Evaluation of 2024 Energy Efficiency and Beneficial Electrification Portfolio – Volume II Program Guidance Document

Prepared for PSEG Long Island

By Demand Side Analytics
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1 PREFACE

GLOSSARY OF TERMS

Key Term	Definition
MWh Beneficial Electrification (MWh_{be})	The increase in weather-normalized annual electric energy consumption attributable to beneficial electrification measures.
MWh Energy Efficiency (MWh_{ee})	The reduction in weather-normalized annual electric energy consumption attributable to energy efficiency programs or measures.
Delta MWh	The total change in annual electric energy consumption. Equal to $MWh_{ee} - MWh_{be}$. Energy Efficiency measures, MWh_{ee}, typically result in a reduction in a customer's annual electric consumption and are reported as positive impacts. Beneficial Electrification measures, MWh_{be}, result in an increase in the customer's annual electric consumption. A negative value of Delta MWh indicates the measure, or program increases electric consumption on the PSEG Long Island system as a whole. A positive value of Delta MWh indicates the measure, or program reduces electric consumption on the PSEG Long Island system.
Discount Rate	The time value of money that is used to calculate the present value of future benefits and costs. PSEG Long Island uses a weighted average cost of capital supplied by LIPA that represents the cost of borrowing to build additional capacity to meet the service territory's future supply needs. Based on these factors, we used a nominal discount rate of 5.66% in the 2024 evaluation.
Ex-Ante Gross Savings	The energy and demand savings recorded by the implementation contractor in the program tracking database. Ex-ante gross savings are sometimes referred to as claimed savings. These savings are calculated using planning assumptions and algorithms.
Ex-Post Gross Savings	The energy and demand savings estimated by the evaluation team, using the best methods and data available at the time of the evaluation.
Ex-Post Net Savings	The savings realized by the program after independent evaluation determines ex-post gross savings and applies NTGRs and line losses. The evaluation team uses the ex-post net impacts in the cost-effectiveness calculation to reflect the current best industry practices.

Key Term	Definition
Gross Impacts	The change in energy consumption or demand directly due to the participants' program-related actions, regardless of why they participated. These impacts include coincidence factors (CFs) for demand and installation rates. Gross impacts presented in this report do not include line losses and, therefore, represent the energy and demand savings as would be measured at the customers' meters.
kW Impacts (Demand or Capacity)	The reduction in demand coincident with system peaking conditions due to energy efficiency measures. For Long Island, system peaking conditions typically occur on non-holiday summer weekdays. This report's peak demand savings values are based on system coincident demand impacts between 4 pm and 5 pm on non-holiday weekdays from June to August.
Levelized Cost of Capacity	To operate the electric grid, the system operator needs installed, operable capacity to meet peak demand conditions. The levelized cost of capacity is a metric that allows planners to compare the costs of different resources to meet (or lower) peak demand. The metric is typically expressed in terms of $kW/year.
Levelized Cost of Energy	The equivalent cost of energy (kWh) over the life of the equipment that yields the same present value of costs, using a nominal discount rate of 6.16%. The levelized cost of energy is a measure of the program administrator's program costs in a form that planners can compare to the cost of supply additions.
Line Loss Factor	The evaluation team applies line losses of 5.67% on energy consumption (resulting in a multiplier of 1.0601 = [1 ÷ (1 – 0.0567)]) and of 7.19% on peak demand (resulting in a multiplier of 1.0775 = [1 ÷ (1 – 0.0719)]) to estimate energy and demand savings at the power plant.
MMBtu Beneficial Electrification ($MMBtu_{be}$)	For fuel-switching measures, the reduction in site-level fossil fuel consumption minus the site level increase in the electric consumption (MWh_{be}) converted to MMBtu at 3.412 MMBtu per MWh.
MMBtu Energy Efficiency ($MMBtu_{ee}$)	The reduction in site-level energy consumption due to energy efficiency expressed on a common MMBtu basis. $MMBtu_{ee}$ impacts are calculated by multiplying the MWh_{ee} impacts by a static 3.412 MMBtu per MWh conversion factor and adding any fossil fuel conservation attributable to the measure. Secondary fossil fuel impacts, such as the waste heat penalty associated with LED lighting, are also deducted from the ex-post $MMBtu_{ee}$ estimates.
Net Impacts	The change in energy consumption or demand that results directly from program-related actions taken by customers (both program participants and non-participants) that would not have occurred absent from the program. The difference between the gross and net impacts is the application of the net-to-gross ratio (NTGR) and line losses. Net impacts presented in this report also include line losses and, therefore, represent the energy and demand savings as would be measured at the generator. Net impacts are used for cost-effectiveness analysis.

Key Term	Definition
Net-to-Gross Ratio (Free-Ridership and Spillover)	The factor that, when multiplied by the gross impacts, provides the net impacts for a program before any adjustments for line losses. The NTGR is defined as the savings attributable to programmatic activity after accounting for free-ridership (FR) and spillover (SO). Free-ridership reduces the ratio to account for those customers who would have installed an energy-efficient measure without a program. The free-ridership component of the NTGR can be viewed as a measure of naturally occurring energy efficiency. Spillover increases the NTGR to account for non-participants who install energy-efficient measures or reduce energy use due to the actions of the program. The NTGR is generally expressed as a decimal and quantified through the following equation: $NTGR = 1 - FR + SO$
Realization Rate	The ratio of ex-post gross to ex-ante gross impacts. This metric expresses the evaluation savings as a percentage of ex-ante savings claimed by PSEG Long Island or the implementation contractor. The Home Energy Management program is implemented by Bidgely on behalf of PSEG Long Island. TRC and its subcontractors implement the remainder of the portfolio.
Ratepayer Impact Test (RIM)	A test that estimates the impact of conservation programs on rates due to changes in utility revenue as result of program activities. The RIM test considers the cost-effectiveness from the perspective of a non-participating ratepayer. Energy efficiency programs will typically not pass the RIM test because measures lead to a reduction in utility revenue. Conversely, BE programs often pass the RIM test because the increased consumption allows the utility to spread its fixed costs across more units of energy.
Societal Cost Test (SCT)	A test that measures a program's net costs as a resource option based on benefits and costs to New York. Rebate costs are not included in this test because they are assumed to be a societal transfer. To maintain consistency with the most current version of the New York Benefit-Cost Analysis Handbook, we applied the SCT as a primary method of determining cost-effectiveness using the same assumptions as those used by PSEG Long Island's resource planning team.
Technical Reference Manual (TRM)	A collection of algorithms and assumptions used to calculate resource impacts of PSEG Long Island’s Energy Efficiency Portfolio. The PSEG Long Island TRM aligns with the New York State TRM in many respects but includes Long Island specific parameters and assumptions where available from saturation studies or prior evaluation research.
Total MMBtu Impact	The primary performance metric since program year 2020. Equal to the sum of $MMBtu_{be}$ and $MMBtu_{ee}$. This metric represents the change in site-level fuel consumption attributable to the measure or program. This metric does not consider the amount of MMBtu required to generate a kWh of electricity – only the embedded energy in the delivered electricity.

Key Term	Definition
Utility Cost Test (UCT)	A test that measures the net costs of a program as a resource option, based on the costs that the program administrator incurs (including incentive costs) and excluding any costs incurred by the participant beyond what is subsidized by the program. To allow for a direct comparison with PSEG Long Island's assessment of all supply-side options and consistent with previous evaluation reports, we continue to show the UCT as a secondary method of determining cost-effectiveness.
Verified Ex-Ante Gross Savings	A key question is if the ex-ante gross energy impacts claimed by the implementation contractors were calculated consistently using the calculations and assumptions approved by PSEG Long Island and LIPA and used to develop annual savings goals. To verify claimed savings, the evaluation team independently calculates the saving using the calculations and assumptions pre-approved by PSEG Long Island. These savings estimates are used to determine if PSEG Long Island achieves its annual scorecard goals.

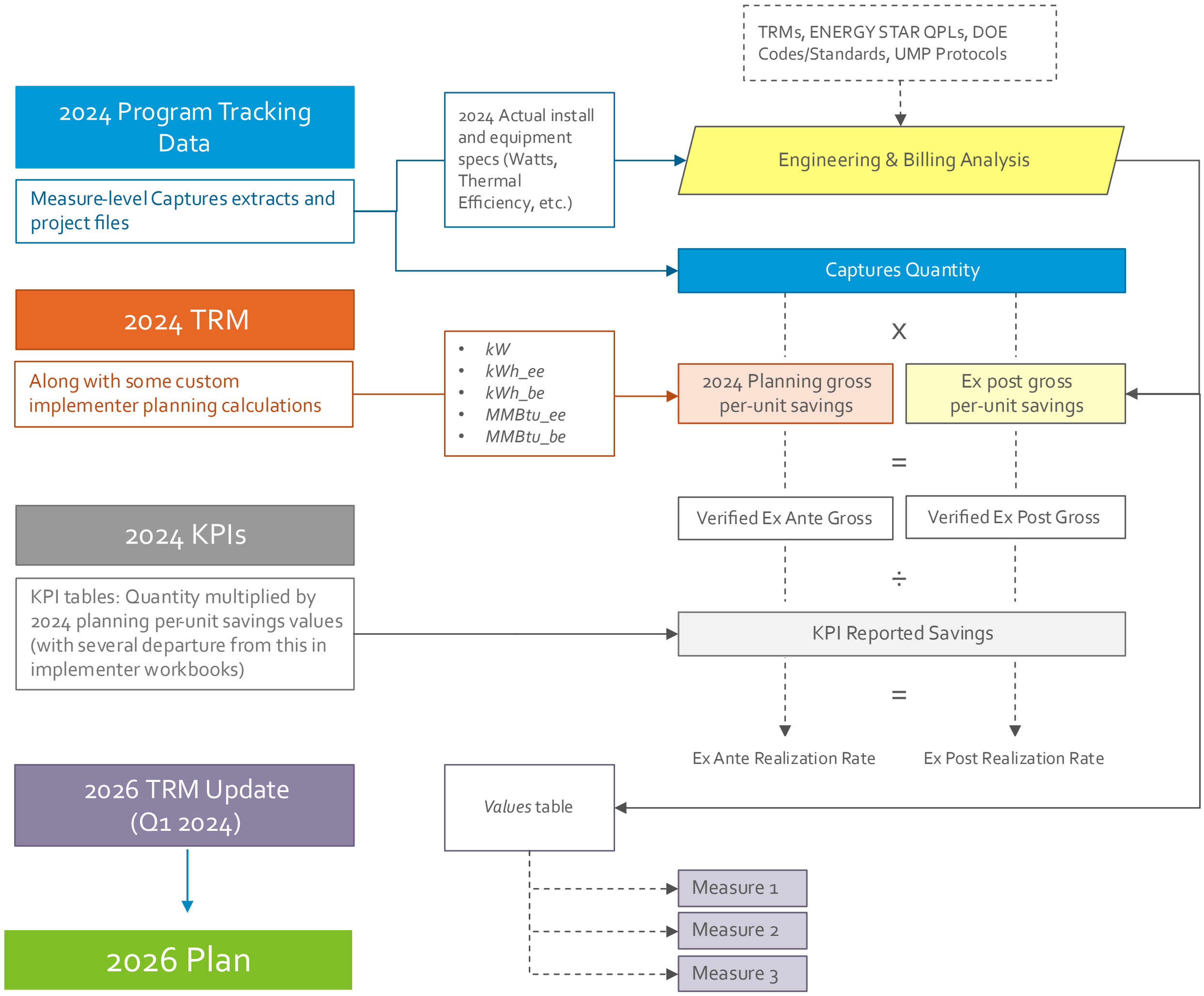
ANNUAL EVALUATION TASKS AND CYCLE TIMELINE

Figure 1 outlines annual energy efficiency and beneficial electrification programming timeline for planning, verified ex-ante, and verified ex-post and the resources that inform assumptions for each deliverable. The verified ex-ante audit asks if the ex-ante gross energy impacts claimed by the implementation contractors were computed consistently with the calculations and assumptions approved by PSEG Long Island. To verify claimed savings, the evaluation team independently calculates the savings using the calculations and assumptions pre-approved by PSEG Long Island. These savings estimates are used to determine if PSEG Long Island achieves its annual scorecard goals, and results are submitted in the Verified Ex-Ante Memo (see Appendix D).

Volumes I and II of this report outline the results from the ex-post evaluation. The ex-post evaluation estimates energy and summer peak demand savings for the portfolio using the most current methods and data available at the time of the evaluation. Assumptions and algorithms from the most up to date TRMs, Federal Codes and Standards, and actual equipment specifications are utilized in this portion of the evaluation. The output informs recommendations for future planning cycles.

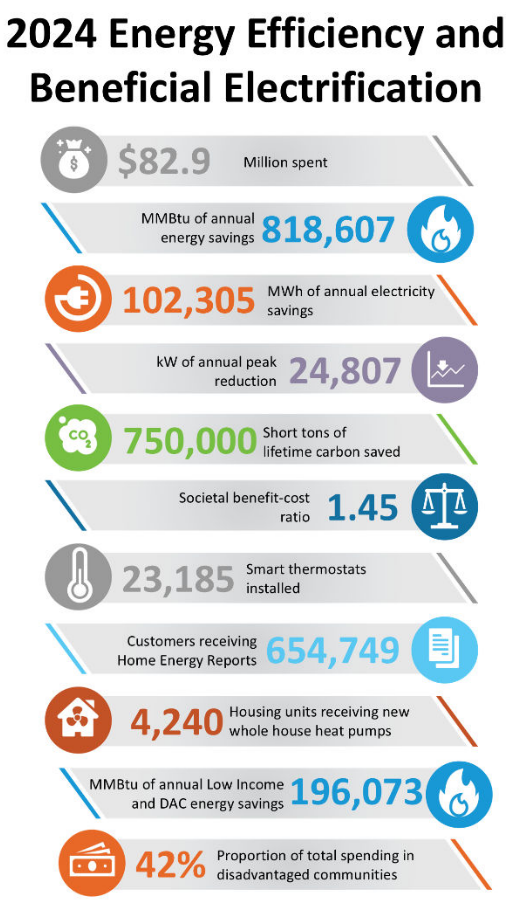
It is important to note that the feedback loop is a two-year cycle. PSEG Long Island has already established 2025 goals and planning assumptions, therefore findings and recommendations from the 2024 ex-post evaluation will not be reflected in the 2025 program claimed savings methodology. The findings and recommendations of this 2024 impact evaluation will be reflected in 2026 planning assumptions, goal setting, and ex-ante savings values. Additionally, any major drivers in differences between ex-post and claimed ex-ante savings discovered in the 2023 evaluation were expected to persist in the 2024 evaluation results.

Figure 1: Annual Evaluation Data Flow



2 INTRODUCTION

PSEG Long Island's Energy Efficiency and Beneficial Electrification programs offer an array of incentive and rebate opportunities to PSEG Long Island residential and commercial customers to assist them in either reducing their energy usage through energy efficiency, thereby lowering their energy bills, or in electrifying their homes and avoiding fossil fuel-based costs through beneficial electrification. The Energy Efficiency and Beneficial Electrification Portfolio is administered by PSEG Long Island and its subcontractor, TRC, on behalf of the Long Island Power Authority (LIPA). The sole exception is the residential behavioral program, Home Energy Management (HEM), which was administered by Bidgley for the 2024 Program Year. This report presents the 2024 Energy Efficiency and Beneficial Electrification Portfolio program evaluation ex-post gross results and covers the period from January 1, 2024, to December 31, 2024.



The Demand Side Analytics evaluation team produced two volumes that together compose the entire Annual Evaluation Report. This document, the 2024 Program Guidance Document (Volume II) presents detailed program-by-program impact analysis results. The 2024 Annual Evaluation Report (Volume I) provides an overview of the portfolio-level evaluation findings.

In 2024, PSEG Long Island spent $82.9 million implementing the Energy Efficiency and Beneficial Electrification Portfolio. The investment led to 818,607 of total MMBtu savings and avoided three quarters of a million short tons of CO_2 emissions – the equivalent of removing approximately 159,000 combustion engine cars for one year.[1] PSEG Long Island's efforts led to over $53 million in net societal benefits, with a societal benefit cost ratio of 1.45.

New York has established many statewide energy efficiency and emission reduction targets. The Climate Leadership and Community Protection Act (CLCPA) set the overall goal of reducing GHG emissions by 40% by 2030 and 85% by 2050. In 2018, New Efficiency: New York set a statewide energy efficiency target of 185 TBtu in energy savings by the end of 2025. By laying out these targets, New York established fuel-neutral metrics to incorporate beneficial electrification in the building and

[1] The EPA estimates 4.29 metric tons of carbon per vehicle-year, the equivalent of 4.73 short tons per vehicle-year. See: https://www.epa.gov/energy/greenhouse-gases-equivalencies-calculator-calculations-and-references

transportation sectors, which is necessary to achieve the State's carbon reduction goals. In response, PSEG Long Island:

- **Changed its primary performance metric from electric energy (kWh) and peak demand (kW) to MMBtu.** The switch, which took place prior to the 2020 program year, allows PSEG Long Island to pursue beneficial electrification measures like heat pumps that increase electric consumption but lower overall energy consumption and emissions. The MMBtu performance metric is "MMBtu at the site" meaning saved or increased kWh is converted to MMBtu using a static factor of 3.412 MMBtu per MWh. The thermal efficiency of the electric power generation fleet does not affect the calculations.
- **Incorporated and continues to expand beneficial electrification measures in its offerings.** PSEG Long Island has continued to pioneer efforts to expand their energy efficiency programs to include rebates and incentives for customers to install measures that supply beneficial electrification to the grid, such as heat pumps, and save on their fossil fuel-based costs. Adopting fuel-neutral savings targets allows PSEG Long Island to aggregate efficiency achievements across electricity, natural gas, and delivered fuels such as oil and propane, which in turn shifts investment towards more non-lighting opportunities.
- **Adopted a 7.85 TBtu by 2025 target, their portion of the overarching 185 TBtu goal.** PSEG Long Island is responsible for reporting their progress towards 7.85 TBtu of energy savings by end of 2025. For consistency with New York investor-owned utilities (IOUs), the impacts counted towards this target are calculated excluding fossil fuel heating penalties. PSEG Long Island includes fossil fuel penalties in their ex-post evaluation of MMBtu impacts. Through 2024, PSEG Long Island has acquired 6.75 TBtu. Based on current projections of 0.75 TBtu for 2025, the Company will fall approximately 4% short of the 7.85 TBtu target.

Energy efficiency and beneficial electrification programs undergo a yearly cycle including planning, implementation, audit and verifications, evaluation, and cost-effectiveness. At each stage, the term "energy savings" is used, leading to the need to be precise about the type of savings. Because conservation program account and evaluation have a unique lexicon, we include a comprehensive Glossary of Terms with definitions and encourage readers who are less familiar with the key terms to review them.

Figure 2 shows the energy efficiency program cycle, the main objectives at each step, and the key terms. The feedback loop is nearly a two-year cycle. The planning activities for 2024 were conducted in 2023 and set the goals, rules, and algorithms for calculating energy savings. The 2023 energy efficiency and beneficial electrification measures were not evaluated until the spring of 2024, meaning 2024 programs were already being implemented before performance metrics were available from the 2023 evaluation. Considering this lag, we expected any major drivers in differences between claimed savings and ex-post impacts that were discussed in the 2023 evaluation to persist in 2024. Additionally, most of the findings and recommendations of this 2024 impact evaluation will be reflected in 2026, not 2025, planning assumptions, goal setting, and ex-ante savings values since PSEG Long Island has already established 2025 goals and planning assumptions.

Figure 2: Energy Efficiency Cycle, Objectives, and Key Terms

	Planning	Implementation	Audit & Verification	Evaluation	Cost-Effectiveness
Objective	Set goals for future years and set rules for how savings will be calculated for settlement with implementer	Recruit participants, maximize energy savings, and track activities	Determine if the Implementer used the assumptions and calculations pre-approved by PSEG Long Island	Produce the best after-the-fact estimate of savings delivered using the best methods and data available	Assess if the portfolio of energy efficiency activities was cost-effective from a (New York) societal perspective using Ex-Post Net savings
Timeline	• **Spring 2023**: Planning for 2023 using draft 2023 TRM assumptions	• **2024**: Portfolio Programs implemented	• **January 2025**: Verified Ex-Ante Savings Calculated using planning assumptions from 2022	• **Spring 2025**: Ex-Post evaluation of 2024 portfolio using most up-to-date methods (PSEG-LI and NYS TRMs)	• **Spring 2025**: Using Ex-Post Net evaluation values
Key terms	• Planned Savings • Technical Resource Manual (TRM)	• Gross Ex-ante Savings (Claimed Savings)	• Verified Ex-Ante Savings	• Ex-post Gross Savings • Ex-Post Net Savings • Realization Rate • Net-to-Gross Ratio (NTGR)	• Societal Cost Test (SCT) • Utility Cost Test (UCT) • Levelized Cost of Energy • Levelized Cost of Capacity

PSEG Long Island exceeded its planning goals for 2024 on both a verified ex-ante and ex-post basis thanks to strong performance from residential programs and addition of new non-lighting offerings in the commercial sector. High home prices and interest rates on Long Island mean homeowners are planning fewer moves and are more willing to invest in their home energy efficiency. Homeowners were able to stack tax incentives and energy efficiency rebates offered by the state-run Inflation Reduction Act's (IRA) programs on top of PSEG Long Island incentives in 2024. In 2025 and beyond, IRA funding will be subject to political uncertainty and New York is changing the organization of its statewide programming. Volume 1 includes a more detailed discussion of the headwinds and tailwinds that face the energy efficiency and beneficial electrification portfolio. In 2024, PSEG Long Island administered eight programs, described in Table 1.

Table 1: Energy Efficiency and Beneficial Electrification Program Descriptions

Program	Description
Commercial Efficiency Program	The program assists non-residential customers in saving energy by offering customers rebates and incentives to install energy conservation measures as well as beneficial electrification measures. Technical Assistance rebates are available under CEP to offset the cost of engineering and design services for qualifying projects. Starting in 2024, horticultural lighting rebates and incentives were added to the CEP Custom measure mix, and free energy waste training was made available through the CEP building operator certification (BOC) measure.

Program	Description
Multi-Family	The Multifamily program was launched in October 2020. At launch, the Multifamily program targeted New Construction Multifamily developments. In 2021, the Multifamily Program expanded to include Existing Building Multifamily properties. The Multifamily program offers rebates for common area lighting (indoor and outdoor), efficient heat pump systems for cooling and heating, and in-unit appliances.
Energy Efficiency Products	The program's objective is to increase the purchase and use of energy-efficient appliances among PSEG Long Island residential customers. Through upstream and downstream promotions, the program provides rebates or incentives for many efficient technologies including smart thermostats, dehumidifiers, air purifiers, and appliances. This program also supports beneficial electrification measures such as heat pump pool heaters and heat pump water heaters. The program supports the stocking, sale, and promotion of efficient residential products at retail locations.
Home Energy Management	Home energy reports are behavioral interventions designed to encourage energy conservation by leveraging behavioral psychology and social norms. The paper or electronic reports compare a customer's energy consumption to similar neighboring households and provide targeted tips on reducing energy use.
Home Comfort	The Residential Home Comfort offers rebates to residential customers for purchasing and installing energy-efficient air-source heat pumps (ASHP), ductless mini split heat pumps, and ground source heat pumps (GSHP). These heat pumps are typically two to three times more efficient than traditional fossil fuel heating. The program seeks to promote whole house solutions to both market and income eligible customers.
Home Performance	The Home Performance program serves residential customers and has two components: Home Energy Assessments (HEAs) and Home Performance with ENERGY STAR (HPwES). The primary objective of the Home Performance program is to make high efficiency choices part of the decision-making process for PSEG Long Island customers when upgrading their home. The overall goal of the Home Performance programs is to reduce the carbon footprint of both market and income-eligible customers who utilize electricity, oil, or propane as a primary heating source.
Residential Energy Affordability Partnership	The program is designed for income-eligible customers and aims to save energy, provide education, help participants reduce electric bills, and make their homes healthier and safer. This program encourages whole-house improvements to existing homes by promoting home energy surveys and comprehensive home assessment services identifying potential efficiency improvements at no cost to the customer.

Program	Description
All Electric Homes	The All Electric Homes program is an extension of New York state policy goals to reduce reliance on fossil fuel combustion appliances in homes. This program offers incentives and rebates to developers who build single-family all-electric homes or convert existing single-family homes from fossil fuel heating and appliances to all-electric. The All Electric Homes program is not part of the 2025 Energy Efficiency and Beneficial Electrification portfolio.

2.1 PORTFOLIO ENERGY SAVINGS AND PERFORMANCE

Table 2 compares planned, claimed, verified, and ex-post gross and net savings under the primary performance metric, MMBtu. At the portfolio level, the claimed, verified ex-ante, and ex-post values exceeded planning targets. Implementation contractor performance is to be judged using the verified ex-ante metric. For the verified ex-ante metric, the evaluation team independently verified that the main contractor, TRC, calculated the savings consistently with the algorithms and assumptions used for planning. Results of the Verified Ex-Ante Memo can be reviewed in Appendix D. The MMBtu totals for CEP in Table 2 differ from the Verified Ex-Ante Memo due to the exclusion of a 3,783 MMBtu custom electric submetering project. The evaluation team removed the project from the ex-ante and ex-post totals for 2024 based on data availability and recommend that it be revisited during the 2025 evaluation once TRC can work with the participant to collect performance data for analysis.

Table 2: Summary of 2024 Energy Program Performance

Sector	Program	Planned Savings (Goals)	Ex-Ante Gross Savings (Claimed)	Verified Ex-Ante Gross Savings	Ex-Post Gross Savings (Evaluated)
		MMBtu	MMBtu	MMBtu	MMBtu
Commercial	Commercial Efficiency Program (CEP)	259,011	271,975	270,436	229,152
	Multi-Family	46,382	38,664	38,664	37,204
Residential	Energy Efficiency Products (EEP)	153,269	177,654	177,610	189,384
	Home Comfort (HC)	107,678	164,552	164,552	181,730
	Home Performance	35,014	36,593	36,593	22,377
	Home Energy Management (HEM)	177,816	106,265	105,330	145,329
	Residential Energy Affordability Program (REAP)	11,980	12,285	12,234	12,902
	All Electric Homes	574	609	543	530
Subtotal Commercial		**305,393**	**310,639**	**309,100**	**266,356**
Subtotal Residential		**486,332**	**497,958**	**496,862**	**552,251**
Total Portfolio		**791,725**	**808,597**	**805,962**	**818,607**

Figure 3 and Figure 4 visualize the program performance. Because the goals are based on MMBtu gross savings, the appropriate comparisons are between MMBtu planned, claimed, and ex-post gross savings.

