluation and activities that support addressing the questions. These issues will be refined to address individual subprograms through interviews with JCP&L implementation and ICSP staff.

Table 18: Multifamily Program Key Researchable Evaluation Issues

Researchable Question	Activity to Support the Question
Program Processes	
How are program processes working between the different ICSPs, GDCs, SWC and JCP&L? Do the program materials accurately reflect the process design or program design?	Program and ICSP staff interviews
	Review of data tracking systems
Program Marketing and Coordination with Trade Allies	
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?	Program and ICSP staff interviews
	Participant survey
How do marketing and program outreach affect the sector? How does awareness vary by marketing method and outreach strategy?	Participant surveys
Customer Awareness and Experiences	
How is the program working? What enhancements are needed in the design and delivery of the program?	Participant surveys
How has the transition to new ICSPs affected customer experiences, if at all? Do they have recommendations?	Participant surveys
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?	Participant surveys

Are program requirements clearly understood? Are the procedures for application and rebates easy to follow?	Participant surveys
Were the application and rebate processed in a timely manner? Was the online application process valuable?	Participant surveys
Are customers satisfied with the program? What specific subprograms have the most and least customer satisfaction?	Participant surveys
What is the customer opinion on financing options? Did they remove barriers to participation?	Participant surveys
What do customers believe could be offered to improve program services?	Participant survey
What mechanisms and additional measures can be added to the measure mix for future program years?	Participant survey
Customer Decision-Making	
Which equipment has been installed, and what type of equipment did it replace? What alternative equipment were customers considering?	Participant surveys
What barriers exist for customers' participation in the program?	Participant surveys
Have customers purchased additional equipment since participating in the program?	Participant surveys
Program Performance Indicators	
Is the program delivering the intended benefits to participants, and are they achieving planned energy impacts?	Participant surveys
Is the appropriate information being collected to support future evaluation activities (i.e., impact evaluation)?	Program documentation review
Are there differences in participation by measure? Is there a difference in measure uptake from initial planning? If so, is that difference significant, and what is driving those differences?	Database review
	Program and CSP staff interviews

ADM will provide actionable recommendations to client in PY2023 for all answered research questions with clearly identified issues impacting the program, barriers impeding program success, and future challenges affecting the program long-term.