Each program chapter also provides energy savings (MWh) and peak demand savings (kW). We caution that measures that reduce fossil fuel use, such as heat pumps and heat pump water heaters, can increase overall electricity consumption and peak demand metrics.

Figure 3: Portfolio MMBtu Savings

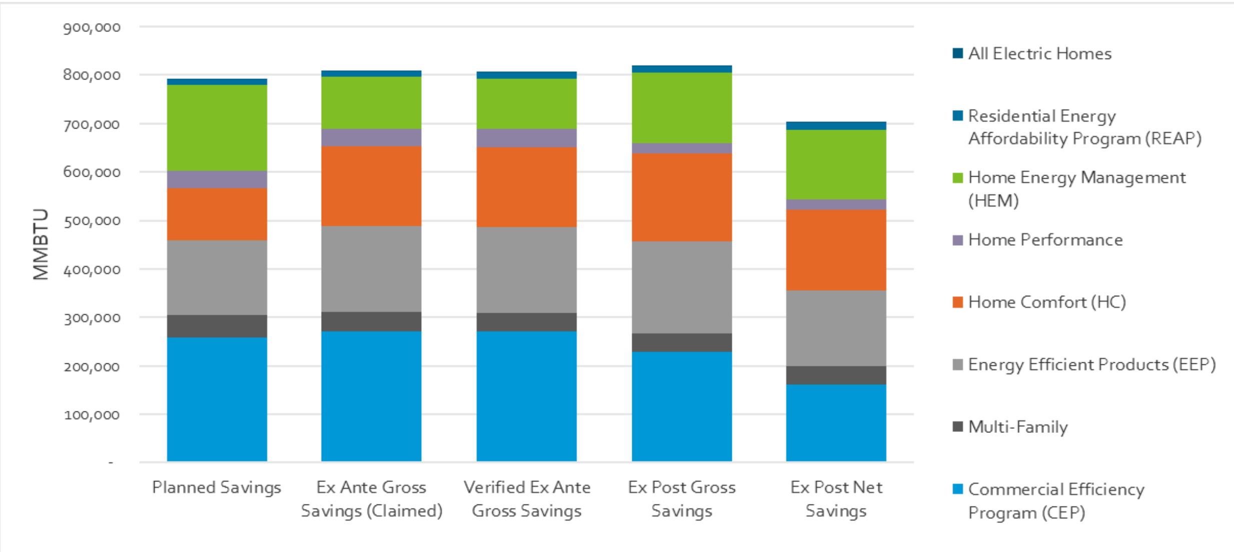
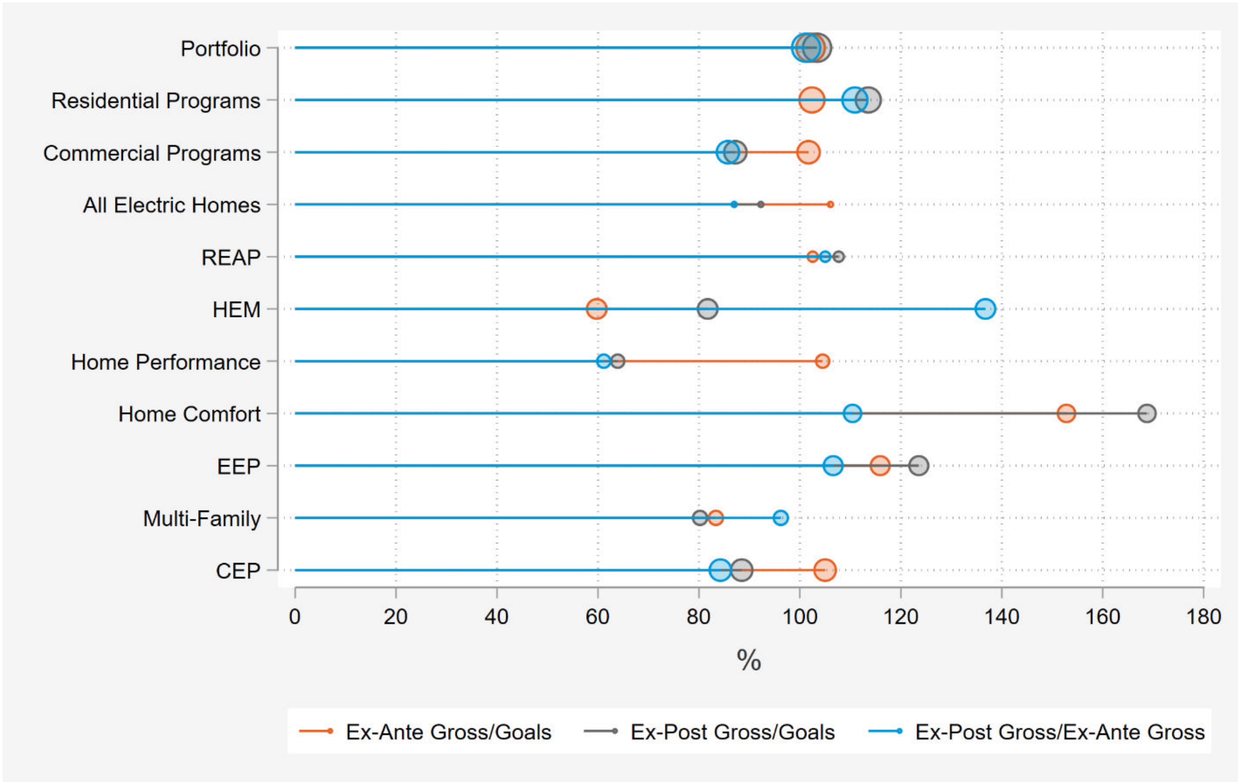


Figure 4 visualizes how evaluated savings compare to claimed savings (the Realization Rate, blue bars), how evaluated savings compare to planned savings (grey bars), and how claimed savings compare to planned savings (orange bars). The size of the circle in the plots is scaled based on the goals for the program. At the portfolio level, the ex-post gross savings were 103% of planned savings. For residential programs, the ex-post gross savings were 114% of planned savings while ex-post gross savings for commercial programs was 87% of planned savings. Most programs had realization rates very close to 100% when comparing claimed savings and ex-post gross savings.

Figure 4: Portfolio Performance Metrics



The overall portfolio realization rate was 101.2% with a total difference of 10,010 MMBtu between claimed ex-ante and verified ex-post gross impacts. In aggregate, the verified savings are closely aligned with claimed savings for the 2024 program year. However, there is some variation between the claimed ex-ante and verified ex-post MMBtu impacts by program and/or certain measure groups. Table 3 summarizes the primary reasons as to why portfolio ex-post gross (evaluated) savings departed from the planned and claimed savings.

Table 3: Summary of Differences between Ex-Post and Ex-Ante

Portfolio Component	Difference Between Ex-Ante Gross and Ex-Post MMBtu Savings	Summary of Savings Difference
Home Energy Management (HEM)	▪ Difference of 39,999 MMBtu savings for an overall realization rate of 137%.	▪ The consumption analysis found similar savings per person as in 2023, but the claimed ex-ante savings were lower in 2024 relative to 2023 due to delayed program delivery and fewer reports issued. The delays were due to the transition to a new program implementation contractor.

Portfolio Component	Difference Between Ex-Ante Gross and Ex-Post MMBtu Savings	Summary of Savings Difference
Home Performance Consumption Analysis	▪ The consumption analysis showed significantly fewer savings than claimed, resulting in a program realization rate of 61%.	▪ The consumption analysis relies on modeling techniques that compare electric consumption changes amongst HPwES participants to a comparison group of homes that received only the Home Energy Assessment kit. ▪ Since PSEG Long Island is an electric utility, the consumption analysis is limited to kWh savings, which are predominantly assumed to occur during the summer cooling season. The observed underperformance of the insulation, air sealing, and duct repair measures during the cooling season is applied to the claimed fossil fuel savings in the heating season.
EEP	▪ Difference of 11,730 MMBtu for an overall program realization rate of 107%.	▪ The Linear LED lighting measure category had an 18% realization rate (-5,405 MMBtu) due to the smaller average fixture sizes in 2024 relative to historic product sized used for planning. The weighted average Wattage differential between baseline and efficient fixtures (8W) was only 31% of the planning assumption (26W). ▪ Smart thermostats were by far the largest measure in EEP, and evaluation results drove the program realization rate up (+15,478 MMBtu). The updated heating and cooling energy savings factors used in the ex-post savings calculations were larger than planning assumptions.
Home Comfort Heat Pumps	▪ Difference of 14,389 MMBtu in the non-cold climate heat pump categories drove the overall program realization rate of 113%.	▪ We included beneficial electrification impacts for non-cold climate ASHP installations that replaced fossil fuel heating systems. In contrast, the ex-ante gross savings claims for these units were based on a code-minimum electric ASHP baseline.

Portfolio Component	Difference Between Ex-Ante Gross and Ex-Post MMBtu Savings	Summary of Savings Difference
CEP Comprehensive and Fast Track Lighting	▪ Difference of -31,797 MMBtu for comprehensive lighting (realization rate = 79%) ▪ Difference of -6,829 MMBtu for fast track lighting (realization rate = 81%)	▪ Most of the discrepancies can be attributed to the exclusion of fossil fuel interactive heating penalties in the ex-ante calculations. Since their lighting programs are classified as electric efficiency programs, New York investor-owned utilities (IOUs) report only kWh and kW savings. For 2024, PSEG Long Island chose to claim ex-ante savings consistently with the IOUs. In contrast, the evaluation team incorporated waste heat factors in the ex-post analysis to reflect fossil fuel heating penalties. ▪ In some of the analyzed building types, the assumed operating hours differed from the values specified in the PSEG-LI TRM.
CEP Custom	▪ Difference of -5,133 MMBtu for a realization rate of 90% for the Custom program component	▪ We evaluated a sample of five custom horticultural lighting sites. For two of the sites, the assumed baseline lighting efficiencies were significantly lower than the minimum values required by New York State for legal cultivation of recreational marijuana. Correcting this baseline discrepancy led to a reduction in ex-post savings.

2.1.1 Overview of Impacts by Disadvantaged Community and Low Income Identifiers

Table 4 shows program-level impacts split into four segments: 1) Non-Disadvantaged Community & Non-Low Income, 2) Disadvantaged Community (DAC) Only, 3) Low Income Only, and 4) DAC & Low-Income. Under the CLCPA, New York utilities are required to direct 35-40% of their portfolio benefits to Low Income or DAC identified customers. The method used to identify DAC and Low Income impacts align with the definitions of the two categories outlined by the Climate Justice Working Group (CJWG). DACs are identified geographically by census tract groups that meet criteria outlined by the CJWG. DAC projects are located within the list of DAC Census Tract Groups produced by NYSERDA and the CJWG. Additionally, Low Income is an income-qualified identifier. Any participant with an income that falls at or below 60% of the state-median income counts towards this segment. Specific methodologies for identifying DAC and Low Income customers for each program can be found in the "Overview of Impacts by Disadvantaged Community and Low Income" section of each program chapter in this report. In the 2024 program year, 24% of the portfolio MMBtu savings were allocated to either Low Income customers or customers who lived in Disadvantaged Communities. Additionally, 42% of all rebates and incentives were issued within DACs or to Low Income households. This exceeds the 35% goal established for 2024.

Table 4: Portfolio Impacts by DAC, Low Income, and Market Rate Customers

Energy Efficiency Program	Ex-Post Gross MMBtu				% DAC/ Low Income
	Non-DAC & Non-Low Income	DAC Only	Low Income Only	DAC & Low Income	
Commercial Efficiency Program (CEP)	176,397	52,755	0	0	23%
Multi-Family	22,188	15,016	0	0	40%
Energy Efficiency Products (EEP)	164,793	24,359	168	64	13%
Home Comfort (HC)	122,608	8,082	45,759	5,281	33%
Home Performance	7,708	977	10,020	3,673	66%
Home Energy Management (HEM)	125,280	20,049	0	0	14%
Residential Energy Affordability Program (REAP)	3,030	1,059	6,270	2,543	77%
All Electric Homes	530	0	0	0	0%
Subtotal Commercial	**198,585**	**67,771**	**0**	**0**	**25%**
Subtotal Residential	**423,949**	**54,525**	**62,216**	**11,561**	**23%**
Total Portfolio	**622,534**	**122,296**	**62,216**	**11,561**	**24%**

2.1.2 Non-Energy Metrics

In addition to energy conservation goals, PSEG Long Island set goals related to the uptake of specific technologies and program activity among historically underserved groups. For the 2024 program year, a goal was specifically set for the total number of unique housing units served by whole home heat pumps. This metric includes the installation of Whole House heat pumps through the Home Comfort, Multi-Family and Home Performance Programs. Two additional goals were established related to spending in Disadvantaged Communities (DACs): (1) PSEG Long Island set a goal that 35% of all rebates and incentives go to program participants in DACs and (2) 35% of heat pump rebates and incentives go to program participants in DACs. Table 5 compares the verified values for these metrics with the goals and claimed values. Verified values mirror the claimed values and the goals were exceeded for each metric.

Table 5: Non-Energy Metrics

Metric Description	Goal	Claimed	Verified
Housing Units Served by Whole House Heat Pumps	3,600	4,241	4,240
Total Rebate and Incentive Spending in DACs	35%	43.0%	42.0%
Heat Pump Only Rebate and Incentive Spending in DACs	35%	59.6%	59.7%

2.1.3 Summary of Program Spending

PSEG Long Island spent 100% of their planned program-specific budget in 2024 (Table 6) For EEP, Home Comfort, and AEH, the actual spending exceeded the planned budget. CEP, Multi-Family, HEM, and REAP had lower costs than planned. For EEP and Home Comfort, the additional spending correlates to an increase in impacts over planned impacts. HEM and Multi-Family had the lowest ratio of actual to planned spend, and their ex-post gross savings were both lower than planned savings. Home Performance spent almost exactly as planned but underperformed relative to planning due to a low realization rate on building envelope measures.

Table 6: Energy Efficiency Portfolio Costs (Planned vs. Actual)

Sector	Program	Planned Budget	Actual Spending	Actual/ Planned
Commercial	Commercial Efficiency Program	$32,575,928	$27,844,005	85%
	Multi-Family	$6,525,125	$3,694,888	57%
Residential	Energy Efficiency Products	$9,455,685	$10,220,223	108%
	Home Comfort	$18,395,560	$23,914,345	130%
	Home Performance	$7,684,590	$7,674,610	100%
	Home Energy Management	$3,289,020	$2,441,048	74%
	Residential Energy Affordability Program	$4,171,914	$3,423,593	82%
	All Electric Homes	$503,694	$512,986	102%
Subtotal Commercial		**$39,101,053**	**$31,538,893**	**81%**
Subtotal Residential		**$43,500,464**	**$48,186,805**	**111%**
Advertising and EM&V		N/A	$3,216,297	N/A
Total Energy Efficiency Portfolio		**$82,601,517**	**$82,941,995**	**100%**

2.2 COST-EFFECTIVENESS RESULTS

In New York, the primary metric for screening portfolios for cost-effectiveness is the Societal Cost Test (SCT), which includes benefits accrued to New York as a whole. The SCT perspective enables New York to factor in the avoided costs of all types of energy as well as greenhouse gas impacts. The SCT perspective enables the inclusion of beneficial electrification technologies that increase electricity use but lead to lower energy consumption overall and reduce emissions by shifting energy use from fossil fuels (fuel oil, propane, and natural gas) to electricity. Finally, the SCT considers the full incremental measure costs.[2]

[2] Incremental costs are defined as the efficient measure cost (including labor) minus the equipment and labor costs of any baseline measure(s) that would otherwise have been installed. In the few cases where incentives surpass incremental costs, the incentive cost is included in the Societal Cost Test rather than the incremental measure cost.

Consistent with PSEG Long Island's Benefit-Cost Analysis (BCA) Handbook, we applied the SCT test as the primary method of determining cost-effectiveness. We also ensured that key assumptions including avoided costs, discount rates, and line losses match those used for PSEG Long Island's latest Utility 2.0 filing. All calculated benefits and cost benefit ratios reflect net impacts. Net impacts are the change in energy consumption or demand that results directly from program-related actions taken by customers (both program participants and non-participants) that would not have occurred absent from the program. The difference between the gross and net impacts is the application of the net-to-gross ratio (NTGR). Net impacts presented in this report also include line losses and, therefore, represent the energy and demand savings as would be measured at the generator.

Table 7 presents the benefit-cost results for the portfolio and for each program using the primary Societal Cost Test perspective. The portfolio-level SCT values are 1.53 and 1.46 for Commercial and Residential Energy Efficiency and Beneficial Electrification programs, respectively. The full energy efficiency and beneficial electrification portfolio SCT value is 1.45. A benefit/cost ratio greater than 1.0 indicates that portfolio benefits outweigh costs, and from a societal perspective the Energy Efficiency and Beneficial Electrification Portfolio is cost-effective.

Table 7: Societal Cost Test Results for Energy Efficiency and Beneficial Electrification Portfolio

Sector	Program	NPV Benefits ($1,000)	Costs ($1,000)	B/C Ratio
Commercial	Commercial Efficiency Program	$59,310	$38,255	1.55
	Multi-Family	$9,083	$6,544	1.39
Total Commercial Portfolio		**$68,393**	**$44,800**	**1.53**
Residential	Energy Efficiency Products	$37,400	$13,713	2.73
	Home Comfort	$50,144	$42,777	1.17
	Home Performance	$5,513	$7,050	0.78
	Home Energy Management	$6,142	$2,594	2.37
	Residential Energy Affordability Partnership	$2,917	$3,338	0.87
	All Electric Homes	$201	$794	0.25
Total Residential Portfolio		**$102,317**	**$70,266**	**1.46**
Total Portfolio [1]		***$170,709***	***$117,644***	***1.45***

[1] Portfolio costs include $3.2M of advertising and EM&V that were not allocated to individual programs

The 2024 portfolio was cost effective with an SCT ratio of 1.45. The SCT ratio varies by program, falling below 1.0 for the REAP, Home Performance, and All Electric Homes programs while CEP, Multi-Family, EEP, Home Comfort, and HEM all had SCT ratios above 1.0. The reasons for the change in SCT ratios relative to prior years vary by program. Some key observations are:

- **CEP:** The SCT ratio for CEP is 1.55 in 2024 compared to 1.19 in 2023. SCT results for the CEP are driven substantially by incremental costs which are largely a function of project costs.

The trend away from lighting and toward beneficial electrification implementation measures from 2023 continued in 2024, resulting in a further increase in the SCT. As the CEP measure mix evolves beyond lighting, it will be important to watch the influence of new and expanded program components on the SCT ratio.

- **Multi-Family:** The SCT ratio for Multi-Family is 1.39 in 2024 compared to 1.20 in 2023. Like CEP, the Multi-Family program saw a continued increase in beneficial electrification measures in 2024 compared to 2023. For beneficial electrification measures, it is useful to also consider the results of the RIM tests discussed in detail in Volume I.
- **EEP:** EEP continues to be one of the most cost-effective programs in the portfolio with a SCT ratio of 2.73 in 2024 compared to 2.03 in 2023. There was a mix of changes in the EEP program that could have contributed to the increased cost effectiveness. Relative administrative costs decreased from 2023 to 2024, continuing the trend from the prior year. Almost 70% of the MMBtu savings for the EEP program in 2024 came from smart thermostats, which save both electricity and fossil fuel. Even with an incremental cost of over $200 per device, the smart thermostat measure is highly cost effective.
- **Home Comfort:** The SCT ratio for Home Comfort is 1.17 in 2024 compared to 1.50 in 2023. Acquisition costs were higher in 2024 compared to 2023, reflecting the continued shift towards whole home and LMI installations for both ducted and ductless heat pumps. Whole home heat pumps have a higher incremental cost per unit of savings than partial home installations.
- **REAP:** The SCT ratio for REAP is 0.87 in 2024 compared to 0.58 in 2023. Cost-ineffectiveness is not unusual for income-qualified programs, which typically are not required to be cost-effective. In section Volume I, we discuss additional non-energy impacts that can potentially be incorporated into cost effectiveness analysis as low-income benefits. Acquisition costs for first-year savings decreased meaningfully from $323/MMBtu in 2023 to $258/MMBtu in 2024 which contributed to the improvement in the SCT. Additionally, the realization rate for REAP was much higher for the 2024 program year, continuing the trend from the prior year. A higher realization rate increases the SCT benefits and improves cost effectiveness.
- **Home Performance:** The SCT for Home Performance is 0.78 in 2024 compared to 0.84 in 2023. The ratio has been close to 1 since 2020 but dipped below 1.0 in 2023. The types of measures implemented in Home Performance are long-term, capital-intensive investments in the home, so an SCT ratio around 1 is expected. This includes an increase in heat pump adoption through the program. Additionally, an increased focus on weatherization measures such as insulation upgrades and infiltration reduction has the potential to drive down SCT cost effectiveness as these are traditionally high-cost, lower-impact measures. The Home Performance realization rate was lower in 2024 compared to 2023, continuing the trend

from the prior year. This lowers the resource savings and SCT benefits, driving cost effectiveness down. For beneficial electrification measures, it is useful to also consider the results of the RIM test. For energy efficiency it is useful to consider the results of the UCT tests. Both are discussed further in Volume I.

- **All Electric Homes:** The SCT ratio for AEH is 0.25 in 2024 compared to 0.15 in 2023. The improvement is mostly due to the substantial drop in contractor fees.
- **HEM:** The SCT ratio is 2.37 in 2024, a substantial increase compared to 1.62 in 2023. The cost effectiveness increased relative to 2023 due to a relative increase in the avoided cost of electric energy (LBMP).

Figure 5 shows SCT ratios for each program. Note that the size of markers is proportional to the ex-post MMBtu savings for each program.

Figure 5: Societal Cost Test Ratios by Program

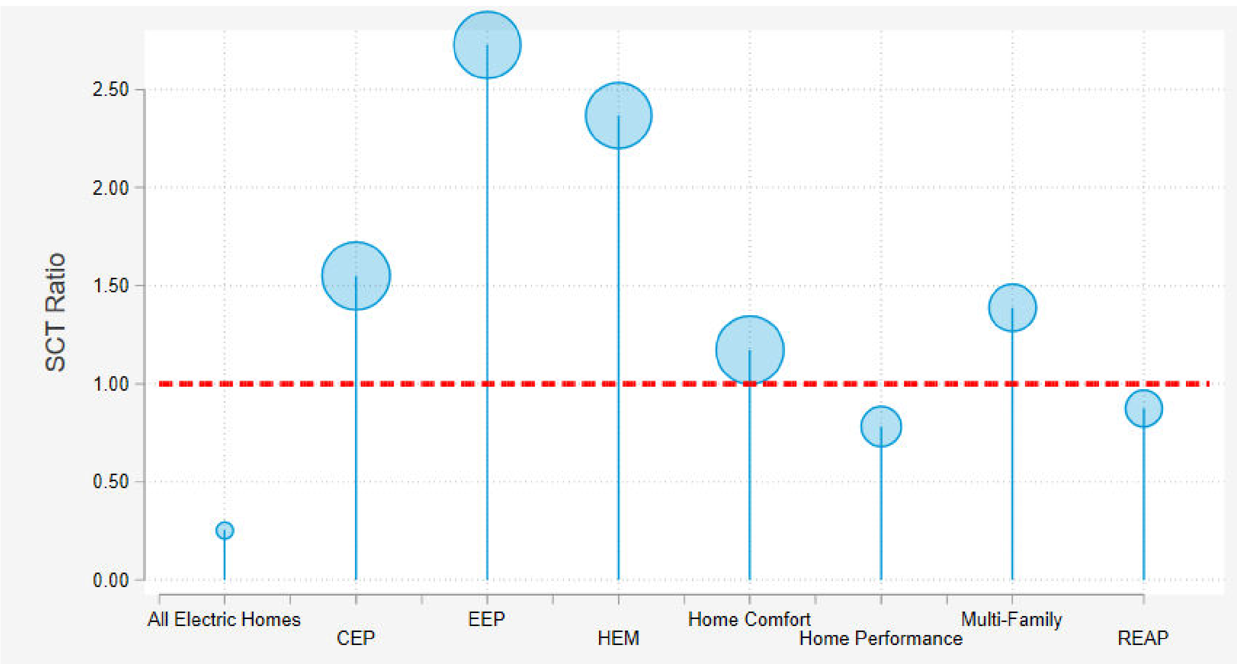
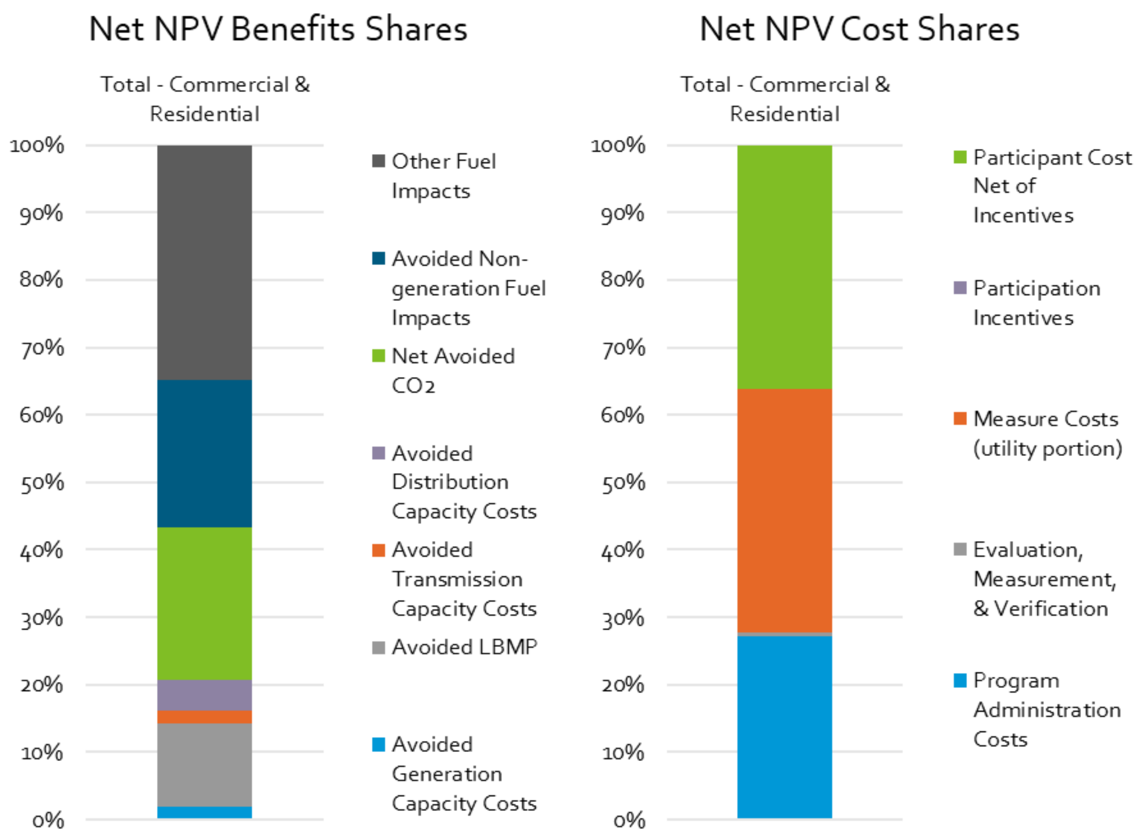


Figure 6 summarizes the benefit and cost categories analyzed and the share each contributed to the SCT. The primary two benefits for the SCT are other fuel impacts at 35% and avoided CO2 emissions at 23% of benefits. The combined benefits for capacity (generation, transmission, distribution) together comprise about 8% of societal benefits. From a societal perspective, the largest two cost categories are the measure costs borne by participants and the measure costs borne by the utility in the form of customer rebates and contractor incentives. Incremental measure costs paid by participants net of incentives account for 36% of the Net NPV Cost and the portion paid by the utility also accounts for 36%. Together these two categories comprise the full incremental cost of program measures over baseline measures. Program administration costs, including utility labor, advertising, and implementation vendor fees, comprise about 27% of societal costs and EM&V accounts for the remaining 1%.

Figure 6: Portfolio Net Present Value Benefit and Cost Shares by Category



3 COMMERCIAL EFFICIENCY PROGRAM

3.1 COMMERCIAL EFFICIENCY PROGRAM DESCRIPTION

PSEG Long Island's Commercial Efficiency Program (CEP) supports non-residential customers in reducing energy consumption by providing rebates and incentives for energy-saving installations. In addition to these rebates, CEP offers Technical Assistance incentives to help cover the costs of engineering and design services for eligible projects. The program promotes a wide range of energy conservation measures across various business sectors, as outlined in Table 8. Additionally, CEP equips participating partners with training, educational resources, and other tools to enhance the overall customer experience.

Table 8: Summary of CEP Measure Catalog

Category and Measure		Description
Lighting	Comprehensive Lighting	CEP continued to offer this performance-based interior lighting program that incentivizes customers and contractors to install the most energy efficient equipment available. Rebates are paid to customers on a $/kWh basis.
Lighting	Fast-Track Lighting	The prescriptive alternative to Comprehensive Lighting allows business customers and their Prime Efficiency Partners (PEPs) to submit streamlined applications for lighting upgrades associated with fixed rebates.
Multi-Family		The Multifamily program was launched in October 2020. At launch, the Multifamily program targeted New Construction Multifamily developments. In 2021, the Multifamily Program expanded to include Existing Building Multifamily properties. The Multifamily program offers rebates for Common Area Lighting (Indoor and Outdoor), Common Area Heating and Cooling, Common Area Pool Equipment, Common Area VFDs, In-Unit Heating and Cooling, and In-Unit Appliances.
HVAC		CEP's HVAC offerings have expanded over time and now include high-efficiency unitary and split-system air conditioners, cold-climate air-source heat pumps, and geothermal heat pumps.
Custom		The Custom program sponsors projects that are not conducive to the prescriptive path, providing business customers with support for complex, interactive, or unique efficiency measures. Variable refrigerant flow (VRF) heat pumps and horticultural lighting were incentivized under the Custom measure category in 2024.
Standard Measures		The Standard category includes commercial measures that do not fall into the above categories and includes refrigeration, compressed air, variable frequency drives (VFDs) non-road electric vehicles and elevator motor-generator retrofits.
Training		Building Operator Certification was a new addition to CEP in 2024. Facility operations staff receive free training on how to identify and address energy waste in the buildings they manage. Savings are claimed on a per square foot basis and savings assumptions vary by industry type.

3.1.1 PROGRAM DESIGN AND IMPLEMENTATION

CEP participation is driven by partnerships with installation contractors, known as Lead Partners, through whom customers can apply directly, even without an installation contractor. Engaging these contractors to implement the program has enhanced both performance and market impact, making Lead Partner relationship management a key program component. Open communication between contractors and the program is actively encouraged and supported by the program.

Since its launch in 2017, the Prime Efficiency Partner (PEP) network has expanded the program's reach, particularly among small businesses, resulting in increased project submissions. To qualify for the Fast Track program and earn the "Prime" designation, contractors must meet specific business criteria, complete required training, and adhere to stringent program standards. The PEP program has also been instrumental in maintaining high customer satisfaction. In 2024, it was further expanded to include all CEP program partners, encompassing HVAC, refrigeration, and compressed air technologies.

3.1.2 PROGRAM PARTICIPATION AND PERFORMANCE

PSEG Long Island's Commercial programs (CEP and Multi-Family) achieved 101% of the 2024 program MMBtu goals, saving 305,393 MMBtu on a verified ex-ante basis. The verified ex-ante total of 309,100 MMBtu shown in Table 9 is 3,783 MMBtu lower than the 2024 Verified Ex-Ante Saving Memo (Appendix D) issued in January 2025 due to exclusion of a large custom project. Section 3.2.1 provides additional details on the excluded project. The actual CEP spend in 2024 was 85% of the planned spend and the actual Multi-Family spend in 2024 was 57% of the planned budget.

Table 9: 2024 CEP and Multi-Family Verified Ex-Ante Gross Program Performance vs. Goals

Metric	MMBtu
Goal	305,393
Verified Ex-Ante Gross Savings	309,100
% of Goal	101%

Comprehensive Lighting projects accounted for the largest share of CEP ex-ante gross energy savings in 2024. As shown in Table 10, Comprehensive Lighting projects accounted for 48% of ex-ante gross MMBtu savings, outpacing Fast Track (12%) and Refrigerated Case Lighting (<1%) measure groups within the lighting category. Custom Measures, which included variable refrigerant flow (VRF) heat pumps and other cooling and refrigeration measures, represented 16% of CEP ex-ante MMBTU savings. Multifamily projects accounted for 12% of CEP ex-ante MMBTU savings, and Refrigeration, Motors & VFDs, Compressed Air, Non-Road Vehicles, Other Commercial Equipment, Building Operator Certification and HVAC collectively accounted for 11% of CEP ex-ante gross MMBtu savings.

Table 10. 2024 CEP Percent of Total Ex-Ante Gross Savings by Program Component

Category	Program Component	Ex-Ante Gross Savings		
		% MMBtu	% MWh	% kW
Lighting	Comprehensive Lighting	47.6%	61.8%	68.0%
	Fast Track Lighting	11.9%	15.4%	7.2%
	Refrigerated Case Lighting	0.3%	0.4%	0.4%
	Lighting Subtotal	**59.8%**	**77.6%**	**75.7%**
Multi-Family	Multi-Family	12.4%	1.0%	0.8%
Standard	Refrigeration	0.9%	1.1%	10.6%
	Motors & VFDs	0.6%	0.8%	0.4%
	Compressed Air	1.0%	1.3%	1.0%
	Nonroad Vehicle Electrification	2.7%	0.0%	-0.1%
	Other Comm. Equipment	0.0%	0.0%	0.1%
	Standard Subtotal	**5.3%**	**3.3%**	**12.0%**
Custom	Custom	16.4%	13.3%	9.1%
HVAC	HVAC	0.5%	0.4%	0.3%
Training	Building Operator Certification	5.5%	4.4%	2.0%
Total		**100%**	**100%**	**100%**

3.2 COMMERCIAL EFFICIENCY PROGRAM IMPACTS

3.2.1 OVERVIEW OF IMPACTS BY RESOURCE TYPE

Table 11, Table 12, and Table 13 compare ex-post gross savings to ex-ante gross savings and show the associated realization rates by program component for MMBtu, MWh, and kW, respectively. An electric submetering project (2024-1933372) was excluded from the Custom category because submeter installation occurred in December 2024 and could not be evaluated without post-installation data to support the claimed savings. We removed the project from the ex-ante and ex-post totals for 2024 and recommend that it be revisited during the 2025 evaluation once TRC can work with the participant to collect performance data for analysis. Realization rates were calculated by dividing ex-post gross savings values by ex-ante gross claimed savings values. Overall, CEP realized 86% of its ex-ante gross MMBtu energy savings claims, 98% of MWh savings claims, and 92% of kW savings claims.

Table 11: 2024 CEP Ex-Post Gross MMBtu Impacts by Program Component

Category	Program Component	N	Ex-Ante Gross Savings (Claimed) MMBtu	Ex-Post Gross Savings MMBtu	Realization Rate %
Lighting	Comprehensive Lighting	863	147,952	116,155	79%
	Fast Track Lighting	681	36,857	30,028	81%
	Refrigerated Case Lighting	12	922	968	105%
	Lighting Subtotal	**1,556**	**185,731**	**147,151**	**79%**
Multi-Family	Multi-Family	53	38,664	37,204	96%
Standard	Refrigeration	6,552	2,677	3,507	131%
	Motors & VFDs	34	2,017	1,737	86%
	Compressed Air	16	3,201	3,201	100%
	Nonroad Vehicle Electrification	581	8,507	8,509	100%
	Other Comm. Equipment	2	73	53	72%
	Standard Subtotal	**7,185**	**16,476**	**17,006**	**103%**
Custom	Custom	273	50,985	45,852	90%
HVAC	HVAC	125	1,701	2,060	121%
Training	Building Operator Certification	26	17,083	17,083	100%
Total		**9,218**	**310,639**	**266,356**	**86%**

Table 12: 2024 CEP Ex-Post Gross MWh Impacts by Program Component

Category	Program Component	N	Ex-Ante Gross Savings (Claimed) MWh[1]	Ex-Post Gross Savings MWh	Realization Rate %
Lighting	Comprehensive Lighting	863	43,362	43,263	100%
	Fast Track Lighting	681	10,802	11,184	104%
	Refrigerated Case Lighting	12	270	284	105%
	Lighting Subtotal	**1,556**	**54,435**	**54,731**	**101%**
Multi-Family	Multi-Family	53	726	496	68%
Standard	Refrigeration	6,552	785	844	108%
	Motors & VFDs	34	591	509	86%
	Compressed Air	16	938	938	100%
	Nonroad Vehicle Electrification	581	0	0	N/A
	Other Comm. Equipment	2	12.9	6.8	53%
	Standard Subtotal	**7,185**	**2,327**	**2,298**	**99%**
Custom	Custom	273	9,365	7,760	83%
HVAC	HVAC	125	250	301	120%
Training	Building Operator Certification	26	3,070	3,070	100%
Total		**9,218**	**70,173**	**68,655**	**98%**

[1] MWh Ex-Ante Gross Savings (Claimed) in table might not match KPI scorecard values. Table values include all Energy Efficiency Savings as well as Beneficial Electrification, while KPI scorecard reports Energy Efficiency Savings only.

Table 13: 2024 CEP Ex-Post Gross kW Impacts by Program Component

Category	Program Component	N	Ex-Ante Gross Savings (Claimed)	Ex-Post Gross Savings	Realization Rate
			kW	kW	%
Lighting	Comprehensive Lighting	863	9,879	10,301	104%
	Fast Track Lighting	681	1,042	1,144	110%
	Refrigerated Case Lighting	12	64	67	105%
	Lighting Subtotal	**1,556**	**10,985**	**11,512**	**105%**
Multi-Family	Multi-Family	53	123	150	122%
Standard	Refrigeration	6,552	1,538	95	6%
	Motors & VFDs	34	51	113	221%
	Compressed Air	16	149	149	100%
	Nonroad Vehicle Electrification	581	(12)	(214)	1860%
	Other Comm. Equipment	2	16	1	9%
	Standard Subtotal	**7,185**	**1,742**	**144**	**8%**
Custom	Custom	273	1,325	1,089	82%
HVAC	HVAC	125	48	121	252%
Training	Building Operator Certification	26	295	295	100%
Total		**9,218**	**14,517**	**13,311**	**92%**

Table 14 shows the breakdown of Energy Efficiency (EE) and Beneficial Electrification (BE) components of MMBtu and kWh savings for measures where BE components exist.

Table 14: Breakdown of Ex-Post Gross Impacts by EE and BE Components

Category	Measure	MWh_{ee}	MWh_{be}	MWh Total (EE - BE)	$MMBtu_{ee}$	$MMBtu_{be}$	MMBtu Total (EE + BE)
Lighting	Comprehensive Lighting	43,263	0	43,263	116,155	0	116,155
	Fast Track Lighting	11,184	0	11,184	30,028	0	30,028
	Refrigerated Case Lighting	284	0	284	968	0	968
	Lighting Subtotal	**54,731**	**0**	**54,731**	**147,151**	**0**	**147,151**
Multi-Family	Multi-Family	496	3,299	(2,803)	11,025	26,179	37,204
Standard	Refrigeration	844	0	844	3,507	0	3,507
	Motors & VFDs	509	0	509	1,737	0	1,737
	Compressed Air	938	0	938	3,201	0	3,201
	Nonroad Vehicle Electrification	0	858	(858)	0	8,509	8,509
	Other Comm. Equipment	7	0	7	53	0	53
	Standard Subtotal	**2,298**	**858**	**1,440**	**8,497**	**8,509**	**17,006**
Custom	Custom	7,760	1,707	6,053	27,716	18,136	45,852
HVAC	HVAC	301	92	209	1,066	995	2,060
Training	Building Operator Certification	3,070	0	3,070	17,083	0	17,083
Total		**68,655**	**5,955**	**62,700**	**212,538**	**53,818**	**266,356**

We estimate that Nonroad Vehicle Electrification and heat pumps in HVAC, Custom, and Multifamily categories contribute to 5,955 MWh/year of additional electrical sales by displacing preexisting fossil fuel fired systems (Beneficial Electrification impacts). The program encouraged customers and contractors to install high-efficiency lighting and other equipment that, when compared with code-compliant or pre-existing electric equipment, led to 68,655 MWh/year of energy savings (Energy Efficiency Impacts). The overall electric consumption therefore decreased by 62,700 MWh. However, accounting for the consumption of displaced fossil fuels in the $MMBtu_{be}$ column, led to 266,356 MMBtu of annual energy savings.

3.2.2 KEY DRIVERS FOR DIFFERENCES IN IMPACTS

Table 15 summarizes the major differences that contributed to the MMBtu realization rates, along with the evaluation team's recommendations to improve savings claims moving forward.

Table 15: Key Contributors to CEP MMBtu RR and Proposed Solutions

Component	Summary of Savings Difference	Recommendation
Comprehensive and Fast Track Lighting	▪ Most of the discrepancies in MMBtu and kWh impacts are due to the exclusion of fossil fuel interactive heating penalties in the ex-ante calculations. The ex-ante approach deliberately excluded fossil fuel interactive effects to maintain alignment with the methodologies used by the investor-owned utilities (IOUs) in New York. Since lighting programs are classified as electric efficiency programs, IOUs report only kWh and kW savings. In contrast, the DSA team incorporated waste heat factors in the ex-post analysis to reflect fossil fuel heating penalties. LED bulbs produce less waste heat compared to inefficient lighting, which increases the heating load during winter months. As a result, heating systems must work harder, leading to increased energy consumption following the measure's installation. ▪ In some of the analyzed building types-specifically auto-related, food stores, office, and retail space types, the assumed operating hours differed from the values specified in the PSEG-LI TRM. While the PSEG-LI TRM has adopted lighting operating hours values from the NYS TRM over the past years, TRC's commercial lighting savings calculation tools have not been consistently updated to align with the NYS TRM across these building types.	▪ If the program intends to continue aligning its lighting savings calculation methodology with that of other New York IOUs—particularly regarding the exclusion of fossil fuel heating penalties—we recommend incorporating an adjustment factor of approximately 20% in cost-effectiveness calculations during the planning phase for indoor lighting applications. This adjustment will help account for the anticipated reduction in ex-post MMBtu impacts observed during evaluation. ▪ Align savings assumptions with PSEG-LI TRM across all building types.

Multifamily Appliances	▪ TRC underreported electric savings (MWh and MW) for 11 multifamily projects which included a total of 303 ENERGY STAR Clothes Washers, 303 ENERGY STAR Refrigerators and 228 ENERGY STAR Dishwashers. MMBtu savings were claimed appropriately from these measures.	▪ Ensure workbook-calculated savings are accurately claimed within the Captures database for all measures.
Multifamily Lighting	▪ Majority of the lighting discrepancies were due to the differences in the unit watts savings assumed by TRC for some of the installed fixture types. ▪ In addition, the fossil fuel heating interactive effects were omitted deliberately as explained earlier by TRC to align with NY IOUs method for claiming savings. These heating penalties were accounted for in the ex-post evaluation.	▪ Align watts saved per fixture with PSEG-LI TRM for all measure codes. ▪ Incorporate an adjustment factor of approximately 20% in cost-effectiveness calculations during the planning phase for indoor lighting applications. This adjustment will help account for the anticipated reduction in ex-post MMBtu impacts observed during evaluation.
Custom Horticultural Lighting	▪ We evaluated a sample of five custom horticultural lighting sites. For three of the five sites, the baseline Photosynthetic Photon Efficacy (PPE) values used in the ex-ante calculations were appropriate. However, for the remaining two sites, the assumed baseline PPEs were significantly lower than the minimum PPE values required by New York State for legal cultivation of recreational marijuana. Correcting this baseline discrepancy led to a reduction in ex-post kW, kWh, and MMBtu savings.	▪ Align baseline PPEs in ex-ante calculations to 2026 PSEG Long Island TRM and New York State TRM v12 based on appropriate facility types and cultivation tiers.
Refrigeration	▪ Ex-Ante kW savings for six Refrigerator Case Door measures were 100x overstated which resulted in a kW realization rate of 6%.	▪ Explore automated detection of savings values that are outside of a plausible range based on kWh/kW or MMBtu/kW ratios.
Non-Road Vehicle Electrification	▪ Ex-ante kW increases for Electric Golf Carts were omitted from Captures tracking data. This resulted in 1860% kW realization rate for this measure category.	▪ Ensure workbook saving calculations include kW impacts regardless of direction (e.g. positive or negative savings)

3.2.3 Overview of Impacts by Disadvantaged Community and Low Income Identifiers

Table 16 shows the commercial program (CEP and Multi-Family Combined) ex-post impacts subdivided into four categories: 1) Non-Disadvantaged Community (DAC) & Non-Low Income, 2) DAC Only, 3) Low Income Only, and 4) DAC and Low Income. For the Multi-Family program, we adopted a conservative interpretation of New York DPS CE-12 guidance regarding Disadvantaged Community Investment and Benefit Reporting.[3] The CE-12 guidance states that "*For programs focused on affordable housing, occurring outside of designated census tracks, where the percentage of low-income recipients is unknown, a factor of 40% should be applied to attribute expenditures and benefits to low-income.*" Since the PSEG Long Island Multi-Family is not specifically designed to target affordable housing complexes, we elected not to apply this 40% factor. Presumably, some fraction of the occupants has incomes at or below 60% of the state-median income so the true share of low-income MMBtu savings within CEP is non-zero. A more detailed definition of each category can be found in the Introduction, Section 2.1.1. Overall, 25% of MMBtu impacts from the CEP and Multi-Family programs count towards the DAC and Low Income standards. Given the emphasis on LMI programming in New York, we recommend PSEG Long Island work with LIPA and DPS to define "affordable housing" and have TRC add an affordable housing indicator variable to the Captures system for Multi-Family projects.

Table 16: Ex-Post Impacts with DAC and Low Income Breakouts

Category	Ex-Post Gross Savings (MMBtu)	% of Ex-Post MMBtu
Non-DAC & Non-Low Income	198,585	75%
DAC Only	67,771	25%
Low Income Only	0	0%
DAC & Low Income	0	0%
Total	**266,356**	**100%**

3.3 CONCLUSIONS AND RECOMMENDATIONS

Table 17 presents our key findings and recommendations for the commercial programs based on the results of this evaluation. In most cases, our recommendations apply to the 2026 program year. Planning for 2025 was finalized a year ago, and program delivery is almost half complete. These types of changes are often the most efficient to implement at the beginning of a new program year. Most of our recommendations are also reflected in the recently completed 2026 PSEG Long Island TRM.

[3] CLCPA-Disadvantaged Communities Investment and Benefits Reporting Guidance. CE-12. Weblink

Table 17: Commercial Efficiency Findings and Recommendations

Finding	Recommendation
▪ CEP's non-lighting measures have become increasingly prominent, while prescriptive lighting's share of savings has gradually decreased year by year. Prescriptive lighting accounted for 60% of ex-post gross MMBtu savings in 2024, down from 63% in 2023.	▪ PSEG Long Island should continue to expand its program offerings beyond lighting to offset the declining share of program savings attributed to lighting. This could be achieved by focusing on non-lighting segments, such as refrigeration and HVAC, as well as lighting controls, for which the market is rapidly evolving. The Building Operator Certification Program is an example of a new, non-lighting measure that was introduced in 2024 and accounted for 6% of ex-post MMBtu savings.
▪ For select measures, important project-level details are excluded from Captures tracking data. As a result, we could not conduct measure-level engineering analysis of the population of projects but rather relied on desk reviews among a sample of comprehensive lighting measures.	▪ No updates needed for lighting. Existing fixture quantities and wattages have been added as fields in Captures for comprehensive lighting. ▪ Add motor horsepower for the Compressed Air and Motors & VFD program components. ▪ Add existing tons for the HVAC program component. ▪ Add evaporator fan motor horsepower for the Refrigeration program component.
▪ Some FastTrack lighting applications were missing building type information in the calculation workbook. As a result, the evaluator had to rely on the building type information of the parent project, as found in captures. For these applications, the savings calculations in the workbook also used the parent project's building type, as a proxy due to missing building type information.	▪ CEP administrators should ensure that applications are complete with actual building type information captured in the workbook as this is the basis for lighting operating hours within the savings analysis. This would allow evaluators to accurately analyze the savings based on the actual building type's hours of operation.
▪ Lighting interactive effects (fossil fuel heating penalties) were intentionally excluded from ex-ante savings estimates to align with NY IOUs' reporting practices. However, these effects are included in ex-post evaluations, leading to a consistent reduction in the evaluated savings.	▪ We recommend applying a conservative adjustment of a 20% reduction in cost-effectiveness calculations during planning for lighting measures.

Finding	Recommendation
▪ An electric submetering project (2024-1933372) was excluded from the Custom category because project installation occurred in December 2024, and there was no post-installation data to support the claimed savings.	▪ Include the project in the 2025 evaluation after data can be collected for analysis. Consider staged incentive payments for projects with pending data requirements to ensure participants have a financial incentive to cooperate with ongoing measurement and verification activities.
▪ Baseline PPEs were significantly lower than the state licensing requirements documented in the New York State Technical Resource Manual for a sample of cannabis facilities.	▪ Align baseline PPEs in ex-ante calculations to 2026 PSEG Long Island TRM and New York State TRM v12 based on appropriate facility types and cultivation Tier level.
▪ The level of rigor used to calculate ex-ante savings in the Custom category varied widely and appeared unrelated to incentive size or savings amount.	▪ Data collection and analysis standards should be established that align the level or rigor and data collection with incentive size or project savings. ▪ The evaluation team should be consulted on the M&V plan or the content of the Technical Approach Documents for all projects with savings that exceed 2,500 MMBtu savings or projected incentive over $200,000.

4 ENERGY EFFICIENCY PRODUCTS PROGRAM

4.1 ENERGY EFFICIENCY PRODUCTS PROGRAM DESCRIPTION

The following sections detail the program design, implementation strategies, and PY2024 participation and performance for the Energy Efficiency Products (EEP) program.

4.1.1 PROGRAM DESIGN AND IMPLEMENTATION

The objective of EEP is to increase the purchase and use of energy efficient appliances and lighting among PSEG Long Island residential customers. The program provides rebates or incentives for smart thermostats and other products that meet the energy efficiency standards set by the Environmental Protection Agency (EPA) and the Department of Energy (DOE). The highest impact measures in the EEP program for 2024 were Wi-Fi connected thermostats and heat pump pool heaters. Smaller measures include linear LED fixtures, and ENERGY STAR appliances such as dehumidifiers, air purifiers, and heat pump water heaters (HPWH). Between PY2023 and PY2024, battery-powered lawn equipment and appliance recycling measures were discontinued from the EEP program.

TRC is responsible for the overall delivery of EEP and manages the rebated components of the program. Subcontractor EFI manages the retail and online marketplace components of EEP.

4.1.2 PROGRAM PARTICIPATION AND PERFORMANCE

The EEP program achieved 116% of 2024 program MMBtu goals, saving 177,610 MMBtu on a verified ex-ante basis. Eighty-eight percent of EEP verified ex-ante savings are attributable to two measure categories: smart thermostats (65%), and heat pump pool heaters (23%). Table 18 shows 2024 EEP program performance compared to goals.

Table 18: EEP Verified Ex-Ante Gross Program Performance vs. Goals

Metric	MMBtu
Goal	153,269
Verified Ex-Ante Gross Savings	177,610
% of Goal	116%

In 2024, the EEP program incentivized nearly 123,000 energy efficient products to PSEG Long Island residential customers. PSEG Long Island rebated 76,224 linear LED fixtures, 21,643 smart thermostats, 1,406 heat pump pool heaters, and 21,696 other appliances in 2024.

Table 19 summarizes participation for each program measure compared to the planning goal.

Table 19. 2024 EEP Program Participation vs. Goals, by Measure

Measure	Number of Units (Actual)	Planned Units (Goal)	Percentage of Goal Achieved
EEP Advanced Power Strip Tier 1	1,195	1,600	75%
EEP Advanced Power Strip Tier 2	9	300	3%
EEP ES Dehumidifier	13,607	13,000	105%
EEP ES Room Air Purifiers (<150 CADR)	3,001	2,000	150%
EEP ES Room Air Purifiers (>150 CADR)	2,048	1,800	114%
EEP Connected Thermostats	12,559	8,000	157%
EEP Learning Thermostats	9,084	6,000	151%
ES Linear Fixture	76,224	120,000	64%
EEP Redeemed Recycling Voucher	3	-	-
EEP Clothes Dryer - Electric Resistance	1,362	2,500	54%
EEP Clothes Dryer - Most Efficient	49	60	82%
EEP ME Clothes Washer	1,902	2,300	83%
Heat Pump Pool Heater	1,406	1,200	117%
EEP Heat Pump Water Heater - Small	128	300	43%
EEP Heat Pump Water Heater - Large	119	200	60%
Solar Pool Covers	2	-	-
EEP Tankless Water Heater < 12 kW	3	-	-
EEP Tankless Water Heater >=12 kW	1	-	-
Total	**122,702**	**159,260**	**77%**

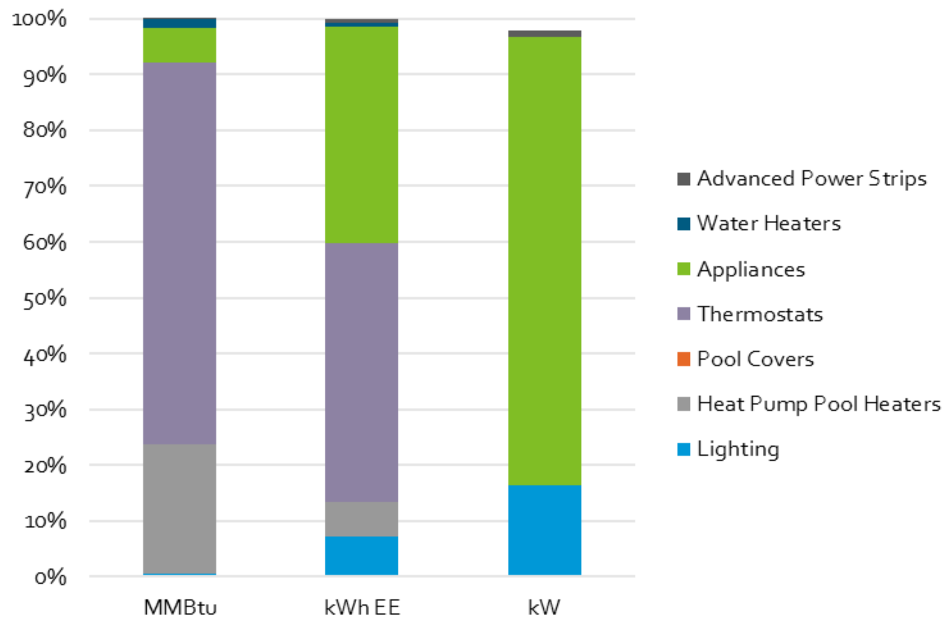
Table 20 compares quantities for 2023-2024 by measure category. The quantity of lighting rebates fell by 97% as standard and specialty lighting was phased out of EEP in mid-year 2023. Linear LED fixtures are the only remaining lighting type eligible for EEP rebates. The quantity of thermostat rebates grew by 24% relative to 2023, heat pump pool heaters by 1%, water heaters by 7%, and appliances by 10%.

Table 20: 2023-2024 Quantity Comparison, by Measure Category

Measure Category	2023 Units	2024 Units	Percentage Change
Lighting	2,692,978	76,224	-97%
Heat Pump Pool Heaters	1,393	1,406	1%
Pool Covers	45	2	-96%
Thermostats	17,408	21,643	24%
Appliances	20,024	21,969	10%
Recycling	1,560	3	-100%
Water Heaters	235	251	7%
Lawn Equipment	72	-	-100%
Advanced Power Strips	1,798	1,204	-33%
Total	**2,735,513**	**122,702**	**-96%**

Figure 7 shows the distribution of ex-ante gross energy and demand savings across the EEP program. The PSEG Long Island does not assume any summer peak demand savings from connected thermostats, but these devices may enroll in the Smart Savers demand response program[4] and deliver dispatchable peak load reductions via direct load control. For a comparison of MMBtu savings between 2023 and 2024, see Figure 9.

Figure 7: 2024 EEP Program Ex-Ante Gross Savings by Resource and Measure Category



4.2 ENERGY EFFICIENCY PRODUCTS PROGRAM IMPACTS

The following sections provide the results of the impact analysis for the EEP program.

4.2.1 OVERVIEW OF IMPACTS BY RESOURCE TYPE

Table 21 shows ex-ante and ex-post gross MMBtu impacts and realization rates by measure category. Table 22 and Table 23 show the equivalent impacts for MWh and kW.

[4] PSEG Long Island's 2024 Dynamic Load Management Report provides additional details on the Smart Savers program and its achievements during summer 2024. Weblink

Table 21: 2024 EEP MMBtu Impacts by Measure Category

Measure Category	Ex-Ante Gross Savings (Claimed)	Ex-Post Gross Savings	Realization Rate
	MMBtu	MMBtu	%
Lighting	6,590	1,185	18.0%
Heat Pump Pool Heaters	41,440	43,711	105.5%
Pool Covers	6	6	99.6%
Thermostats	114,740	129,578	112.9%
Appliances	12,243	11,863	96.9%
Water Heaters	2,396	2,801	116.9%
Advanced Power Strips	239	239	100.0%
Total	**177,654**	**189,384**	**106.6%**

Table 22: 2024 EEP MWh Impacts by Measure Category

Measure Category	Ex-Ante Gross Savings (Claimed[1])	Ex-Post Gross Savings	Realization Rate
	MWh	MWh	%
Lighting	1,881	606	32.2%
Heat Pump Pool Heaters	1,808	(1,478)	-81.7%
Pool Covers	2	2	99.6%
Thermostats	3,576	4,062	113.6%
Appliances	3,031	2,944	97.1%
Water Heaters	(128)	(132)	113.6%
Advanced Power Strips	70	70	100.0%
Total	**10,240**	**6,074**	**59.3%**

[1] MWh Ex-Ante Gross Savings (Claimed) in table might not match KPI scorecard values. Table values include all Energy Efficiency Savings as well as Beneficial Electrification, while KPI scorecard reports Energy Efficiency Savings only.

Table 23: 2024 EEP kW Impacts by Measure Category

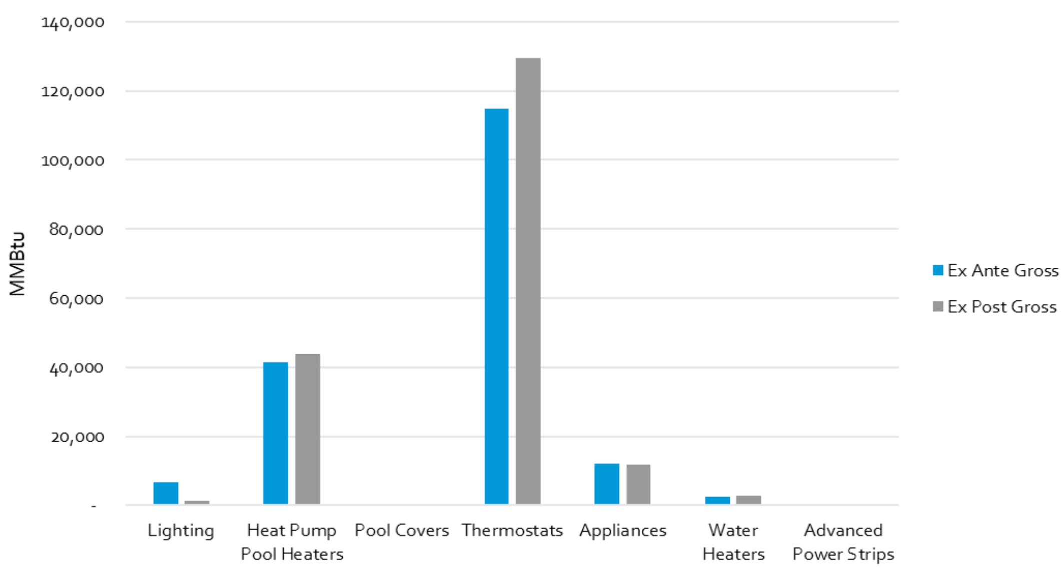
Measure Category	Ex-Ante Gross Savings (Claimed)	Ex-Post Gross Savings	Realization Rate
	kW	kW	%
Lighting	343	109	31.8%
Heat Pump Pool Heaters	-	-	
Pool Covers	-	-	
Thermostats	-	-	
Appliances	719	533	74.1%
Water Heaters	(14)	(14)	98.5%
Advanced Power Strips	8	8	100.0%
Total	**1,056**	**636**	**60.0%**

4.2.1.1 Ex-Post Findings

The overall EEP program MMBtu realization rate, calculated as the ratio of ex-post gross savings to ex-ante gross savings, is 106.6%. The overall program level variance between the claimed and ex-post gross MMBtu (the MMBtu variance) nets out to 11,730 MMBtu more than reported. More detail on the cause of variance for each measure is included in the following section.

Figure 8 compares ex-ante gross and ex-post gross MMBtu savings by measure category.

Figure 8: EEP Ex-Ante Gross and Ex-Post Gross MMBtu Savings by Measure Category

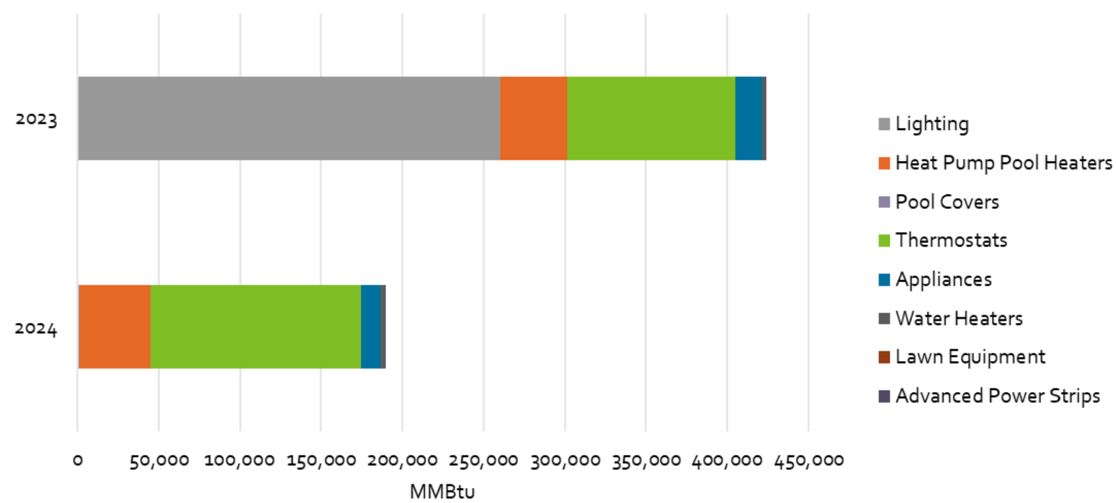


Overall, 11 out of 18 EEP measures have MMBtu realization rates of greater than or equal to 100%, and 6 measures have realization rates of less than 100% (one measure—Recycling Vouchers—claims no savings). The highest measure-level realization rate in EEP is for Most Efficient Clothes Dryers (172%), and the lowest is for Linear LED Fixtures (18%). The biggest positive ex-post gross MMBtu variance is for Connected Thermostats, which exceeds ex-ante values by 14,839 MMBtu. The biggest negative ex-post gross variance is in Linear LED Fixtures, where ex-post savings fell short of ex-ante by 5,405 MMBtu.

4.2.1.2 Comparison to 2023

EEP MMBtu savings decreased by 55% from 2023 to 2024 as lighting savings dropped by more than 99 percent. The biggest MMBtu savings increase is in thermostats (25%), following 44% growth in thermostat MMBtu from 2022-2023. Figure 9 shows how ex-post gross EEP MMBtu savings changed from 2023 to 2024.

Figure 9: EEP MMBtu Impacts by Measure Category, 2023 and 2024 (ex-post gross)



4.2.1.3 Beneficial Electrification Impacts

Table 24 shows the breakdown of Energy Efficiency (EE) and Beneficial Electrification (BE) MMBtu and kWh for measures where a BE component exists. The clothes dryer, water heater, and heat pump pool heater measures include a mixture of electric efficiency and beneficial electrification impacts.

Table 24: Breakdown of Ex-Post Gross MMBtu Per-Unit Impacts by EE and BE Components

Measure	$MMBtu_{ee}$	$MMBtu_{be}$	$MMBtu_{total}$	kWh_{ee}	kWh_{be}	ΔkWh
EEP-300 EEP Clothes Dryer - Electric Resistance	0.07	0.14	0.21	21.59	202.62	(181.03)
EEP-310 EEP Clothes Dryer - Most Efficient	0.56	0.38	0.94	163.38	75.74	87.64
EEP-600 EEP Heat Pump Water Heater - Small	1.20	11.84	13.05	352.67	733.90	(381.22)
EEP-610 EEP Heat Pump Water Heater - Large	0.33	9.01	9.34	95.94	714.29	(618.34)
EEP-655 EEP Tankless Water Heater >=12 kW	(0.75)	2.46	1.70	(220.39)	2,453.90	(2,674.29)
EEP-720 EEP Heat Pump Pool Heater	1.24	29.85	31.09	364.12	1,415.08	(1,050.96)

4.2.2 Overview of Impacts by Disadvantaged Community and Low Income Identifiers

Table 25 shows the EEP program ex-post impacts subdivided into four categories: 1) Non-Disadvantaged Community (DAC) & Non-Low Income, 2) DAC Only, 3) Low Income Only, and 4) DAC & Low-Income. A more detailed definition of each category can be found in the Section 2.1.1. Overall, 13% of EEP MMBtu impacts count towards the DAC and Low Income target, mostly from connected thermostat rebates.

Table 25: Ex-Post Impacts with DAC and Low Income Breakouts

Category	Ex-Post Gross Savings (MMBtu)	% of Ex-Post MMBtu
Non-DAC & Non-Low Income	164,793	87.0%
DAC Only	24,359	12.9%
Low Income Only	168	0.1%
DAC & Low Income	64	0.0%
Total	**189,384**	**100%**

4.2.3 Key Drivers for Differences in Impacts

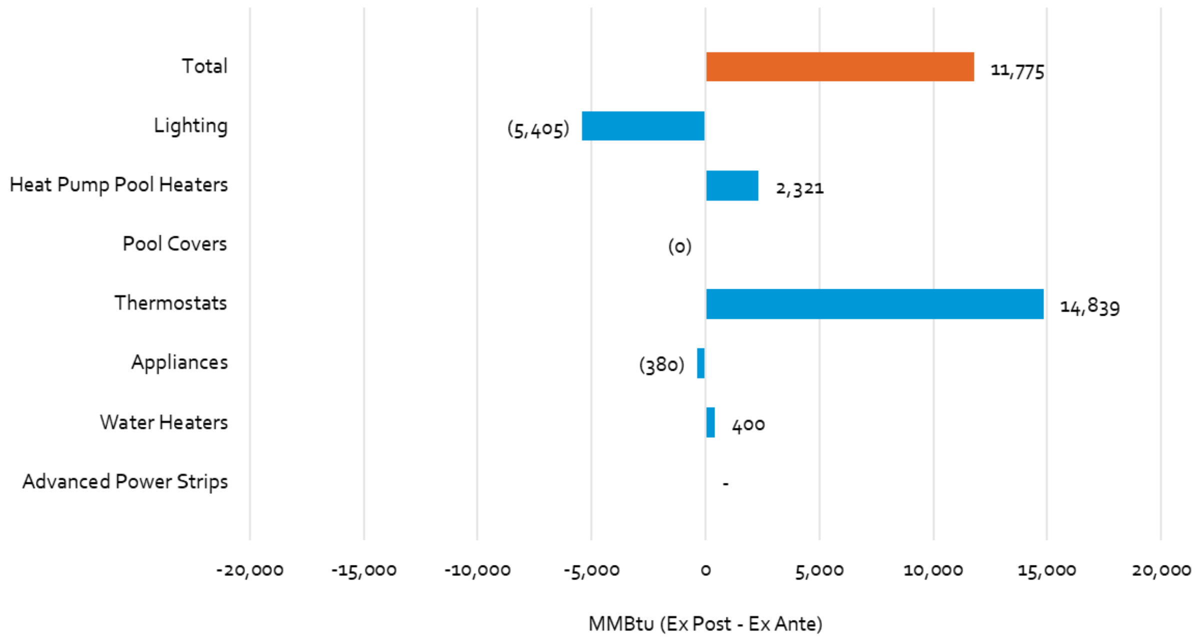
This section describes key drivers of the overall gross realization rates, with an emphasis on MMBtu savings. Most variance between ex-ante gross and ex-post gross savings is due to one or more of the following evaluation activities:

- **Refinement to savings algorithm inputs based on an improved source or revised assumption.** The single largest driver of differences in impacts for EEP is the increase in connected and learning thermostat savings factors that took effect in the 2025 PSEG Long Island TRM to better align with the ENERGY STAR standard and NYS TRM. The Thermostat section to follow contains more detail. For air purifiers and heat pump pool heaters, baseline assumptions were updated, as described in the measure-specific sections below.

- **Use of equipment characteristics from units installed during 2024 to inform and refine per-unit savings assumptions.** For example, by mapping fixture model numbers from about 95% of the Linear LED Fixtures rebated in PY2024 to actual wattages, and using the lumen output of those fixtures to estimate baseline wattage, we discovered that the average linear fixture incentivized during 2024 was much smaller than in prior years, which led to a variance with the planning assumption. The wattage reduction from baseline to efficient fixture was about 81% lower than the 2024 planning value, resulting in a MMBtu realization rate for Linear LED Fixtures of 18%. In this case the variance over the past few years will lead to a structural change to the Linear LED measure in the PSEG Long Island TRM, where the measure will be split into size tiers starting in 2026.
- **Errors in reported per-unit impacts.** Reporting discrepancies were nearly nonexistent in 2024, with only one notable issue where the in-service rate of 97% was applied twice to the kWh savings claims for Linear LED Fixtures.
- **Carryover planning assumptions from prior years.** While carryover planning assumptions are not present for most measures, about 350 clothes dryers and 80 heat pump water heaters (36% of small HPWHs) were reported using 2023 planning values. Carryover between program years is unavoidable as projects started in one year close in the next year, and these projects are granted the legacy planning values for purposes of verified ex-ante savings. For ex-post savings, carryover results in realization rate variance if planning values have changed between years. One heat pump pool heater and two heat pump water heaters used 2022 planning assumptions (two-year carryover), and for heat pump pool heaters specifically, there was a big change in per-unit kWh savings between 2022 and 2023. In the end, carryover quantities are small enough that the impact is marginal for 2024 verified savings.

The sub-sections below summarize the key drivers in order of measure contribution to the overall EEP MMBtu realization rates. The measure categories detailed in this section (Thermostats, Lighting, and Heat Pump Pool Heaters) account for nearly all the overall EEP MMBtu variance.

Figure 10: MMBtu Variance by Measure Category (Ex-Post Gross Minus Ex-Ante Gross)



4.2.3.1 Thermostats

Table 26: EEP Thermostat Category MMBtu Savings Summary

Measure Code	Measure	Qty	Ex-Ante MMBtu	Ex-Post MMBtu	MMBtu RR	% of EEP Ex-Post MMBtu
EEP-1415	Connected Thermostat	12,559	62,882	71,503	114%	38%
EEP-1420	Learning Thermostat	9,084	51,857	58,075	112%	31%
Thermostats Total		**21,643**	**114,740**	**129,578**	**113%**	**68%**

Smart Thermostats accounted for 68% of EEP ex-post gross MMBtu savings in 2024. Realization rates are 113% for MMBtu and kWh. Zero kW are claimed. Table 27 shows key contributors to Thermostat variance.

Table 27: Key Contributors to RR Variance and Recommendations: Thermostats

Component	Summary of Contributing Factors	Recommendations
Smart Thermostats	▪ **Heating and Cooling Energy Savings Factors:** These factors were updated starting with the 2025 PSEG-LI TRM to reflect that ENERGY STAR qualified thermostats, on which the PSEG-LI *Connected* Thermostat measure is based, save 10% of cooling load and 8% of heating annually per the ENERGY STAR specification and NYS TRM. The *Learning* Thermostat measure is assumed to save 1% more as it actively adapts to household HVAC preferences. The result is an increase of 1% for both the heating and cooling savings factors relative to the planning value for both thermostat measures. ▪ **Output Heating Capacity for Heat Pumps:** Updated to align with the average capacity from 2024 Home Comfort installations.	▪ Continue to use the most recent PSEG-LI TRM savings assumptions for thermostat planning values.

4.2.3.2 Lighting

Table 28: EEP Lighting Category MMBtu Savings Summary

Measure Code	Measure	Qty	Ex-Ante MMBtu	Ex-Post MMBtu	MMBtu RR	% of EEP Ex-Post MMBtu
EEP-2200	ES Linear Fixture	76,224	6,590	1,185	18%	1%

In July 2023, screw-based lighting was phased out of the EEP program. In April 2022, the US Department of Energy released its final rulemaking regarding the Energy Independence and Security Act (EISA) backstop provision. This standard established a baseline efficiency requirement of 45 lumens per Watt for most categories of general service light bulbs (A-lamps, reflectors, globes, candelabra) and effectively prohibits the sale of non-LED lamps. This federal standard change significantly reduced the remaining lighting opportunity, and the EEP Lighting category includes a single measure for 2024: linear LED fixtures. The gross realization rate is 18% for MMBtu savings, 32% for kWh savings, and 32% for kW. Table 29 lists the key drivers of differences between ex-ante gross and ex-post gross impacts for EEP lighting.

In 2024 there was a notable transition toward smaller linear LED fixtures rebated through EEP relative to 2023. In 2024 the 2-foot 14W shop lite pictured below—which saves 0.02 MMBtu/unit and has a delta wattage (baseline fixture wattage – efficient fixture wattage) of 6 W—accounted for more than half of all fixtures. More than 37,000 of these specific fixtures were rebated in 2024. The average wattage differential of Linear LED fixtures in 2024 was about 8 W, while the planning assumption based on units rebated by EEP in previous years was 26 W.

Figure 11: 14W Shoplite, Most Prevalent Linear LED Fixture in EEP During 2024

In 2023, for instance, while the same 2-foot 14W Shoplite fixture was the quantity leader in EEP, larger fixtures were more common, and the overall average delta wattage of Linear LED fixtures was nearly 44 Watts. The 2026 PSEG-LI TRM introduces two size tiers for planning, aimed at reducing the realization rate variability for Linear LEDs. The tiers use a 2,000 Lumen threshold to distinguish between small and large fixtures.

Table 29: Key Contributors to Lighting RR Variance and Recommendations

Component	Summary of Contributing Factors	Recommendations
ES Linear Fixture	▪ **Wattage:** Due to the smaller average fixture size in 2024 relative to the previously installed actuals used for planning, delta wattage between baseline and efficient fixtures (8 W) was only 31% of the planning assumption (26 W). ▪ **Reporting Issue:** The 97% in-service rate was applied twice to kWh savings.	▪ Use the size tiers included in 2026 TRM for claiming linear LED savings. This should result in smaller realization rate variance due to actual installed wattages.

4.2.3.3 Heat Pump Pool Heaters

Table 30: EEP Heat Pump Pool Heater Category MMBtu Savings Summary

Measure Code	Measure	Qty	Ex-Ante MMBtu	Ex-Post MMBtu	MMBtu RR	% of EEP Ex-Post MMBtu
EEP-720	Heat Pump Pool Heater	1,406	41,440	43,711	106%	23%

Heat Pump Pool Heaters accounted for 23% of EEP ex-post gross MMBtu savings in 2024. HPPH realization rates are 106% for MMBtu and 16% for MWh. Demand (kW) savings are assumed to be zero because we assume limited pool heating is required on the system peak day.

Realization rate variance for heat pump pool heaters is primarily due to an update to the fractions of fuel-fired and electric baseline heaters after evaluation team conversations with six pool equipment contractors on Long Island. After hearing that electric resistance pool heaters are exceedingly uncommon for new non-heat pump installations, the portion of fuel-fired heaters assumed for the baseline condition increased from the previous assumption of 74% to 95%. This results in a decrease in MWh savings for this measure, but an overall increase in MMBtu savings, as most MMBtu savings from HPPHs are due to the avoided fuel usage from a fossil fuel-powered unit. Offsetting this increase is slightly lower than planned average heat pump coefficient of performance (COP) for actual installations, nudging savings downward.

Table 31 Key Contributors to RR Variance and Recommendations: Heat Pump Pool Heaters

Component	Summary of Contributing Factors	Recommendations
Heat Pump Pool Heaters	▪ **Coefficient of Performance (COP) actual:** Actual efficient COP (5.89) is 99% of assumed planning value. ▪ **Fuel-fired and electric resistance baseline heater fractions:** Updated to reflect conversations with Long Island pool equipment contractors.	▪ Continue to use the most recent PSEG-LI TRM savings assumptions for HPPH planning values.

4.2.3.4 Appliances

Combined Appliance category realization rates are 96% for MMBtu, 96% for kWh and 73% for kW.

Table 32: EEP Appliance Category MMBtu Savings Summary

Measure Code	Measure	Qty	Ex-Ante MMBtu	Ex-Post MMBtu	MMBtu RR	% of EEP Ex-Post MMBtu
EEP-500	EEP ES Dehumidifier	3,607	5,377	5,348	99%	3%
EEP-120	EEP ES Room Air Purifiers (<150)	3,001	1,511	1,793	119%	1%
EEP-125	EEP ES Room Air Purifiers (>150)	2,048	3,336	2,915	87%	2%
EEP-300	EEP Clothes Dryer - Electric Resist.	1,362	329	292	89%	0%
EEP-310	EEP Clothes Dryer - Most Efficient	49	27	46	172%	0%
EEP-400	EEP ME Clothes Washer	1,902	1,663	1,469	88%	1%
Appliances Total		**21,969**	**12,243**	**11,863**	**97%**	**6%**

In 2024, Dehumidifiers were the largest contributor to Appliance savings, accounting for 45% of verified Appliance MMBtu and 3% of overall EEP MMBtu. The Dehumidifier MMBtu realization rate is 99% for PY2024, compared to 51% for PY2023. Realization rate variance is caused by slight differences in actual product efficiency (L/kWh) and capacity (pints/day) specifications compared to planning assumptions. For kW savings, the Dehumidifier coincidence factor dropped from 0.56 to 0.37 in v12 of the NYS TRM and this change was adopted in this evaluation and the 2026 PSEG Long Island TRM.

Table 33 Key Contributors to RR Variance and Recommendations: Appliances

Component	Summary of Contributing Factors	Recommendations
Air Purifier	Efficiency and Clean Air Delivery Rate (CADR) of actual installs are slightly higher than planning values; efficient standby power of actuals is slightly lower than planning values.	▪ **Continue to revise planning assumptions** on an ongoing basis to align with the PSEG-LI TRM.
Clothes Dryer	There was a shift toward larger (>= 4.4 cubic feet) units with slightly lower efficiency ratings (CEF) than assumed during planning	
Clothes Washer	Slight revisions to washer equipment specs based on actual installations. 100% of washers are front-load, and 99% are > 2.5 cubic ft.	▪ **Assume all washers are front-load for planning purposes**

Component	Summary of Contributing Factors	Recommendations
Dehumidifier	Slight differences in actual product efficiency (L/kWh) and capacity (pints/day) specifications compared to planning assumptions.	▪ **Require model numbers or ENERGY STAR ID in reporting for all units.** Despite continued improvement for dehumidifiers compared to prior years, 250 units (2%) reported no model numbers or valid ENERGY STAR ID.

4.2.3.5 Water Heaters

Table 34: EEP Water Heater Category MMBtu Savings Summary

Measure Code	Measure	Qty	Ex-Ante MMBtu	Ex-Post MMBtu	MMBtu RR	% of EEP Ex-Post MMBtu
EEP-600	EEP Heat Pump Water Heater – Sm.	128	1,504	1,670	111%	1%
EEP-610	EEP Heat Pump Water Heater – Lg.	119	875	1,112	127%	1%
EEP-650	EEP Tankless Water Heater < 12 kW	3	16	18	108%	0%
EEP-655	EEP Tankless Water Heater >=12 kW	1	2	2	108%	0%
Water Heaters Total		**251**	**2,396**	**2,801**	**117%**	**1%**

Combined Water Heater realization rates across Heat Pump and Tankless measures are 117% for MMBtu, 103% for kWh, and 99% for kW. Water heaters combine for 1% of EEP savings in 2024. Model numbers from Captures were cross-referenced with the ENERGY STAR qualified product list to use the rated uniform energy factor (UEF) and draw pattern for each efficient unit. For heat pump water heaters, baseline UEFs are based on federal standards for storage water heaters that use baseline fuel type, first hour rating, and draw pattern to ultimately calculate UEF based on an intercept value and a slope coefficient on tank volume. This is an incremental improvement over prior year savings estimates that relied on average tank volume and draw pattern assumptions. Figure 12 shows the Baseline UEF algorithms and coefficients for electric storage water heaters from code of federal regulations as documented in the NYS TRM version 12. A similar table exists for gas-fired storage water heaters and was used for the assumed fraction of HPWH assumed to replace fossil fuel systems.

Figure 12: Baseline Efficiencies from which Electric Savings are Calculated

Product Class	Rated Storage Volume and Input Rating	Draw Pattern	$UEF_{baseline}$
Electric Storage Water Heater	≥ 20 gal and ≤ 55 gal	Very Small	0.8808 - (0.0008 x v_r)
		Low	0.9254 - (0.0003 x v_r)
		Medium	0.9307 - (0.0002 x v_r)
		High	0.9349 - (0.0001 x v_r)
	> 55 gal and ≤ 120 gal	Very Small	1.9236 - (0.0011 x v_r)
		Low	2.0440 - (0.0011 x v_r)
		Medium	2.1171 - (0.0011 x v_r)
		High	2.2418 - (0.0011 x v_r)

Table 35: Key Contributors to RR Variance and Recommendations: Water Heaters

Component	Summary of Contributing Factors	Recommendations
Water Heaters	▪ Uniform energy factors of actual installations are slightly higher than planning assumption. ▪ Gallons per day (GPD) assumption in TRM was updated since planning.	▪ Continue to use the latest version of the PSEG-LI TRM for planning values.

4.2.3.6 Other EEP Measures

Advanced Power Strips (quantity 1,204) and Solar Pool Covers (quantity 2) contributed 0.13% of verified ex-post MMBtu savings for EEP in 2024. Realization rates for Advanced Power Strips are 100% for MMBtu, kWh, and kW. Realization rates for Pool Covers are 99.6% for MMBtu and kWh, and no kW impacts were claimed.

Table 36: Other EEP Measures MMBtu Savings Summary

Measure Code	Measure	Qty	Ex-Ante MMBtu	Ex-Post MMBtu	MMBtu RR	% of EEP Ex-Post MMBtu
EEP-200	EEP Advanced Power Strip Tier 1	1,195	234	234	100%	0%
EEP-210	EEP Advanced Power Strip Tier 2	9	5	5	100%	0%
EEP-750	Solar Pool Covers	2	6	6	100%	0%

Table 37: Key Contributors to RR Variance and Recommendations: Other EEP Measures

Component	Summary of Contributing Factors	Recommendations
Advanced Power Strips	▪ 100% RR	▪ Continue to use the latest version of the PSEG-LI TRM for planning values.
Solar Pool Covers	▪ Savings for both units were claimed using 2023 carryover planning assumptions	▪ Continue to use the latest version of the PSEG-LI TRM for planning values.

5 HOME COMFORT PROGRAM

PSEG Long Island's Home Comfort Residential Heating and Cooling Program offers rebates to residential customers for purchasing and installing energy-efficient heat pumps. These heat pumps are typically two to three times more efficient than traditional fossil fuel heating. The Home Comfort program aligns with New York State's Climate Leadership and Community Protection Act (CLCPA) and the Governor's goal to electrify 2 million homes by 2030. Each year, the Home Comfort Program has evolved to support the state's aggressive greenhouse gas (GHG) reduction targets, including an 85% emissions reduction by 2050. Administered by PSEG Long Island, the program promotes ENERGY STAR-certified ducted split cold climate air-source heat pumps (ccASHP), ductless mini-split and multi-split heat pumps (DMHP), and ground-source heat pumps (GSHP). By displacing fossil fuels and decarbonizing residences, the program plays a key role in advancing clean energy adoption. In 2024, the Home Comfort Program facilitated the installation of 6,847 heat pumps, including 6,614 ducted and ductless air-source heat pumps (ASHP), 155 geothermal heat pumps (GSHP), 77 heat pump water heaters (HPWH) and one air-to-water heat pump.

5.1 HOME COMFORT PROGRAM DESIGN AND PARTICIPATION

The following sections detail the program design, implementation strategies, and PY2024's participation and performance for the Home Comfort program.

5.1.1 Program Design and Implementation

The Home Comfort Program provides rebates to both market-rate and income-eligible customers, along with contractor incentives for heating and cooling system upgrades. Enhanced low-income rebates are available to all income-qualified participants. While weatherization measures are encouraged alongside heat pump installations, they are processed through the Home Performance Program to ensure a comprehensive whole-home approach.

Program participation is largely driven by partnerships with installation contractors, known as Home Comfort Participating Contractors. Engaging these contractors has enhanced program performance and market impact by ensuring Quality Installation Verification (QIV) of HVAC systems. This includes proper equipment sizing, refrigerant charge correction, and airflow testing. Home Comfort partners play a key role in promoting program benefits and have strengthened the ASHP market by adhering to PSEG Long Island's QIV standards. All whole-house heat pumps[5] in 2024 required QIV installation.

5.1.2 Notable Changes in 2024

In 2024, the Residential Home Comfort Program began incentivizing only whole-house ccASHPs with QIV and discontinued rebates for partial-house installations with QIV. A whole-house system is

[5] A whole-house heat pump system is sized and installed to provide between 90% and 120% of the design heating load per Manual J calculations.

designed and sized to meet the full heating and cooling load of the home. While the ccASHP system must serve as the primary heating source, integrated controls are permitted for customers who choose to retain their existing fossil fuel system as a secondary heat source.

In April 2024, Whole House Air-to-Water Heat Pumps were introduced to the program. Unlike traditional systems, these pumps distribute heat through hydronic or hot water systems instead of forcing conditioned air through ductwork. Rebates are available for both market-rate and income-eligible customers, following the same structure as cold-climate ASHP incentives.

5.1.3 Program Participation and Performance

Based on verified ex-ante estimates, the Home Comfort program reached 153% of its energy savings goal in 2024. Table 38 presents 2024 Home Comfort programs verified ex-ante gross MMBtu savings compared to goal.

Table 38: Home Comfort Program Verified Ex-Ante Gross MMBtu Savings versus Goals

Metric	MMBtu
Goal	107,678
Verified Ex-Ante Gross Savings	164,552
% of Goal	153%

Table 39 presents Home Comfort measure installations from 2021 through 2024. The installation of ductless & ducted ASHPs through the Home Comfort program continued to be a high contributor to the overall Home Comfort portfolio in 2024, consistent with PSEG Long Island MMBtu-based savings goals and New York State Clean Heat initiatives. The program started incentivizing Whole House Air-to-Water Heat Pump installations in 2024.

Table 39: Comparison of Home Comfort Program Measures Installed – 2021 to 2024

Measure	2021	2022	2023	2024	Percent Difference 2023 to 2024
Ducted ASHPs	985	1,192	2,171	2,071	-5%
Ductless ASHPs	2,917	2,564	3,853	4,543	+18%
GSHP	146	201	152	155	+2%
HPWH	11	65	121	77	-36%
Smart Thermostats	68	84	60	14	-77%
Air-to-water heat pumps	0	0	0	1	N/A
Central AC Tune Up	0	0	0	1	N/A
Tankless Water Heaters	0	0	0	2	N/A
Total	**4,127**	**4,106**	**6,357**	**6,864**	**+8%**

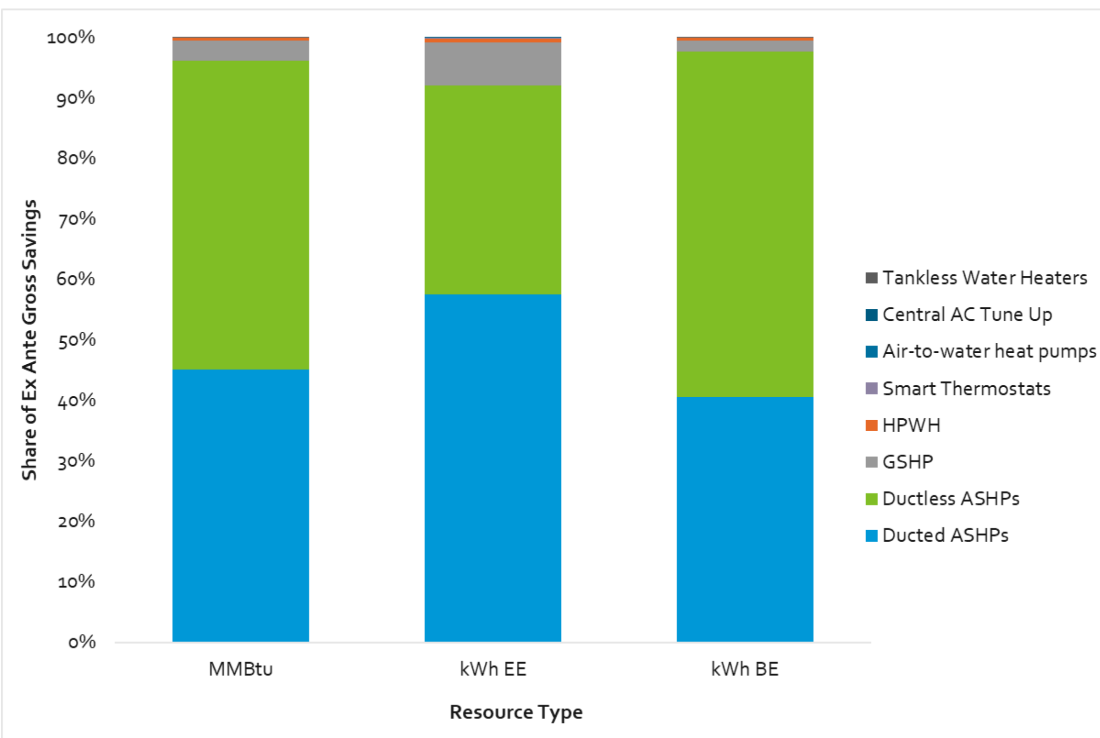
Figure 13 shows the distribution of ex-ante gross energy savings across the Home Comfort program. Ducted and ductless heat pumps accounted for a combined 96% of the ex-ante gross MMBtu savings in 2024. These installations also resulted in beneficial electrification impacts for which a baseline heating load supplied by a fossil fuel source was displaced by the incented heat pump. When planning for the 2024 program year, TRC identified the cooling and heating baseline scenarios for heat pump installations shown in Table 40. The evaluation team reviewed and agreed with these baseline assumptions during the program planning phase and have therefore incorporated them in the calculation of ex-post impacts.

Table 40: Cooling and Heating Baseline Scenarios for Heat Pump Installations

#	Scenario	% of Installs in 2024	Preexisting Cooling Equipment	Preexisting Heating Equipment	Cooling Baseline	Heating Baseline
1	New Construction	1.5%	N/A	N/A	Code Compliant HP	Code compliant fossil fuel furnace
2	Retrofit	92.9%	AC or Heat Pump	Fossil Fuel	Preexisting AC or HP	Preexisting fossil fuel furnace/boiler
3	Retrofit	5.6%	AC or Heat Pump	Electric Resistance or Heat Pump	Preexisting AC or HP	Preexisting electric heating system

Beneficial electrification measures increase electricity consumption, resulting in negative kWh impacts, but reduce total energy consumption (MMBtu) and emissions from the displacement of fossil fuels. Scenarios 1 and 2 above result in beneficial electrification impacts, shown as kWh BE in Figure 13. The electric savings resulting from the installation of more efficient electric heating and cooling equipment are shown as kWh EE.

Figure 13: Home Comfort Program Ex-ante Gross Impacts by Resource and Measure Category



Evaluators identified that the kW impacts for ASHP systems were very low and driven by lower installed EER2 ratings compared to the baseline EER2 specified in the NYS TRM for most cold-climate ductless mini- and multi-split heat pumps installed in 2024. Table 41 shows the distribution of ex-ante gross summer peak demand impacts across the Home Comfort program.

Table 41: Home Comfort Program Ex-ante Gross Peak Demand Impacts

Measure	Ducted ASHPs	Ductless ASHPs	GSHP	HPWH
Ex-ante Summer Peak kW	-29	-54	141	-4

5.2 HOME COMFORT IMPACTS

The following sections provide the results of the impact analysis for the Home Comfort program.

5.2.1 Overview of Impacts by Resource Type

Table 42 shows ex-post gross MMBtu impacts by measure category. Table 43 and Table 44 show the ex-post MWh and kW impacts, respectively. Realization rates are calculated by dividing ex-post gross savings values by ex-ante gross savings values. Overall, the Home Comfort program realized 110% of its ex-ante gross MMBtu energy savings claims, 101% of MWh impacts claims, and 525% of kW savings claims. Note that the overall gross MWh impacts are negative for the Home Comfort program due to significant increase in site-level electric consumption from beneficial electrification measures (e.g., heat pumps). We expand on the impacts of beneficial electrification for Home Comfort measures in Section 5.2.1.1.

Table 42: 2024 Home Comfort Program Ex-Post Gross MMBtu Impacts

Measure	N	Ex-Ante Gross Savings (Claimed)	Ex-Post Gross Savings	Realization Rate
		MMBtu	MMBtu	%
Ductless ccASHPs	3,374	81,345	84,780	104%
Ducted ccASHPs	1,828	73,654	73,010	99%
Non-cc Ducted and Ductless ASHPs	1,412	3,076	17,465	568%
GSHP	155	5,501	5,505	100%
Smart Thermostats	14	35	30	83%
HPWH and Tankless Water Heaters	79	749	749	100%
CAC Tune-up	1	0	0	100%
Air-Water Heat Pump	1	54	54	100%
Project Adjustments	6	137	137	100%
Totals	**6,870**	**164,552**	**181,730**	**110%**

Note: Totals may not sum due to rounding.

Table 43: 2024 Home Comfort Program Ex-Post Gross MWh Impacts

Measure	N	Ex-Ante Gross Savings[1] (MWh)	Ex-Post Gross Savings[1] (MWh)	Realization Rate (MWh)
Ductless ccASHPs	3,374	-10,466	-8,272	79%
Ducted ccASHPs	1,828	-6,083	-6,347	104%
Non-cc Ducted and Ductless ASHPs	1,412	902	-1,187	-132%
GSHP	155	-118	-131	111%
Smart Thermostats	14	6	9	142%
HPWH and Tankless Water Heaters	79	-43	-43	100%
CAC Tune-up	1	0	0	100%
Air-Water Heat Pump	1	-11	-11	100%
Project Adjustments	6	2	2	100%
Totals	**6,870**	**-15,812**	**-15,981**	**101%**

Note: Totals may not sum due to rounding

[1] MWh impacts include both energy efficiency (EE) and beneficial electrification (BE) components. MWh impacts are negative for heat pump and water heater measures due to the displacement of preexisting fossil fuel heating with electricity. The forthcoming section separates the EE and BE components for all measure groups and further explains the reasons for negative impacts.

Table 44: 2024 Home Comfort Program Ex-Post Gross kW Impacts

Measure	N	Ex-Ante Gross Savings (kW)	Ex-Post Gross Savings (kW)[1]	Realization Rate (kW)
Ductless ccASHPs	3,374	-21	116	-551%
Ducted ccASHPs	1,828	16	102	640%
Non-cc Ducted and Ductless ASHPs	1,412	-78	-72	93%
GSHP	155	141	125	88%
Smart Thermostats	14	0	0	N/A
HPWH and Tankless Water Heaters	79	-4	-4	100%
CAC Tune-up	1	0	0	100%
Air-Water Heat Pump	1	0	0	100%
Project Adjustments	6	-4	-4	100%
Totals	**6,870**	**50**	**262**	**525%**

Note: Totals may not sum due to rounding.

[1] kW impacts are negative for some ASHPs since EER ratings for most installed units were lower than code minimum EER from NYS TRM. kW impacts are negative for heat pump water heater measures due to the displacement of preexisting fossil fuel heating with electricity.

5.2.1.1 Beneficial Electrification Impacts

Table 45 shows the breakdown of Energy Efficiency (EE) and Beneficial Electrification (BE) components of MMBtu and kWh savings for measures where a BE component exists. The ductless mini splits and ducted ASHPs, GSHP, and HPWH measures include a mixture of electric energy efficiency and beneficial electrification impacts.

Table 45: Breakdown of Ex-Post Gross Impacts by EE and BE Components

Measure	MWh_{ee}	MWh_{be}	MWh Total (EE - BE)	$MMBtu_{ee}$	$MMBtu_{be}$	MMBtu Total (EE + BE)
Ductless ccASHPs	449	8,721	-8,272	1,533	83,247	84,780
Ducted ccASHPs	1,656	8,003	-6,347	5,650	67,361	73,010
Non-cc Ducted and Ductless ASHPs	709	1,896	-1,187	2,419	15,046	17,465
GSHP	215	346	-131	707	4,797	5,505
HPWH and Tankless Water Heaters	16	59	-43	54	696	749
Total	**3,045**	**19,025**	**-15,980**	**10,363**	**171,146**	**181,509**

We estimate that 2024 program-supported heat pump and water heater measures added 19,025 MWh/year of additional electrical sales by displacing preexisting fossil fuel-fired systems. The program incented customers and contractors to install high-efficiency heat pumps and water heaters that, when compared with code-compliant or pre-existing electric equipment, led to 3,045 MWh/year of energy savings. The overall electric consumption therefore increased by 15,980 MWh. However, accounting for the consumption of displaced fossil fuels in the $MMBtu_{be}$ column, Home Comfort heat pumps led to 181,509 MMBtu of annual energy savings.

5.2.2 Overview of Impacts by Disadvantaged Community and Low-Income Identifiers

Table 46 shows the Home Comfort program ex-post impacts subdivided into four categories: 1) Non-Disadvantaged Community (DAC) & Non-Low Income, 2) DAC Only, 3) Low Income Only, and 4) DAC & Low-Income. A more detailed definition of each category can be found in the Introduction, Section 2.1.1. Overall, 32% of Home Comfort MMBtu impacts count towards the DAC and Low-Income standards. For Home Comfort, the Low-Income impacts were identified by the 'LMI-ASHP' tag added to the program field in the data. DAC impacts were identified utilizing project locations and the DAC census tract list provided by NYSERDA.

Table 46: Ex-Post Impacts with DAC and Low-Income Breakouts

Category	Ex-Post Gross Savings (MMBtu)	% of Ex-Post MMBtu
Non-DAC & Non-Low Income	122,608	67%
DAC Only	8,082	4%
Low Income Only	45,759	25%
DAC & Low Income	5,281	3%
Total	**181,730**	**100%**

5.2.3 KEY DRIVERS FOR DIFFERENCES IN IMPACTS

We conducted a measure-level savings approach to calculate the total PY2024 ex-post gross impacts for ductless ASHP, ducted ASHPs, GSHP, and Smart Thermostats. We assigned a 100% realization rate for gross impacts for HPWH, tankless water heaters, air-to-water heat pump and CAC tune up measures, due to their negligible contribution to the Home Comfort population impacts. Most measure-specific discrepancies between ex-ante and ex-post gross savings are due to differences in program and evaluation savings algorithms and assumptions, including, but not limited to, baseline efficiencies and full load operating hours of equipment. Like in the past three years, there was an increased emphasis on electrification of fossil fuel systems in 2024, for the purpose of meeting decarbonization goals. This resulted in an overall increase of electric equipment load on the grid due to the displacement of fossil fuel heating loads by heat pumps.

The U.S. Department of Energy (DOE) implemented new energy efficiency standards for residential and commercial air conditioners and heat pumps, effective January 1, 2023. These federal regulations supersede state and local codes, ensuring uniform compliance nationwide. The updated efficiency metrics (EER2, SEER2, HSPF2) and testing procedures apply to all units manufactured after this date. For the PY2024 Home Comfort evaluation, baseline and installed efficiencies were evaluated using EER2, SEER2, and HSPF2 ratings.

PSEG Long Island significantly revised the Whole House Cold Climate Air Source Heat Pump worksheet for the 2024 Home Comfort Application, integrating the Northeast Energy Efficiency Partnerships (NEEP) heat pump list. This reduced Home Comforts Partner inputs by 12 and enabled a more streamlined estimation of ex-ante gross impacts. While most ASHP ex-ante gross impacts were calculated using the 2024 worksheet, some carryover applications under Home Comfort relied on the 2022 and 2023 worksheets. These older worksheets used historical efficiency ratings (EER, SEER, HSPF) to estimate kW, MWh, and overall MMBtu impacts resulting in discrepancies for all impact metrics compared to evaluation.

The primary reason for the increase in evaluated MMBtu and MWh impacts compared to ex-ante estimates was the inclusion of beneficial electrification impacts for all non-cold climate ASHP installations that replaced fossil fuel heating systems. In contrast, the ex-ante gross impact analysis was deliberately conservative and did not account for these beneficial electrification effects. Instead, the ex-ante gross analysis assumed a code-minimum heat pump as the heating baseline for these measures. The evaluation team estimated these impacts by leveraging data from Captures, including the existing heating system's fuel type, equipment type, and Annual Fuel Utilization Efficiency (AFUE).

Overall, the evaluators calculated a small positive summer peak demand impacts for ducted and ductless cold-climate mini- and multi-split heat pumps, while the program claimed a small negative value for these units (see Table 44). **Baseline EER2 standards in the 2024 NYS TRM were overstated** due to outdated conversion equations from DOE, Building America House Simulation Protocols, which was dated October 2010. For the evaluation, we aligned baseline efficiencies and efficiency adjustment coefficients with the forthcoming V13 of the NYS TRM (effective January 1, 2026).

Below we describe the reasons for differences between gross ex-ante savings and ex-post savings for each measure.

Table 47: Key Contributors to Home Comfort Realization Rates and Recommended Adjustments

Component	Summary of Contributing Factors	Recommendation
Non-cold climate ASHP installations (non-QIV)	▪ We included beneficial electrification impacts for all non-cold climate ASHP installations that replaced fossil fuel heating systems. In contrast, the ex-ante gross impact analysis did not account for these beneficial electrification effects where applicable.	▪ **Claim beneficial electrification impacts for all applicable heat pump installation scenarios**. Based on data collected from the site, calculate and track beneficial electrification impacts from equipment-only ducted and ductless ASHPs, where a fossil fuel heating load is being displaced.
All Heat Pumps under Home Comfort	▪ Twelve percent of heat pumps incentivized in 2024 under Home Comfort utilized carryover calculation workbooks from 2022 and 2023 to estimate ex-ante impacts. While we calculated the energy impacts and realization rates using the new DOE efficiency metrics EER2/SEER2/HSPF2 for these units, TRC used historic metrics of EER/SEER/HSPF in their calculations for these carryover applications.	▪ **No updates necessary.** TRC has already incorporated the new DOE efficiency ratings into the savings algorithms in their 2024 workbooks and tracks these ratings as separate fields in Captures.
Cold-climate Ducted and Ductless ASHPs	▪ The New York State Joint Utilities has released an updated measure draft for ccASHPs, incorporating the latest EER2, SEER2, and HSPF2 standards into its algorithms and impact factor coefficients. Specifically, the coefficients—a and b for COP adjustments and c and d for SEER adjustments—have been revised to reflect the new DOE efficiency metrics. Approved by the Joint Utilities in Q1 2025, these updates were used in the evaluation of Home Comfort measures for the 2024 program year. However, the ex-ante gross impacts, which were calculated using the 2022–2024 worksheets, relied on older TRM factor versions, resulting in discrepancies in kWh and MMBtu savings compared to the evaluation results.	▪ **Align the control scenarios and impact factor coefficients for ccASHPs with the upcoming draft of the 2026 NYS TRM.** The Home Comfort workbooks must be updated with these new factors as soon as the revised NYS TRM measure draft becomes publicly available.

Component	Summary of Contributing Factors	Recommendation
Smart Thermostats	▪ Eight of the fourteen smart thermostats incentivized under the Home Comfort program in 2024 relied on carryover planning assumptions and algorithms from 2023, which based the Equivalent Full Load Hours (EFLHs) from the NYS TRM v9 recommendations. The NOAA's updated climate normals for 1991–2020 were incorporated into NYS TRM v10, resulting in lower estimated cooling and heating EFLHs in the TRM.	▪ **Align the full load heating and cooling hours with 2026 PSEG-LI TRM.** The 2026 PSEG-LI TRM recommendations align with values provided for residential units in 2025 NYS TRM.

6 HOME PERFORMANCE PROGRAM

PSEG Long Island's Home Performance program has two components: Home Energy Assessments (HEAs) and Home Performance with ENERGY STAR (HPwES). The primary objective of the Home Performance program is to make high efficiency choices part of the decision-making process for PSEG Long Island customers when upgrading their home. The overall goal of the Home Performance with ENERGY STAR programs is to reduce the carbon footprint of customers who utilize electricity, oil, or propane as a primary heating source. To achieve this goal, the HPwES component encourages customers to consider high efficiency options when updating their home's envelope or heating systems. Home Energy Assessments (HEAs) are free energy audits offered to certain single-family homeowners. Participants in the HEA component are encouraged to pursue rebates through the HPwES component.

6.1 HOME PERFORMANCE PROGRAM DESIGN AND PARTICIPATION

6.1.1 Program Design and Implementation

The Home Performance portfolio offers customer rebates and contractor incentives for heating and cooling system upgrades, weatherization, and building shell upgrades like insulation, air sealing, and duct sealing. Certain minimum efficiency requirements must be met to receive Home Performance incentives, and all projects must be pre-approved by the program team contractor. Home Performance offerings are available to all single-family homes in PSEG Long Island, including both market-rate and Low-Moderate Income (LMI) demographics.

As part of the HPwES Program, Home Energy Assessments (HEA) are free energy audits available to any single-family homeowner in PSEG Long Island service territory. The program is administered by TRC and involves a qualified contractor conducting a Home Energy Assessment to make the homeowner aware of energy savings opportunities. In addition to the assessment, TRC mails a "Thank You" Kit that contains a Tier 1 Smart Power strip to each HEA participant.

6.1.2 Program Participation and Performance

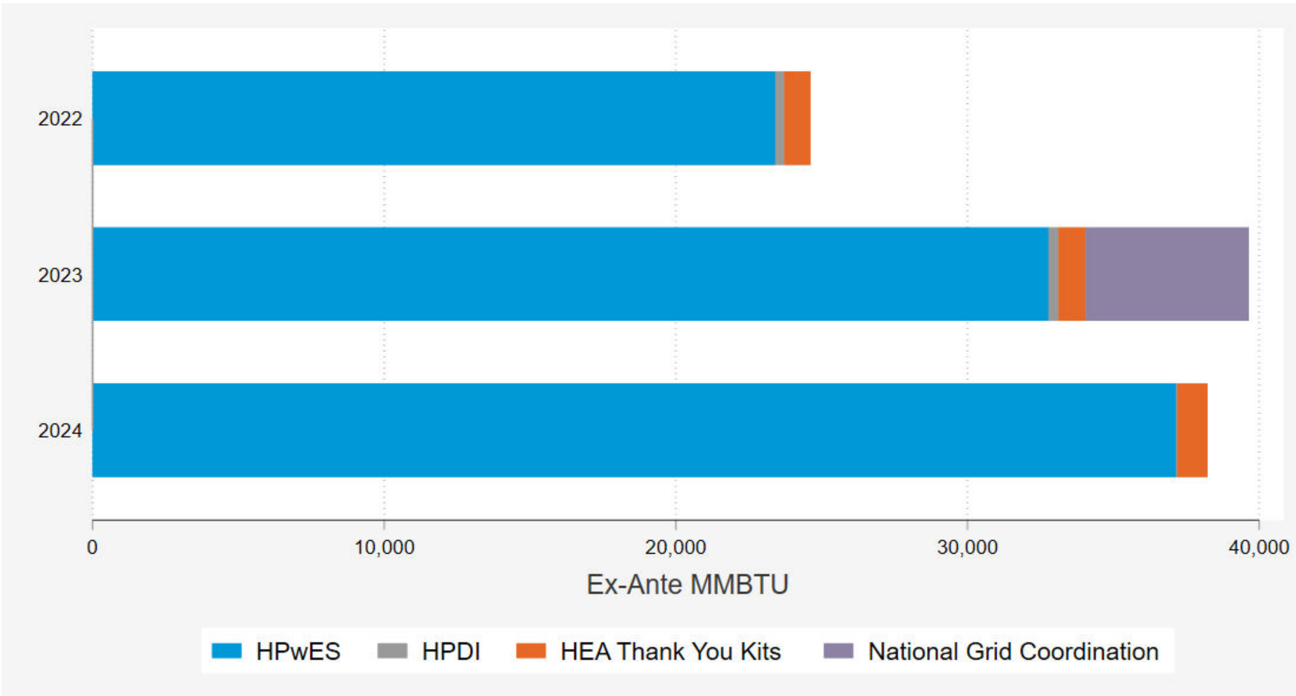
Based on verified ex-ante estimates, the Home Performance program reached 104.5% of its energy savings goal in 2024. Table 48 presents 2024 Home Performance programs verified ex-ante gross MMBtu savings compared to goal.

Table 48: Home Performance Programs Verified Ex-Ante Gross MMBtu Savings versus Goals

Metric	MMBtu
Goal	35,014
Verified Ex-Ante Savings	36,593
% of Goal	104.5%

Figure 14 shows the claimed MMBtu savings by Home Performance program component for the last three years. The program included fewer components for 2024 as the HPDI component was closed and there was no active coordination with National Grid in 2024.

Figure 14: Ex-Ante MMBtu Savings by Program Component and Year



In 2024 the HPwES program treated 906 customers. The HEA program delivered thank you kits to 5,597 customers. Of the HEA recipients, 617 customers also participated in the HPwES program. Overall, 5,269 unique customers were treated by the Home Performance programs in 2024. These counts include the 301 HPwES customers who installed beneficial electrification measures. Relative to 2023, the Home Performance program had increased HPwES participation, with 906 participants in 2024 compared to 683 in 2023. The program achieved fewer savings per customer in 2024. Despite the increase in HPwES participation, the decrease in heat pump and envelope projects led to a decreased MMBtu savings per home.

6.2 HOME PERFORMANCE PROGRAMS IMPACTS

The following sections provide the results of the impact analysis for the Home Performance program.

6.2.1 Overview of Impacts by Resource Type

For the ex-post evaluation, we used both engineering and consumption analysis to estimate savings for the Home Performance programs in 2024. To calculate ex-post gross MWh savings due to energy efficiency (EE MWh savings), we applied the consumption analysis realization rate (19%) to the ex-ante gross EE savings. To calculate the ex-post gross MWh impacts due to beneficial electrification measures, we utilized results from engineering analysis. To calculate ex-post gross demand and MMBtu savings for EE measures, we used a kW/MWh and MMBtu/MWh ratio respectively developed from the engineering analysis and applied to the ex-post gross energy savings.

The combined consumption and engineering analyses found that the programs generated approximately 22,377 MMBtu in ex-post gross energy savings for 2024, or approximately 61.2% of the ex-ante gross MMBtu savings. Table 49 shows ex-ante gross impacts, ex-post gross impacts, and the realization rate by resource (MMBtu, MWh, and kW) category.

Table 49: 2024 Home Performance Program Ex-Post Impacts

Resource	Ex-Ante Gross Savings	Ex-Post Gross Savings	Realization Rate
MMBtu	36,592	22,377	61.2%
MWh	(531)	(955)	179.8%
kW	408	125	30.6%

6.2.2 Analysis Approach and Detailed Results

Our ex-post gross savings estimates are anchored in the analysis of daily kWh from the meter and supplemented by engineering calculations to estimate total MMBtu conservation and peak demand savings. We use engineering analysis to calculate MMBtu to kWh and kW to kWh ratios at the measure level and utilize these ratios to estimate ex-post gross MMBtu and kW impacts. In addition, because engineering analysis provides savings at the measure level, we gain insights into the relative savings contributions of the measures offered by the programs. Finally, these measure-level savings allow us to make recommendations to the implementation team for adjusting ex-ante planning assumptions going forward.

6.2.2.1 Consumption Analysis – Approach

The Home Performance program has historically relied on a consumption analysis approach that is the industry standard for measuring electric savings from weatherization improvements. However, the program's current shift in strategic focus and measurement metrics poses new challenges that question the suitability of the consumption analysis.

- **Shift in performance metrics.** The program's emphasis has shifted towards beneficial electrification (BE) and significant fossil fuel savings, which are not detectable through electric meter readings alone. This transition means that a substantial portion of the program's energy savings, particularly those from fossil fuels, which constitute nearly three-quarters of the total claimed savings, are not being captured in the analysis.

- **Increased adoption of heat pumps.** The increased promotion and adoption of heat pumps, which save electricity for summer months but use more electricity for winter heating, complicates consumption analysis due to the need for assumptions about fossil fuel displacement. This introduces uncertainties that can significantly skew the accuracy of evaluations.

- **The average signal size is small program wide.** Although there are many homes to analyze, with around 3,000 total households participating, most participants fall into the HEA component. The HEA-only group only receives an Advanced Power Strip which is expected to save approximately 60 kWh/year, or around 1% of a typical Long Island home's annual electric consumption. To address this challenge in the 2024 evaluation, we used the HEA participants as a control group to measure HPwES savings against and estimated HEA savings via engineering analysis.

- **Changing population and smaller sample size.** The decision to perform consumption analysis only on HPwES participants increases the average effect size we are trying to measure, but it lowers the sample size. The growing inclusion of BE measures further reduces the eligible sample size since it is impossible to disaggregate electric savings from insulation, air sealing, and duct sealing from increased electric consumption due to heat pump installation. Small sample sizes lead to broad confidence intervals and challenge the reliability of the consumption analysis.

Still the consumption analysis approach does present certain advantages:

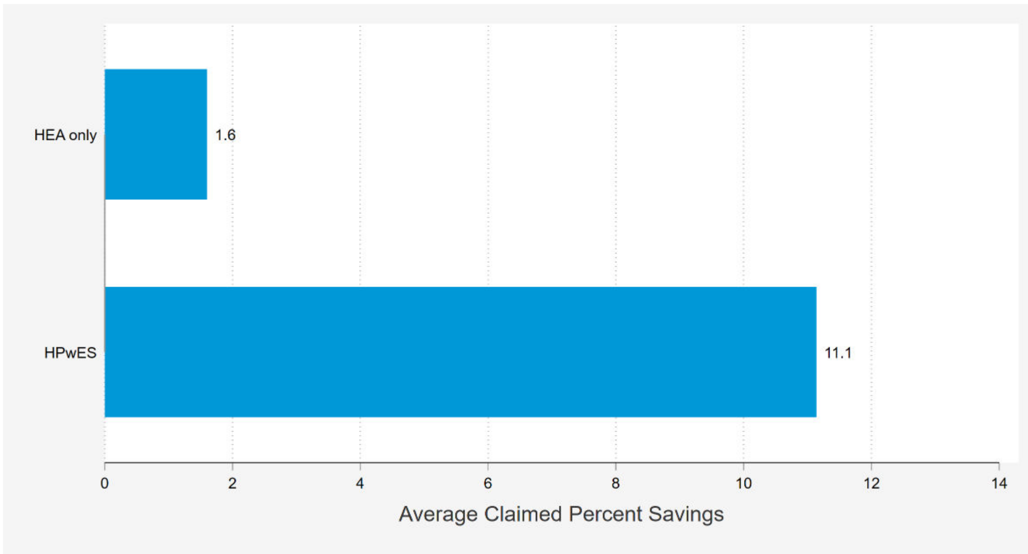
- **The measures are retrofit rather than replace-on-burnout.** Because HPwES measures are installed proactively, the actual pre-installation condition serves as the baseline.

- **Participating households tend to adopt multiple measures.** Measures like insulation, air sealing, and duct sealing tend to interact with one another as well as the efficiency of the home's HVAC system. This can lead to unreliable engineering estimates. Consumption analysis addresses this issue by analyzing the actual change in electric consumption at participating homes.

- **A like-minded control group controls for selection effects**. Using HEA-only homes as the matching pool ensures that the control group also has some program engagement, helping control for participant motivation and reducing potential selection bias compared to a completely non-participating control group.

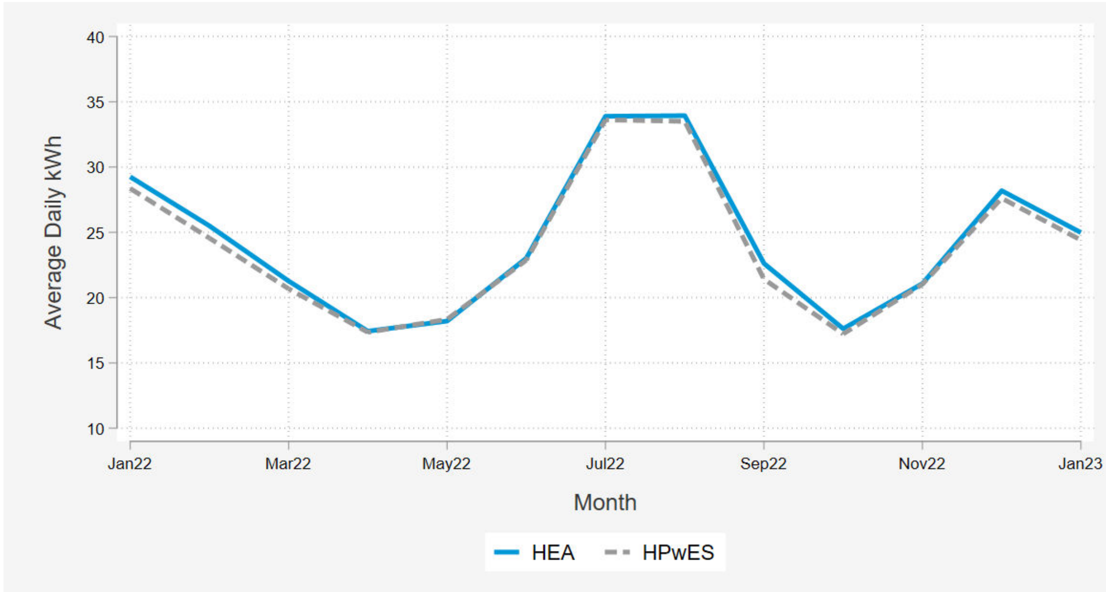
- **HPwES savings are reasonably large on a percentage basis.** As shown in Figure 15, ex-ante kWh savings as a percentage of weather-normalized pre-retrofit electric consumption varies by program component. The 2023 HPwES participants that were included in the consumption analysis show significantly higher claimed percentage reductions in electric consumption than the HEA-only group. HEA kits transitioned mid-2023 from LED lamps to Advanced Power Strips so the 1.6% savings include a mix of homes receiving the two different kits.

Figure 15: Average Ex-Ante kWh as a Percentage of Annual Household Consumption



Because the consumption analysis requires post-installation electricity usage data for approximately one year after treatment, we utilized 2023 participants in the analysis since they each have at least one year of post-installation data. The use of HEA participants as controls for HPwES is a new approach for the 2024 evaluation. In prior years, we used future participants as controls. We further refine the comparison groups using propensity score matching. Figure 16 compares the average daily consumption of the 'treatment group' and matched control group during 2022, which is the year prior to the first installation dates in our dataset. We employ a difference-in-differences regression model that nets out pre-period differences from the impact estimates.

Figure 16: Comparison of Pre-Treatment Consumption for Home Performance Consumption Analysis



The consumption analysis model employs daily electric consumption data to quantify changes in energy use following program participation. Matched controls (HEA-only participants) are assigned a pseudo pre-post transition date based on their corresponding HPwES participant match. The transition from the pre- to the post-period is anchored on the project completion date, meaning that over the course of 2023 the overall composition of the participant group gradually shifts. To ensure sufficient and high-quality data in both periods, we restricted our sample to participants whose projects were completed no later than December 2023, thereby guaranteeing at least 365 days of post-installation data.

The analysis utilizes a weather-normalized linear fixed effects panel regression model, which controls for time-invariant household characteristics by including a unique intercept for each account in both the treatment and comparison groups. Additional details on the model specification and parameter definitions are provided in Appendix A, Subsection H. Multiple model specifications were tested to evaluate robustness, and the results were consistent across these variations.

The consumption analysis returns an estimate specific to HPwES measures since both groups had savings from participating in the HEA channel. In 2023, the HPwES program included a mix of electric conservation measures and beneficial electrification measures. To create a homogeneous sample for the consumption analysis, we implemented a two-step filtering process to exclude homes that installed beneficial electrification measures. First, households with non-zero beneficial electrification savings were flagged using the "Current Savings BE MMBtu" field in the measure-level HPwES Captures data. Second, we cross-referenced Home Performance participant data with Home Comfort participation records to identify any additional households with non-zero beneficial electrification savings.

Although the consumption analysis method itself does not differentiate between the directions of savings, including homes with both positive and negative electric savings can pull the average toward zero, making it more challenging to precisely estimate impacts. Because the 2023 beneficial electrification measures were primarily heat pumps, we opted to perform the consumption analysis exclusively on homes without beneficial electrification measures and evaluate beneficial electrification measures separately using the engineering analysis methods applied in the Home Comfort program.

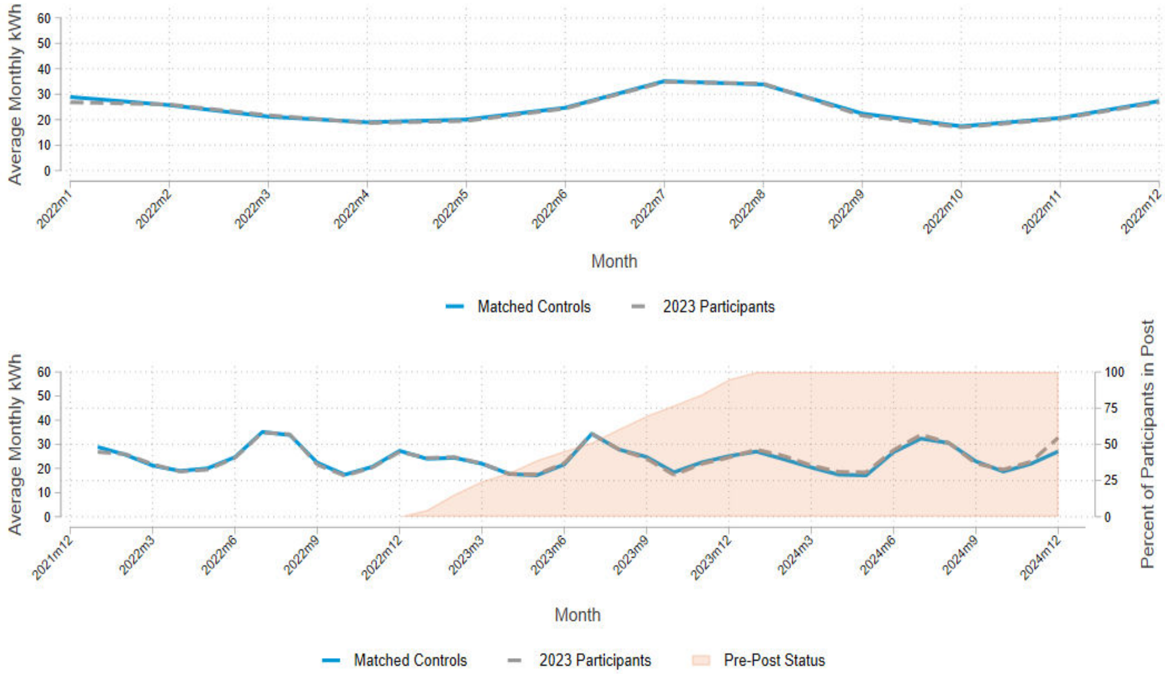
6.2.2.2 Consumption Analysis – Results

In Table 50 we use the results of the HPwES model to estimate average savings for 2023 participants and compare the estimated impact to the ex-ante gross kWh savings claimed by the implementer. Across the 261 Long Island homes that were included in the regression model, the average annualized savings was 198.36 kWh. This equals 19.42% of the average ex-ante gross kWh savings claimed for the same homes. We applied the 19.42% realization rate to the ex-ante gross kWh savings claim of 2024 participants to estimate ex-post gross kWh savings for efficiency measures. Figure 17 visualizes the consumption analysis results. The graph highlights the minimal effect the treatment had on electric consumption, as the two groups show limited separation in the post-installation period. The limited sample size and small average savings lead to wide confidence intervals for the savings and an estimated effect is not statistically significant.

Table 50: Home Performance Consumption Analysis Results (n=261)

Parameter	Estimate	Lower Bound of 95% CI	Upper Bound of 95% CI
Daily Treatment Effect (kWh Saved)	0.54	-0.199	1.285
Daily Treatment Effect (% Savings)	2.24%	-0.82%	5.32%
Annual Savings	198.36	-72.76	469.48
Ex-Ante Gross kWh	1,021.23		
Realization Rate	19.42%	-7.13%	45.97%

Figure 17: Home Performance Consumption Analysis Results Visualized



PSEG Long Island does not sell natural gas or deliver fuel, so fossil fuels consumption records are not available for analysis. To estimate MMBtu and peak demand savings for the Home Performance programs, we first calculated MMBtu-to-kWh and kW-to-kWh ratios between the engineering-based estimates for each measure. Next, we applied this ratio to the energy savings estimates derived from the consumption analysis to generate ex-post demand savings.

6.2.2.3 Engineering Analysis: HPwES

The evaluation team used program tracking data and engineering analysis to estimate gross MMBtu, kWh, and kW demand savings achieved by each HPwES measure. Results of the engineering impact analysis provides us with the demand-to-energy ratio needed to quantify demand savings from the energy consumption analysis, as well as an understanding of individual measure savings variations between consumption analysis results and planning assumptions. Table 51, Table 52, and Table 53 compare gross engineering analysis savings to ex-ante gross savings by HPwES measure category for MMBtu, kWh, and kW savings, respectively.

Table 51: 2024 HPwES Engineering Analysis Gross MMBtu Impacts

Category	N	Ex-Ante Gross Savings (MMBtu)	Engineering Analysis Ex-Post Gross Savings (MMBtu)	Engineering Analysis Realization Rate (MMBtu)
Duct Sealing	518	3,084	2,387	77%
Air Sealing	860	4,379	2,712	62%
Envelope (Attic, wall, basement, and garage insulation)	1,546	9,312	6,699	72%
Ducted Air-source Heat Pumps	156	7,465	7,815	105%
Ductless Mini-splits	267	9,866	8,693	88%
HVAC (Non heat pumps - thermostats)	126	11	11	100%
DHW	144	1,378	1,190	86%
Measure-Level Total[1]	**3,617**	**35,494**	**29,506**	**83%**

[1] Measure-level savings are obtained through contractor reports and are used in evaluating measure category ex-ante savings to elucidate measure performance. These measure-level savings do not account for interactivity and are therefore not the official project-level savings claimed by the program administrators.

Table 52: 2024 HPwES Engineering Analysis Gross MWh Impacts

Category	N	Ex-Ante Gross Savings[1] (MWh)	Engineering Analysis Ex-Post Gross Savings (MWh)[2]	Engineering Analysis Realization Rate (%)
Duct Sealing	518	301	229	76%
Air Sealing	860	268	121	45%
Envelope (Attic, wall, basement, and garage insulation)	1,546	490	355	72%
Ducted Air-source Heat Pumps	156	-596	-703	118%
Ductless Mini-splits	267	-1,245	-711	57%
HVAC (Non heat pumps - thermostats)	126	3	3	100%
DHW	144	-73	-70	96%
Measure-Level Total	**3,617**	**-853**	**-776**	**91%**

[1] Reported ex-ante gross savings include measure-level electricity savings and interactive electricity impacts from incentivized measures but exclude impacts from beneficial electrification measures.
[2] Negative savings are due to beneficial electrification from displacement of fossil fuel heating systems.

Table 53: 2024 HPwES Engineering Analysis Gross kW Impacts

Category	N	Ex-Ante Gross Savings (kW)	Engineering Analysis Ex-Post Gross Savings (kW)	Engineering Analysis Realization Rate (%)
Duct Sealing	518	208	168	81%
Air Sealing	860	67	46	69%
Envelope (Attic, wall, basement, and garage insulation)	1,546	91	104	114%
Ducted Air-source Heat Pumps	156	6	-9	-169%
Ductless Mini-splits	267	9	16	176%
HVAC (Non heat pumps - thermostats)	126	0	0	100%
DHW	144	-8	-8	94%
Measure-Level Total	**3,617**	**373**	**317**	**85%**

6.2.2.4 Reasons for Differences in Engineering Impacts: HPwES

Table 54 identifies the key contributors to the overall engineering analysis gross MMBtu realization rate of 83%. In most cases, our recommendations apply to the 2026 program year as opposed to PY2025. Planning for the 2025 programs was finalized a year ago, and program delivery is almost half complete. These types of changes are often most efficient to implement at the beginning of a new program year. Most of our recommendations are also reflected in the recently completed 2026 PSEG Long Island TRM.

Table 54: Key Contributors to HPwES Engineering Analysis and Proposed Rectification Steps

Component	Summary of Savings Difference	Proposed Solution
Ducted and Ductless Heat Pumps	▪ Several inconsistencies were identified during the evaluation that influence realization rates for heat pumps. Supplemental systems were reported as whole home, reported controls are inconsistent with HVAC systems in the home, missing quality install savings for multi-split systems, use of equipment max heating capacity in place of site calculated Manual J outputs, and the application of existing system efficiencies in place of code minimums.	▪ Create data collection standards to ensure that secondary system data points and home information are tracked properly in the project worksheet and analysis. Follow TRM requirements for system efficiencies and make use of site calculated Manual J outputs.
Envelope (insulation), missing savings	▪ Across all insulation measures two HVAC related issues were identified. For some projects the evaluation found homes with	▪ Ensure that HVAC savings for the home align with the equipment that is

Component	Summary of Savings Difference	Proposed Solution
	cooling installed but no cooling related savings were estimated in the ex-ante results. For other projects cooling energy savings were estimated but there was no associated estimation for demand savings.	identified and tracked in the project workbooks.
Envelope (insulation), lower cooling usage	▪ Lower ex-post evaluated savings from the 2026 PSEG-LI TRM methodology are partially tied to lower cooling degree days (CDD) and equivalent full load cooling hours on residential equipment	▪ Both the ex-ante and ex-post savings are accurate to the TRM methodologies they applied. However recent updates to the PSEG-LI TRM lowered residential cooling usage across all measures leading to realization rates below 100%. Align analysis tools with PSEG-LI defined savings methodologies
Air Sealing, ΔCFM_{50} approximation	▪ Ex-ante savings for most sampled projects were calculated using the blower door methodology with default pre- and post-improvement air leakage measurements even when areas where air sealing was applied range from 240 to 1,826 ft^2.	▪ Revise air sealing methodology to the ΔCFM_{50} approximation defined by the PSEG-LI and NY State TRMs that 50% of the improved area (ft^2) is equal to ΔCFM_{50} when blower door results are unavailable

6.2.2.5 Engineering Analysis: HEA Thank You Kits

For each HEA completed by PSEG Long Island in 2024, the program provided a Thank You Kit to the customer containing a single advanced tier 1 power strip. Table 55, Table 56, and Table 57 compare ex-post savings (via engineering analysis) with ex-ante gross MMBtu, MWh, and kW savings, respectively, for the two distinct Thank You Kits.

Table 55: 2024 HEA Thank You Kits Gross MMBtu Impacts

Category	N	Ex-Ante Gross Savings (MMBtu)	Engineering Analysis Gross Savings (MMBtu)	Engineering Analysis Realization Rate (MMBtu)
Thank You Kits	5,597	1,098	1,098	100%

Table 56: 2024 HEA Thank You Kits Gross MWh Impacts

Category	N	Ex-Ante Gross Savings (MWh)	Engineering Analysis Gross Savings (MWh)	Engineering Analysis Realization Rate (%)
Thank You Kits	5,597	322	322	100%

Table 57: 2024 HEA Thank You Kits Gross kW Impacts

Category	N	Ex-Ante Gross Savings (kW)	Engineering Analysis Gross Savings (kW)	Engineering Analysis Realization Rate (kW)
Thank You Kits	5,597	35	35	100%

To estimate ex-ante gross savings, the TRC applied the planning assumptions for EEP tier 1 advanced power strips. Evaluated MMBtu, MWh, and kW savings aligned with the ex-ante assumptions resulting in 100% realization rates for all metrics.

6.2.2.6 Engineering to Billing Calibration Calculations

The consumption analysis resulted in lower ex-post gross kWh savings compared to ex-ante gross kWh savings, as shown by the 19.42% realization rate. The results were stable across multiple model specifications but have a relatively wide margin of error. The 95% confidence interval of the realization rate ranges from -7% to 46%. A wide margin of error is expected given the limited sample size. As shown in Figure 15, savings from homes that only receive a Home Energy Assessment are modest compared to HPwES, which is why they can act as a serviceable control group. However, due to the very limited sample size of the participants, isolating the effect of interest is still difficult.

The MMBtu and peak demand savings for Home Performance are estimated via a calibration of the electric consumption analysis and engineering calculations. For both MMBtu and kW, the ex-post gross savings were much lower than the ex-ante gross savings. This result is a function of the MMBtu/kWh and kW/kWh ratios in the engineering analysis.

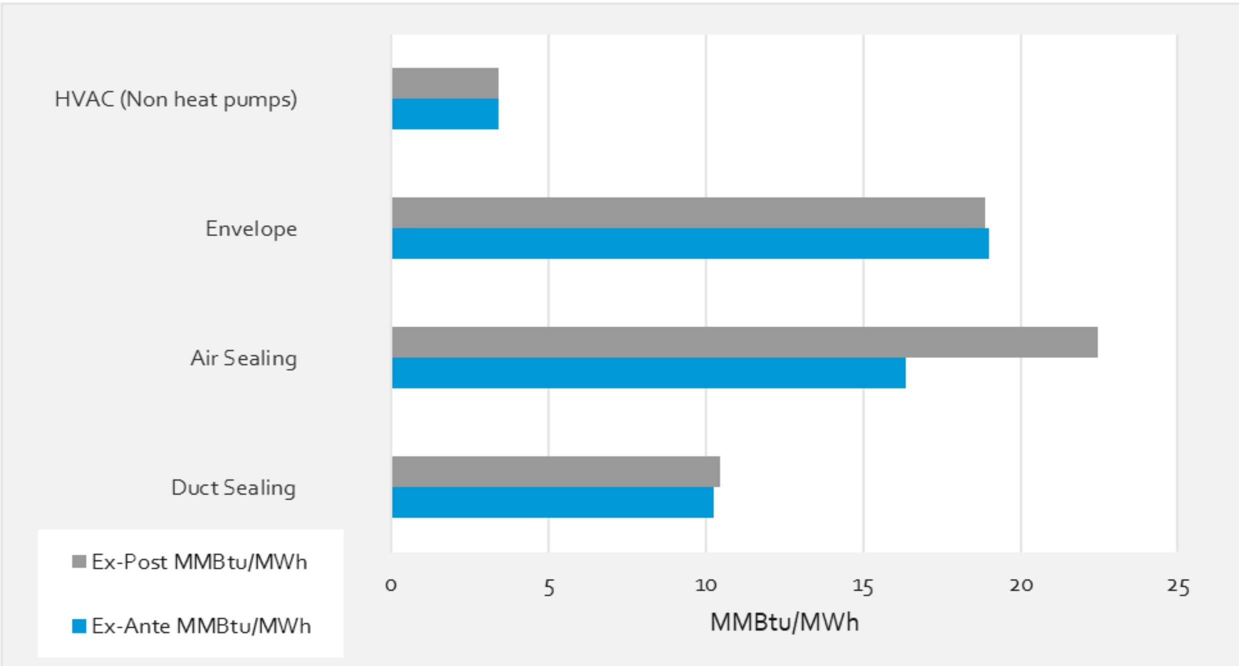
A direct conversion from MWh to MMBtu is 3.412 MMBtu/MWh.

- Measures that save only electricity will therefore have a ratio of MMBtu savings to MWh savings of 3.412. In that case, we would expect measures with relatively equal kWh and MMBtu impact estimates (or similar realization rates) to have a ratio close to 3.412.
- Measures that save fossil fuel as well as electricity will have a ratio greater than 3.412 MMBtu/MWh.

PSEG Long Island has a cold weather climate, and many of the HPwES measures primarily reduce energy consumption through a reduction in space heating. The heating fuel mix in Long Island is primarily fossil fuel, so insulating measures tend to offer more fossil fuel savings than electric savings.

Figure 18 shows that measures like home envelope and air sealing have a much larger fossil fuel impact versus electric. For the air sealing measure, the ratio of MMBtu to MWh was much higher in our ex-post engineering calculations than the ex-ante savings claims.

Figure 18: Ex-Ante Gross and Ex-Post Gross MMBtu/MWh Ratios



The billing analysis realization rate for the Home Performance program is 19.42%. Because of the variability in MMBtu per MWh across measure categories and between our engineering calculations and ex-ante assumptions, the Evaluation Team chose to calibrate MMBtu and kW savings to the billing analysis using the aggregate ratios across all measures in the engineering calculations. Table 58 shows the steps for MMBtu savings. The aggregate ratio of kW to MWh from our engineering calculations was 0.36.

Table 58: Home Performance MMBtu Billing to Engineering Calibration Calculation

Calibration Component	Calculation	Value
Billing Analysis MWh Ex-Post Impacts	MWh Ex-Ante Gross * Billing Realization Rate	208 MWh
MMBtu/MWh Ratio	Engineering MMBtu Ex-Post / Engineering MWh Ex-Post	17.25 MMBtu/MWh
Calibrated MMBtu Impacts	Billing Analysis MWh Ex-Post Impacts * MMBtu/MWh Ratio	3,580 MMBtu
Add Beneficial Electrification and HEA Kit Impacts	Engineering Analysis of Heat Pumps and HEA Kits	18,796 MMBtu
Home Performance Program Total	Calibrated MMBtu Impacts + Heat Pumps and HEA Kits	22,377 MMBtu

6.2.2.7 Beneficial Electrification Impacts

In 2024, the HPwES program completed 285 beneficial electrification (BE) projects that resulted in an increase in electric consumption. These measures involved displacement of fossil fuel-fired HVAC or DHW systems with high-efficiency electric systems – for example, from an oil furnace to an air-source heat pump. While BE projects increase overall electric consumption, they generate non-electric energy savings through avoided fossil fuel consumption.

To ensure that evaluated impacts accurately inform the program cost-effectiveness assessment, the evaluation team quantified both BE and energy efficiency (EE) impacts separately through engineering analysis, as shown in Table 59. The energy savings of the displaced fuel after electrification, and positive and negative impacts associated with energy efficiency measures, are expressed in MMBtu.

Table 59: Separation of EE and BE Impacts for HP Beneficial Electrification Measures

Category	Ex-Post Gross kWh_{ee}	Ex-Post Gross kWh_{be}	Ex-Post Gross ΔkWh (EE - BE)	Ex-Post Gross $MMBtu_{ee}$	Ex-Post Gross $MMBtu_{be}$	Ex-Post Gross MMBtu Total (EE + BE)
Ducted ASHP	75,687	778,590	-702,902	373	7,442	7,815
Ductless ASHP	42,010	753,083	-711,072	143	8,550	8,693
DHW	31,369	101,574	-70,204	107	1,083	1,190
Total	**149,067**	**1,633,246**	**-1,484,179**	**623**	**17,075**	**17,698**

6.2.3 OVERVIEW OF IMPACTS BY DISADVANTAGED COMMUNITY AND LOW INCOME IDENTIFIERS

Table 60 shows the Home Performance program ex-post Engineering impacts subdivided into four categories: 1) Non-Disadvantaged Community (DAC) & Non-Low Income, 2) DAC Only, 3) Low Income Only, and 4) DAC & Low-Income. A more detailed definition of each category can be found in the Introduction, Section 2.1.1. Overall, 66% of Home Performance MMBtu impacts count towards the DAC and Low Income standards. Low Income impacts were identified using the 'LMI' tags added to Low Income project fields in the tracking data.

Table 60: Ex-Post Impacts with DAC and Low Income Breakouts

Category	Ex-Post Gross Savings (MMBtu)	% of Ex-Post MMBtu
Non-DAC & Non-Low Income	7,708	34%
DAC Only	977	4%
Low Income Only	10,020	45%
DAC & Low Income	3,673	16%
Total	**22,377**	**100%**

6.3 CONCLUSIONS AND RECOMMENDATIONS

Our key findings and recommendations based on this evaluation are shown in Table 61. Starting in 2026 the NY TRM will revise savings methodologies for air source heat pumps to apply the SEER2 and HSPF2 efficiency metrics. As part of this change the seasonal heating and cooling coefficients and factors will be updated. Heat pump savings results for PY2024 reflect both the updated efficiency metrics and NY TRM heat pump coefficients that are expected in 2026.

Table 61: Home Performance Findings and Recommendations

Finding	Recommendation
▪ Many of the Home Performance savings methodologies differ from the recommended algorithms, inputs, and assumptions developed in the PSEG-LI TRM and Planning Documents. Realization rate inconsistencies in the engineering analysis can be minimized if the program savings are based on the same tools developed by the utility and aligned with site details documented in the analysis workbooks	▪ Review the Home Performance analysis workbooks and align the savings methodologies with data provided in the PSEG-LI TRM and planning documents.

Finding	Recommendation
▪ Ex-ante air sealing analysis for many projects is based on a ΔCFM_{50} assumption of square footage divided by two, as provided by the NYS TRM.	▪ Move away from the air sealing assumptions and emphasize the importance of pre- and post-improvement blower door tests to develop site specific air sealing results for these projects. This will help reduce the variance across sites and for the measure overall.
▪ The Home Performance program focuses on fossil fuel savings; however, PSEG Long Island does not sell gas or oil. This leads to limitations in the billing analysis since it currently relies on electric billing data. As a result, the consumption analysis only evaluates the impact of EE measures through customer billing data.	▪ Incorporating billing data from National Grid for homes that have natural gas heating would allow the billing analysis to evaluate fossil fuel savings through the Home Performance program. ▪ Explore the possibility of sourcing billing data from National Grid for homes that use natural gas for heating.

7 RESIDENTIAL ENERGY AFFORDABILITY PARTNERSHIP PROGRAM

7.1 PROGRAM DESCRIPTION

The Residential Energy Affordability Partnership (REAP) program assists low-income households with energy efficiency improvements. The program helps low-income customers save energy, improves overall residential energy efficiency on Long Island, and lowers PSEG Long Island's financial risk associated with bill collection by lowering utility bills. To be eligible to participate in the REAP program, household income must correspond with the United States Department of Housing and Urban Development low-income guidelines and have an income less than or equal to 80% of the state median income.

7.1.1 PROGRAM DESIGN AND IMPLEMENTATION

The REAP program includes a free home energy audit and free installation of energy-saving measures. In 2024, program measures included LED light bulbs (general service, globes, reflectors, candelabras, and night lights), domestic hot water (DHW) measures, thermostatic valves, smart power strips, room air conditioners (RACs), dehumidifiers, refrigerators, Wi-Fi connected smart thermostats, room air purifiers and attic hatch insulation. During the home energy audit, auditors provide power strips to customers with instructions on how to use the new equipment, but auditors do not install the equipment.

In addition to providing program participants with energy-saving measures, the program includes an educational component. Auditors work with participating customers to determine additional energy-saving actions and behavior changes that customers will commit to. These additional steps help the customers generate savings beyond those realized by the measures installed during the home audit. By educating the customers on the use and value of installed efficiency measures and helping them identify additional opportunities to save, the program can achieve its goal of helping customers who have the greatest energy burden on Long Island. REAP auditors also inspect the customers' heating and hot water systems for safety.

7.1.2 PROGRAM PARTICIPATION AND PERFORMANCE

Based on verified ex-ante estimates, the REAP program reached 102.1% of its energy savings goal in 2024. Table 62 presents verified ex-ante gross MMBtu savings compared to goals for the 2024 REAP program.

Table 62: 2024 REAP Program Verified Ex-ante Gross Program Performance against Goals

Metric	MMBtu
Goal	11,980
Verified Ex-ante Gross Savings	12,234
% of Goal	102.1%

Table 63 shows the distribution of savings by program component. Smart thermostats account for the largest share of gross MMBtu savings in 2024, accounting for 56.8%. Lighting continues to account for the largest share of gross REAP electric savings, accounting for 38.5% of ex-ante gross MWh savings and 45.3% of ex-ante gross kW savings in 2024.

Table 63: 2024 REAP Program Component Percent of Total Ex-Ante Gross Savings

Program Component	Ex-Ante Utility Gross Savings		
	MMBtu (%)	MWh (%)	kW (%)
REAP Lighting	17.6%	38.5%	45.3%
Energy Star Refrigerators	0.8%	4.6%	4.6%
Power Strips	12.8%	27.6%	23.0%
Aerators	1.2%	0.6%	0.0%
DHW Pipe Insulation	1.8%	0.6%	0.6%
DHW Temperature Turndown	0.0%	0.0%	0.0%
Energy Star Dehumidifier	0.4%	0.8%	2.3%
Low Flow Showerhead	2.4%	0.9%	0.0%
Room Air Conditioners	0.8%	1.8%	13.3%
Thermostatic Valve	0.2%	0.1%	0.0%
Room Air Purifier	5.2%	11.3%	10.8%
Smart Thermostat	56.8%	13.2%	0.0%
Attic Hatch Cover	0.0%	0.0%	0.0%
Water Heater Blanket Insulation	0.1%	0.2%	0.1%
Total	**100%**	**100%**	**100%**

The REAP program treated 1,906 unique participants in 2024 compared to 1,976 customers in 2023. Table 64 shows that nearly all REAP participants received power strips and night lights. Most participants also received LED lighting and approximately half of the participants received a smart thermostat. Few participants received dehumidifiers, refrigerators, or domestic hot water (DHW) measures.

Table 64: Percent of REAP Program Participants Receiving each Measure Category

Category	Percent Receiving
Power Strips	82.6%
Night Lights	80.1%
Lighting	64.4%
Smart Thermostats	46.8%
Air Purifiers	24.3%
Room AC	21.7%
DHW - Aerators	14.3%
DHW - Pipe Insulation	9.1%
Dehumidifiers	8.4%
DHW - Low Flow Showerheads	7.7%
Refrigerators	4.7%
DHW - Thermostatic Shower Valve	3.2%
DHW - Temp Turndown	0.4%

7.2 REAP PROGRAM IMPACTS

7.2.1 OVERVIEW OF IMPACTS BY RESOURCE

In prior years, our REAP evaluation relied on both an engineering analysis and a consumption analysis. For 2024, we removed the consumption analysis from the evaluation since most of the savings are from fossil fuel heating (via smart thermostats) and domestic water heating. These savings would not be captured in an electric consumption analysis. Table 65 shows program impacts by resource type. The program achieved ex-post gross MMBtu savings of 12,902 MMBtu, ex-post gross MWh savings of 1,932 MWh, and ex-post gross kW savings of 244 kW. The engineering calculations resulted in a MMBtu realization rate of 105%.

Table 65: 2024 REAP Program Impacts

Resource	Ex-Ante Gross Savings	Ex-Post Gross Savings	Realization Rate
MMBtu	12,285	12,902	105%
MWh	1,661	1,932	116%
kW	199	244	123%

Table 66, Table 67, and Table 68 show the ex-post gross MMBtu, MWh, and kW savings for each REAP measure category. Smart thermostats account for the largest share of ex-post gross MMBtu savings (62%), while LED lighting measures account for the largest share of ex-post gross MWh and kW savings (44% and 53% respectively).

Table 66: 2024 REAP Program Measure-Specific MMBtu Gross Impacts

Category	N	Ex-Ante Gross Savings (Claimed)	Ex-Post Gross Savings	Realization Rate
		MMBtu	MMBtu	%
REAP Lighting	19,310	2,161	1,769	81.9%
Energy Star Refrigerators	136	102	100	98.8%
Power Strips	2,891	1,567	1,567	100.0%
Aerators	433	147	151	102.2%
DHW Pipe Insulation	299	219	172	78.8%
DHW Temperature Turndown	7.0	1.1	2.2	190.1%
Energy Star Dehumidifier	160	47	55	118.8%
Low Flow Showerhead	181	296	215	72.7%
Room Air Conditioners	600	102	115	112.1%
Thermostatic Valve	74	31	31	100.4%
Room Air Purifier	461	640	749	117.0%
Smart Thermostat	1,389	6,973	7,937	113.8%
Attic Hatch Cover	24	5	43	853.7%
Water Heater Blanket Insulation	16	11	11	96.4%
Project Adjustments	(8)	(16)	(16)	100.0%
Total	**25,973**	**12,285**	**12,902**	**105.0%**

Table 67: 2024 REAP Program Measure-Specific MWh Gross Impacts

Category	N	Ex-Ante Gross Savings (Claimed)	Ex-Post Gross Savings	Realization Rate
		MWh	MWh	%
REAP Lighting	19,310	640	858	134.0%
Energy Star Refrigerators	136	76	73	95.5%
Power Strips	2,891	459	459	100.0%
Aerators	433	9	7	73.1%
DHW Pipe Insulation	299	10	10	100.0%
DHW Temperature Turndown	7	0.2	0.4	190.0%
Energy Star Dehumidifier	160	14	16	118.6%
Low Flow Showerhead	181	15	11	73.0%
Room Air Conditioners	600	30	34	112.1%
Thermostatic Valve	74	2	2	100.5%
Room Air Purifier	461	188	220	117.0%
Smart Thermostat	1,389	219	244	111.0%
Attic Hatch Cover	24	0.1	0.2	270.5%
Water Heater Blanket Insulation	16	3	3	96.3%
Project Adjustments	(8)	(5)	(4)	100.0%
Total	**25,973**	**1,661**	**1,932**	**116.2%**

Table 68: 2024 REAP Program Measure-Specific kW Gross Impacts

Category	N	Ex-Ante Gross Savings (Claimed)	Ex-Post Gross Savings	Realization Rate
		kW	kW	%
REAP Lighting	19,310	90	128	142.4%
Energy Star Refrigerators	136	9	9	99.1%
Power Strips	2,891	46	46	100.0%
Aerators	433	0.0	0.0	--
DHW Pipe Insulation	299	1.1	1.1	100.0%
DHW Temperature Turndown	7	0.02	0.03	190.0%
Energy Star Dehumidifier	160	4.6	3.7	81.3%
Low Flow Showerhead	181	0	0	--
Room Air Conditioners	600	27	30	114.2%
Thermostatic Valve	74	0	0	--
Room Air Purifier	461	21.5	25.2	117.0%
Smart Thermostat	1,389	0	0	--
Attic Hatch Cover	24	0.002	0.002	111.3%
Water Heater Blanket Insulation	16	0.3	0.4	139.6%
Total	**25,981**	**199**	**244**	**122.5%**

7.2.2 Overview of Impacts by Disadvantaged Community and Low-Income Identifiers

Table 69 shows the REAP program ex-post impacts subdivided into four categories: 1) Non-Disadvantaged Community (DAC) & Non-Low Income, 2) DAC Only, 3) Low Income Only, and 4) DAC & Low-Income. A more detailed definition of each category can be found in the Introduction, section 2.1.1. While REAP is an income-qualified program, its income threshold (80% of the state median income) is higher than the broader portfolio low income definition of 60% of state median income. As result, not all REAP savings fall into the broader low income definition used for DAC and LMI reporting. Overall, 77% of REAP MMBtu impacts count towards the DAC and Low Income standards. Low Income Impacts were identified using the 'Income Eligibility Threshold' field tracked in the Captures database.

Table 69: Ex-Post Impacts with DAC and Low Income Breakouts

Category	Ex-Post Gross Savings (MMBtu)	% of Ex-Post MMBtu
Non-DAC & Non-Low Income	3,030	23%
DAC Only	1,059	8%
Low Income Only	6,270	49%
DAC & Low Income	2,543	20%
Total	**12,902**	**100%**

7.2.3 Key Drivers for Differences in Impacts

Measure-level savings estimates were greater than the ex-ante gross savings which resulted in realization rates of 105.0% for MMBtu, 116.2% for MWh, and 122.5% for kW as shown in Table 66, Table 67, and Table 68. The smart thermostat measure was the largest contributor to the REAP Program's gross savings comprising 62% of ex-post MMBtu savings. Realization rates for this measure were 114% for MMBtu and 111% for MWh. Increases to cooling and heating energy savings factors in the 2025 PSEGLI TRM to align with the ENERGY STAR Connected Thermostat specification resulted in realization rates over 100%. The updates were made to align with capacity assumptions for Smart Thermostat measures in the EEP and Home Comfort programs.

The lighting measure category was the second largest contributor to the REAP program's gross savings, comprising 44% of ex-post MWh savings. REAP lighting MMBtu and MWh realization rates were 82% and 134% respectively as shown in Table 70. MMBtu realization rates are less than 100% for many of the interior lighting measures. This is because the waste heat penalty was used for ex-post savings but was excluded from ex-ante savings. MWh and kW realization rates exceed 100% because baseline wattage assumptions were generally higher for the ex-post calculations than they were for the ex-ante calculations. Ex-post baseline wattages, which were drawn from the 2026 PSEG-LI TRM, are compared with ex-ante baseline wattage assumptions in Table 71. The ex-post baseline wattage is higher for all lighting measures except night lights and R-40 reflectors. For ex-ante calculations, each lamp was categorized as either Nightlight, Standard, or Specialty. Baseline watts were assigned to each lamp type based solely on their category. For ex-post, representative baseline watts were assigned to each lamp irrespective of category. This resulted in the variation in MWh and kW realization rates among lamp types shown in Table 71. Note there were no differences between ex-post and ex-ante LED wattages for any of the lighting measures.

Table 70: 2024 REAP Lighting Ex-Post Realization Rates

Lighting Measure	N	Ex-Post MMBTU RR	Ex-Post kWh RR	Ex-Post kW RR
		%	%	%
REAP .3 Watt Nightlight	2,818	41%	86%	--
REAP 10 Watt "A" Bulb	8,513	87%	152%	150%
REAP 14 Watt "A" Bulb (3-way)	494	58%	102%	100%
REAP 4.7 Watt Candelabra B10	2,497	108%	187%	186%
REAP 5 watt Globe	650	111%	189%	187%
REAP 6.5 Watt Candelabra BA13	771	80%	141%	139%
REAP 9 Watt Reflector R-30	799	61%	106%	105%
REAP 9 Watt Reflector R-40	631	52%	90%	89%
REAP Exterior 10 Watt "A" Bulb	1,646	117%	116%	--
REAP Exterior 9 Watt Reflector R-30	45	118%	118%	--
REAP Exterior 9 Watt Reflector R-40	446	108%	108%	--
Lighting Total	**19,310**	**82%**	**134%**	**142%**

Table 71: 2024 REAP Lighting Ex-Post, and Ex-Ante Baseline Wattage Comparison

Lighting Measure	Ex-Post Baseline Watts	Ex-Ante Baseline Watts	Ex-Post Percentage of Ex-Ante Baseline Watts	Ex-Ante Lamp Category
REAP 0.3 Watt Night Light	5	5.75	87%	Nightlight
REAP 10 Watt "A"Bulb	60	43	140%	Standard
REAP 14 Watt "A" Bulb (3-way)	100	100	100%	Specialty
REAP 4.7 Watt Candelabra B10	43.2	25	173%	Specialty
REAP 5 Watt Globe	51.7	29	178%	Standard
REAP 6.5 Watt Candelabra BA13	53.1	40	133%	Specialty
REAP 9 Watt Reflector R-30	62.4	60	104%	Specialty
REAP 9 Watt Reflector R-40	54.3	60	91%	Specialty
REAP Exterior 10 Watt "A"Bulb	45	43	105%	Standard
REAP Exterior 9 Watt Reflector R-30	63.3	60	106%	Specialty
REAP Exterior 9 Watt Reflector R-40	59.3	60	99%	Specialty

Table 72: Realization Rate Drivers

Component	Summary of Contributing Factors	Recommendations
Smart Thermostats	▪ The assumed Energy Savings Factor (ESF) for cooling was increased from 7% to 8% and the assumed ESF for heating was increased from 9% to 10% in the 2025 PSEG Long Island TRM to align with the requirements of the ENERGY STAR specification.	▪ Rely on the savings in the 2026 PSEG Long Island TRM to claim ex-ante saving for 2025 thermostat installations.
Lighting	▪ MWh realization rates ranged from 86% to 152%. This variation is the result of differences in ex-post and ex-ante baseline wattage assumptions.	▪ The 2026 PSEG Long Island TRM provides product-specific measure characterizations, which if implemented, would minimize differences between ex-ante savings claims and ex-post engineering calculations.
Hot Water Measures	▪ Ex-ante savings for some projects were calculated using the planning assumption that 85% of participant homes have fossil fuel water heating and 15% have electric water heating. ▪ Some projects had no designated fuel type in Captures.	▪ Discontinue the use of planning assumptions for ex-ante savings claims. ▪ Rely on the auditor's determination of DHW fuel and claim electric savings for homes with electric DHW and claim fossil fuel savings for homes with fossil fuel DHW.

8 HOME ENERGY MANAGEMENT (HEM) PROGRAM

PSEG Long Island's Home Energy Management (HEM) program currently delivers paper and electronic home energy reports (HERs) to about 655,000 residential customers. Residential behavioral programs, such as HEM, leverage behavioral psychology and social norms to lower residential energy usage by comparing a customer's energy consumption to similar neighboring households. In addition to HERs, treatment customers can participate in "opt-in" interventions, such as High Usage Alerts, Home Energy Assessment Tools, Online Marketplace, and HEM Controls Pilot. While PSEG Long Island's behavioral program delivers cost-effective energy savings from many customers, the New York Department of Public service has suggested utilities no longer fund behavioral programs through energy efficiency funds starting in 2026.

This report summarizes the program year 2024 (PY2024) energy savings from PSEG Long Island's Home Energy Management Program. Although behavioral programs typically deliver small percentage changes in energy use, they typically yield considerable aggregate savings because they reach a large volume of customers and do not require rebates or installations. The primary challenge is the need to accurately detect small changes in energy consumption while systematically eliminating plausible alternative explanations for those changes, including random chance. Thus, accurate measurement relies on large scale randomized control trials, the use of pre-intervention and post-intervention data, and is analyzed using difference-in-differences.

The 2024 evaluation had five main research questions:

- Were the participant and control groups similar in terms of energy use prior to the introduction of the HERs?
- What is the magnitude of annual electricity savings?
- Is there an overlap with other energy efficiency programs (to avoid double-counting)?
- Do HERs lead to different heat pump adoption rates?
- What steps can be undertaken to improve delivery and performance?

8.1 PROGRAM OVERVIEW

The Home Energy Management program offers a set of intervention strategies to influence customers' energy use behaviors. The primary strategy is a HER engagement campaign leveraging a randomized control trial (RCT) design. In addition to HERs, treatment customers can participate in "opt-in" interventions, such as High Usage Alerts, Home Energy Assessment Tools, Online Marketplace, and HEM Controls Pilot. The specific objectives of the program are to:

- Reduce energy usage,

- Increase peak hour energy savings,
- Increase awareness of and participation in energy efficiency programs,
- Consider renewable energy/energy storage and demand response programs, and
- Increase customer satisfaction with PSEG Long Island.

Home energy reports are behavioral interventions designed to encourage energy conservation in both gas and electricity. The paper or electronic reports compare a customer's energy consumption to similar neighboring households, thus leveraging behavioral psychology and social norms to lower residential energy usage. They are sent to customers in the treatment group by mail and email and contain the following information:

- Customer electric energy usage for the previous month,
- A comparison of the customer's energy usage to the energy usage of nearby homes with similar characteristics from the previous month,
- Information showing which energy use categories contribute the most to the customer's overall energy consumption,
- A chart depicting the customer's energy use over the past year,
- Promotion of applicable PSEG Long Island programs and rebates, and
- Tips for reducing energy consumption.

The program launched in September 2017 when 341,570 customers began receiving HERs. This first wave of customers is referred to as Cohort 1 in this report. In August 2018, the program began to send HERs to an additional 159,348 customers. This second wave of customers is referred to as Cohort 2. The third wave, called Cohort 3, started in May 2021, when the program began to send HERs to another 60,000 customers. A fourth and fifth cohort began treatment in February 2023. Cohort 4 consisted of 80,000 treatment and 25,000 control customers who receive email and paper reports and were selected from PSEG Long Island customers who had an email address on file. Cohort 5, consisting of 50,000 treatment and 20,000 control customers, were drawn from only customers who had no email on file, so they only received paper reports. Finally, a sixth cohort of 133,464 newly treated customers was started in May of 2024.

The program's initial goal, set in 2017, was to achieve over 30,000 MWh of behavior-based energy savings per year over a two-year period. The HEM exceeded its 2023 goal of 32,758 MWh and achieved 37,090 MWh of ex-post evaluated savings. The goal for 2024 was increased to 52,115 MWh and program implementation was transitioned from Uplight to Bidgely. Due to attrition (mostly move-outs), the treatment and control groups for all cohorts are smaller now compared to when the cohorts were first launched. With the addition of Cohort 6, 654,749 households were regularly receiving HERs in 2024. Additional details on attrition and current treatment numbers are provided in Section 8.2.

8.2 2024 PROGRAM ENROLLMENT AND REPORT COUNTS

Table 73 presents HEM program participation for all six cohorts. In prior years, cohorts averaged an attrition rate of 8% to 11%, but between PY2023 and PY2024, there was an *increase* of 0.3% in the number of treatment households. The reason for this can be traced back to a change in the implementation contractor. Bidgley ran the program for the first time in PY2024, and they reported treating approximately 5,000 households in Cohorts 1 through 5 that were not reported as being treated in the past. Bidgely also reported not treating a large number (120,000) of households from Cohorts 1-5. Our analysis includes all active treatment group homes from Cohorts 1-6 regardless of whether they were treated in 2024 to preserve the RCT design of the program. Since the HEM measure life is one year, any savings that occurred at the meter in 2024 have not been claimed previously so there is no threat of "double counting". While the savings observed among homes not treated in 2024 are presumably attributable to HEM exposure in prior years, those savings are a direct result of PSEG Long Island programming and the program should get credit for all incremental measured savings.

The evaluation method used requires before and after data for each participant and control. Thus, we only analyze sites with a full year of data before they receive the behavioral intervention, which are approximately 98% of the population, and apply the results to the full population.

Table 73: 2024 HEM Program Participation Summary[6]

Cohort	Number of Treatment Customers	Number of Control Customers	Number of Customers per Cohort
Cohort 1	242,975	29,580	272,555
Cohort 2	115,902	24,913	140,816
Cohort 3	47,075	18,446	65,521
Cohort 4	73,116	22,913	96,028
Cohort 5	42,218	21,151	63,368
Cohort 6	133,464	21,435	154,899
Total	**654,749**	**138,438**	**793,187**

On average, each treatment group household received three paper reports and two electronic reports over the course of the year. Based on the program tracking data, the verified count of paper reports sent was 2,155,676 (a slight reduction from 2,206,148 in PY2023) with each participant receiving multiple reports throughout the year. The handover to Bidgley resulted in no reports being sent in the first four months of the year. The verified number of paper and electronic reports sent each month and the total for 2024 are presented in Table 74.

[6] Counts represent the average number of customers with active billing data in 2024. Savings were calculated for each month separately based on the number of customers with active billing data that month.

Table 74: HEM Program Paper HERs Sent by Month in 2024

Month	Verified Paper Report Count	Verified Electronic Report Count
January	0	0
February	0	0
March	0	0
April	0	3,960
May	214,079	517,274
June	142,099	30,471
July	289,388	0
August	487,284	0
September	217	2,219
October	481,479	188,423
November	422,122	146,935
December	119,008	186,627
Total	**2,155,676**	**1,075,909**

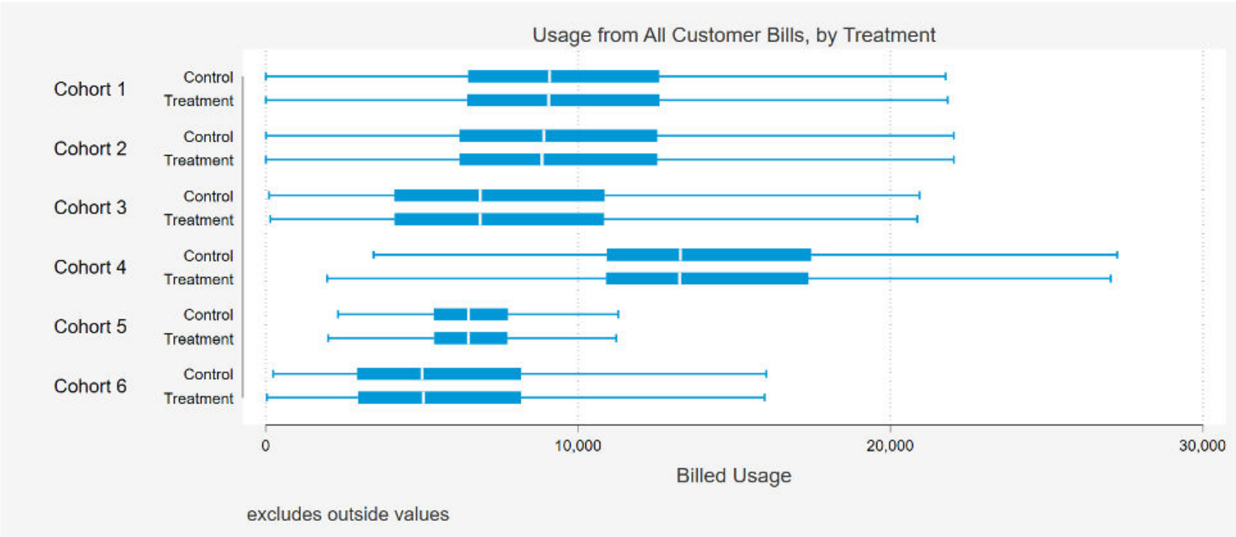
8.3 EQUIVALENCY RESULTS

This section compares customers receiving HER treatments to their corresponding control group prior to the intervention. The goal is to compare the energy use patterns and ensure that there are no systematic differences. A good control group should behave and use energy in a similar manner to the participants before either group has received an HER.

Electricity use is characterized by a wide range of end uses and technologies, including lighting, cooking and cleaning appliances, entertainment, and more. But the primary driver of energy loads is the heating and cooling systems. Electric usage peaks in the summer as air conditioning systems are running and in the winter for electrically heated homes. Because of this, energy use is highly dependent on weather. The home energy reports focus on conservation through a range of electric devices. For each wave of HER distribution, pre-treatment energy consumption should be identical across the participant and control groups, on average.

Figure 19 shows the distribution of annual consumption by cohort for the treatment and control groups prior to each HER cohort launch. Treatment and control groups are comparable, and the average customer size is relatively similar between cohorts. Cohort 5 is clearly much different than the other four cohorts. Unlike all other cohorts, Cohort 5 is drawn solely from customers without email addresses. These customers have a lower total consumption and their consumption has a much narrower spread. Most importantly, though, the control and treatment distributions are nearly identical within each cohort, indicating the random assignment was properly implemented. The new cohort, Cohort 6, appears to have a representative control group

Figure 19: Pre-Treatment Annual Electric Consumption by Cohort



By cohort, Table 75 shows the average annual pre-participation usage for the treatment and control groups. No wave shows a statistically significant difference between the two groups. The minor pre-existing difference is netted out in the statistical analysis.

Table 75: HEM Program Pre-Participation Average Daily Consumption, Treatment vs. Control

Wave	Start Date	Number of Homes Analyzed[1]		Annual Use (kWh)		Difference in Annual Use		
		Control	Treated	Control	Treated	kWh	%	95% Conf. Interval
Cohort 1	10/1/2017	28,354	232,789	10,388.4	10,372.8	-15.7	-0.15%	(-93.1 ,61.8)
Cohort 2	8/27/2018	23,703	108,620	10,288.9	10,257.8	-31.2	-0.30%	(-129.7 ,67.4)
Cohort 3	5/15/2021	15,038	38,619	8,551.3	8,523.0	-28.3	-0.33%	(-153.7 ,97.1)
Cohort 4	2/1/2023	20,274	64,765	15,685.8	15,696.2	10.3	0.07%	(-118.5 ,139.1)
Cohort 5	2/1/2023	15,904	31,814	6,610.5	6,608.4	-2.0	-0.03%	(-29.4 ,25.3)
Cohort 6	5/7/2024	21,037	130,672	6,091.0	6,123.5	32.5	0.53%	(-27.9 ,93.0)

[1] The estimating sample is limited to participants and control with a full year of pre-intervention data and are roughly 98% of the total participants

8.4 ELECTRIC EX-POST SAVINGS SUMMARY

Table 76 depicts the ex-post savings results for HEM in MMBtu and MWh. A total of 654,749 customers received HERs in PY2024. These customers saved an average of 68.3 kWh per home. Prior to accounting for any dual enrollment in other programs, referred to as uplift, total annual savings for PY2024 were 44,709 MWh or 152,548 MMBtu. The uplift refers to energy savings due to the boost in energy efficiency program participation in the treatment group relative to the control group due to the

HER messaging. Uplift savings are backed out to avoid double-counting since they are already accounted for in the other programs. Once we account for uplift, the average participant saved 65 kWh annually for total annual savings of 42,594 MWh and 145,329 MMBtu.

The HEM realization rate is the ratio between claimed ex-post savings and claimed ex-ante savings. In 2024, the realization rate for electric savings was 136.8%. The ex-post savings were 81.7% of the HEM goal for 2024, possibly due to the delayed launch of 2024 program activities.

Table 76: 2024 HEM Program Ex-Post Gross Impacts

Metric	Participation	Energy Savings		
		kWh per participant	MMBtu	MWh
Goal	440,000	118.4	177,816	52,115
Claimed Ex-Ante	654,749	47.6	106,265	31,144
Verified Ex-Ante	654,749	47.1	105,330	30,870
Unadjusted Ex-Post	654,749	68.3	152,548	44,709
Uplift Adjustment	654,749	3.2	7,219	2,116
Adjusted Ex-Post After Accounting for Uplift	654,749	65.0	145,329	42,594
Realization Rate of Claimed Ex-Post to Ex-Ante	100%	138%	136.8%	136.8%
Ex-Post as Percent of Goal	149%	55%	81.7%	81.7%

While no peak demand savings were claimed for HEM in PY2024, we did assess peak demand reductions for the program as a part of the ex-post analysis and included the demand savings as a part of the cost-effectiveness assessment. Table 77 summarizes the peak demand savings (MW) for the HEM program for 2024. The HEM population was able to reduce demand by 10.51 MW between 4 and 5 PM during the top twenty load days of summer 2024. The kW impacts were estimated for sites that had AMI data in 2024 and scaled for the full population of participants. Appendix A, Subsection G provides additional details on the peak demand savings calculations. It should be noted that because there is so much noise in these estimates and the signal is so small, none of the hourly estimates are statistically different than zero. This means that, while we can say that the HEM program results in statistically significantly different outcomes, when we look at each hour individually, there is not enough evidence to reject a null impact for each hour.[7]

[7] A key limitation of the hourly peak demand analysis is smart meter hourly data is not available during the pre-treatment for the largest cohorts, which precludes the use of more statistically powerful techniques such as difference-in-differences.

Table 77: HEM Peak Demand Reduction

Wave	MW Impact
Cohort 1	6.06
Cohort 2	3.02
Cohort 3	1.62
Cohort 4	1.35
Cohort 5	0.89
Cohort 6	-2.54
Total	**10.51**

8.4.1 Overview of Impacts by Disadvantaged Community and Low Income Identifiers

Table 78 shows the HEM program ex-post Engineering impacts subdivided into four categories: 1) Non-Disadvantaged Community (DAC) & Non-Low Income, 2) DAC Only, 3) Low Income Only, and 4) DAC & Low-Income. A more detailed definition of each category can be found in the Introduction, Section 2.1.1. Overall, 14% of HEM MMBtu impacts count towards the DAC and Low Income standards. No Low Income impacts were claimed since income eligibility is not tracked for HEM participants.

Table 78: Ex-Post Impacts with DAC and Low Income Breakouts

Category	Ex-Post Gross Savings (MMBtu)	% of Ex-Post MMBtu
Non-DAC & Non-Low Income	125,280	86%
DAC Only	20,049	14%
Low Income Only	0	0%
DAC & Low Income	0	0%
Total	**145,329**	**100%**

8.5 ELECTRIC EX-POST SAVINGS DETAIL

Table 79 depicts the unadjusted ex-post savings from the analysis, calculated using a Lagged Dependent Variable (LDV) model. Across all waves, participants saved approximately 68.28 kWh ± 7.3 kWh annually (95% confidence), or approximately 0.76% of their annual consumption. On an aggregate basis, HEM reduced energy consumption by 152,548 MMBtu. Cohorts 1, 2, 3, and 5 had statistically significant savings, while Cohort 4 just barely missed the significance cutoff. Cohort 6 had no statistically significant impact from treatment, but that is not surprising given their treatment only started in May. The savings tend to build as customers receive more reports, and new cohorts are not expected to be statistically significant in the initial years, so the light savings from Cohort 4 and 5 are to be expected.

Table 79: 2024 HEM Unadjusted Ex-Post Per-Household and Program Energy Savings

Cohort	Number of Customers Treated in 2024	Unadjusted Savings (% per household)	Unadjusted Energy Savings (kWh per household)	Upper Bound	Lower Bound	Unadjusted Program Savings (MMBtu)
Cohort 1	242,975	1.05%	102.31	118.23	83.32	84,696
Cohort 2	115,902	1.04%	101.57	121.85	77.82	40,114
Cohort 3	47,075	1.20%	97.06	123.10	73.51	15,595
Cohort 4	73,116	0.18%	27.14	55.24	-0.72	6,819
Cohort 5	42,218	0.51%	35.77	54.34	16.90	5,150
Cohort 6	133,464	-0.07%	-2.70	8.80	-18.53	-1,195
Total	**654,749**	**0.76%**	**68.28**	**75.55**	**57.58**	**152,548**

Table 80 depicts the percent savings for each cohort by month. We see that the highest percent savings generally occur in the winter, with savings of about 1% in January and December on average across the pooled cohorts. This reflects both a higher baseline of energy usage in summer, and slightly higher kWh savings during the winter.

Table 80: 2024 HEM Unadjusted Ex-Post Percent Savings by Month, Monthly LDV Model

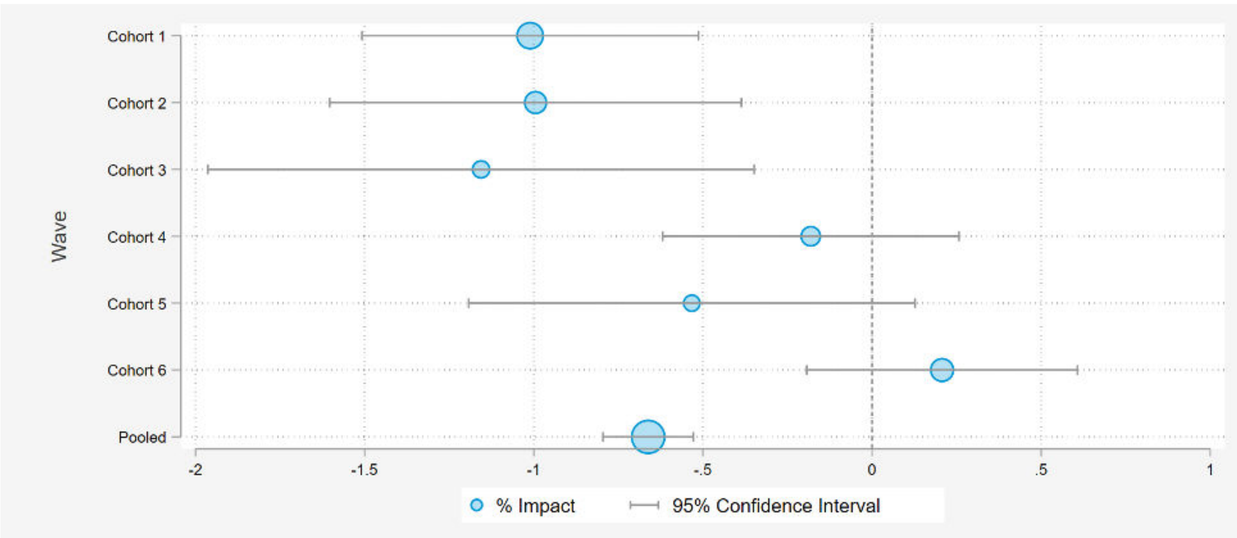
Month	Cohort 1 Unadjusted Savings (% per hh)	Cohort 2 Unadjusted Savings (% per hh)	Cohort 3 Unadjusted Savings (% per hh)	Cohort 4 Unadjusted Savings (% per hh)	Cohort 5 Unadjusted Savings (% per hh)	Cohort 6 Unadjusted Savings (% per hh)	Program Unadjusted Savings (% per hh)
January	1.41%	0.95%	1.20%	0.24%	0.90%	--	1.03%
Feb	1.37%	1.09%	1.22%	0.26%	0.62%	--	1.03%
March	1.05%	1.23%	0.82%	0.03%	0.44%	--	0.84%
April	0.87%	0.95%	0.73%	0.00%	0.33%	--	0.68%
May	1.03%	0.57%	0.96%	0.18%	0.08%	--	0.72%
June	0.83%	0.88%	1.40%	0.14%	0.34%	-0.13%	0.60%
July	0.69%	0.89%	1.23%	0.33%	0.22%	0.12%	0.60%
August	0.82%	1.07%	1.15%	0.33%	0.04%	0.08%	0.67%
Sept	0.78%	1.10%	1.28%	0.15%	0.42%	-0.02%	0.63%
October	1.23%	0.98%	1.15%	0.13%	0.67%	-0.17%	0.77%
Nov	1.32%	1.25%	1.31%	-0.06%	1.45%	-0.40%	0.83%
Dec	1.52%	1.39%	1.38%	0.16%	1.11%	-0.21%	0.99%
Annual	**1.05%**	**1.04%**	**1.20%**	**0.18%**	**0.51%**	**-0.07%**	**0.76%**

The evaluation team tested the robustness of the impacts by implementing two other common methods for estimating behavioral impacts: a panel difference-in-difference model and a classic difference-in-difference calculation. The panel difference-in-difference model uses data from both the pre and post periods and analyzed impacts via a regression model with fixed effects and time effects.

The classic difference-in-difference approach examines differences in raw averages using the same data. It compares the change observed among participants between the before and after period and nets out the change observed among controls in the before and after period.

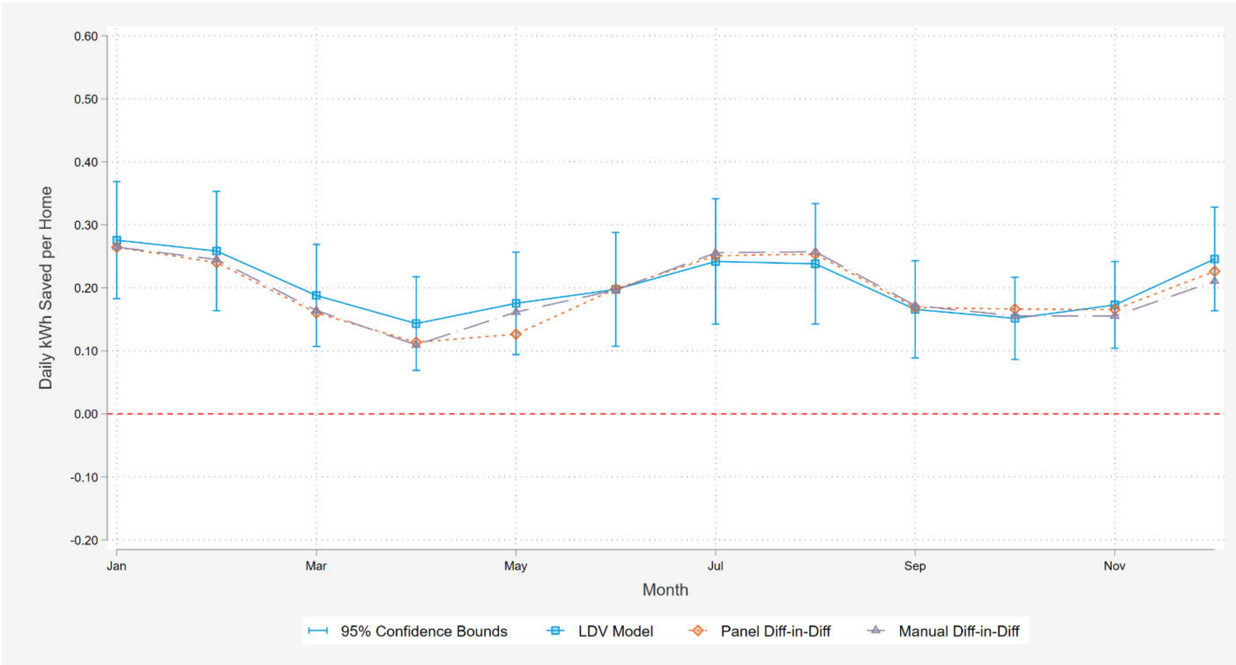
Figure 20 shows the percent savings by cohort and for all cohorts pooled using the classic difference in difference model. The size of the marker indicates the relative participant population size for each wave. The focus is on the pooled analysis, which combines the results across all the waves. The overall savings are 0.66% ± 0.06% with 95% confidence. Cohort 1, 2, and 3, the cohorts that have had time to mature, all show significant savings of about 1%.

Figure 20: Electric Percent Savings by Wave



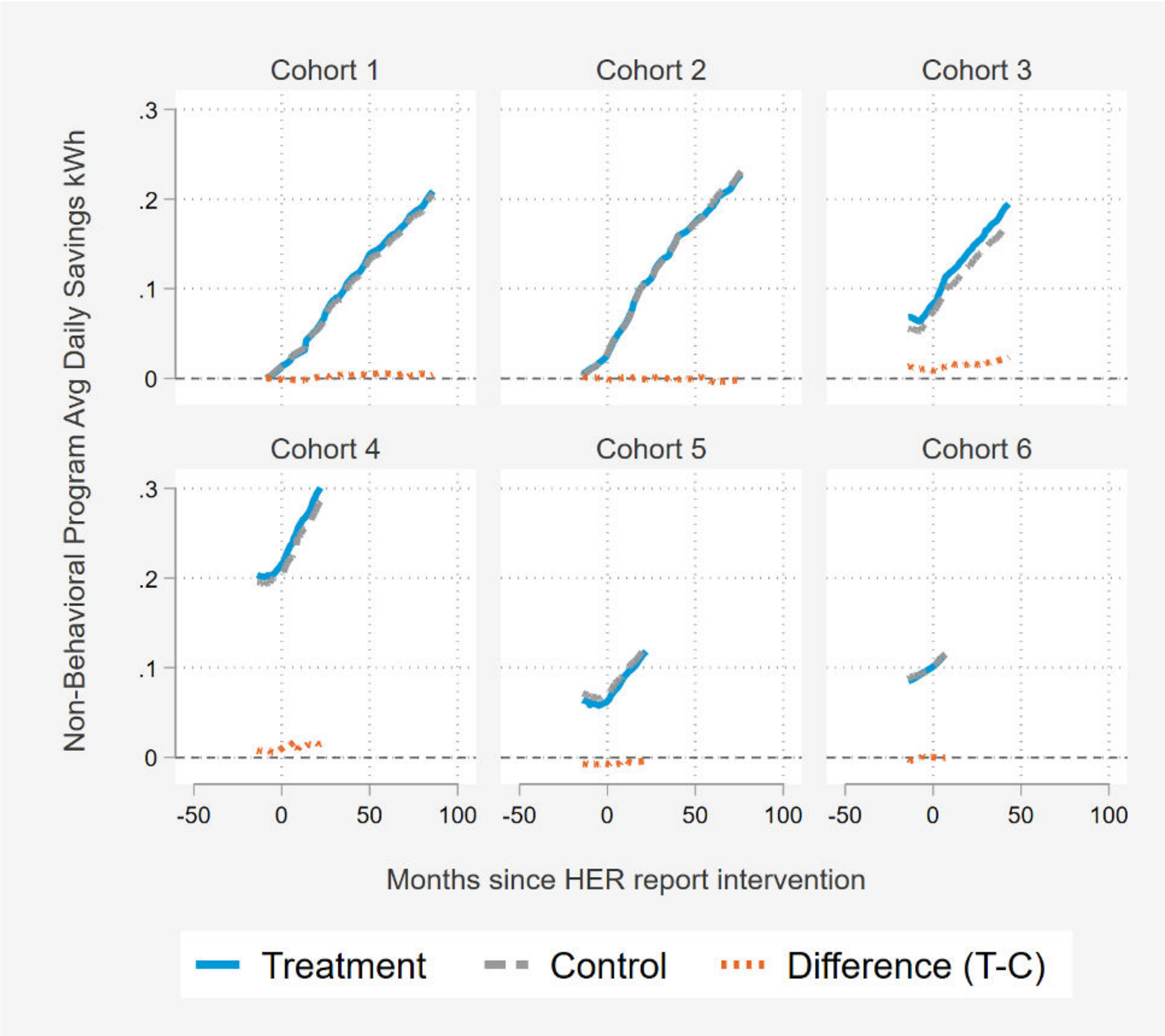
The monthly savings point estimates were very similar across the three methods for the pooled population. Figure 21 provides a comparison of the average daily savings estimates each method yields. Figure 21 also displays 95% confidence bounds for savings estimates from the lagged dependent variable (LDV) model, which is the primary model. The point estimates of the alternative modeling approaches are within the margin of error of the LDV model estimate each month. The pooled savings are also statistically significant for each month.

Figure 21: Unadjusted Savings by Month by Model Specification



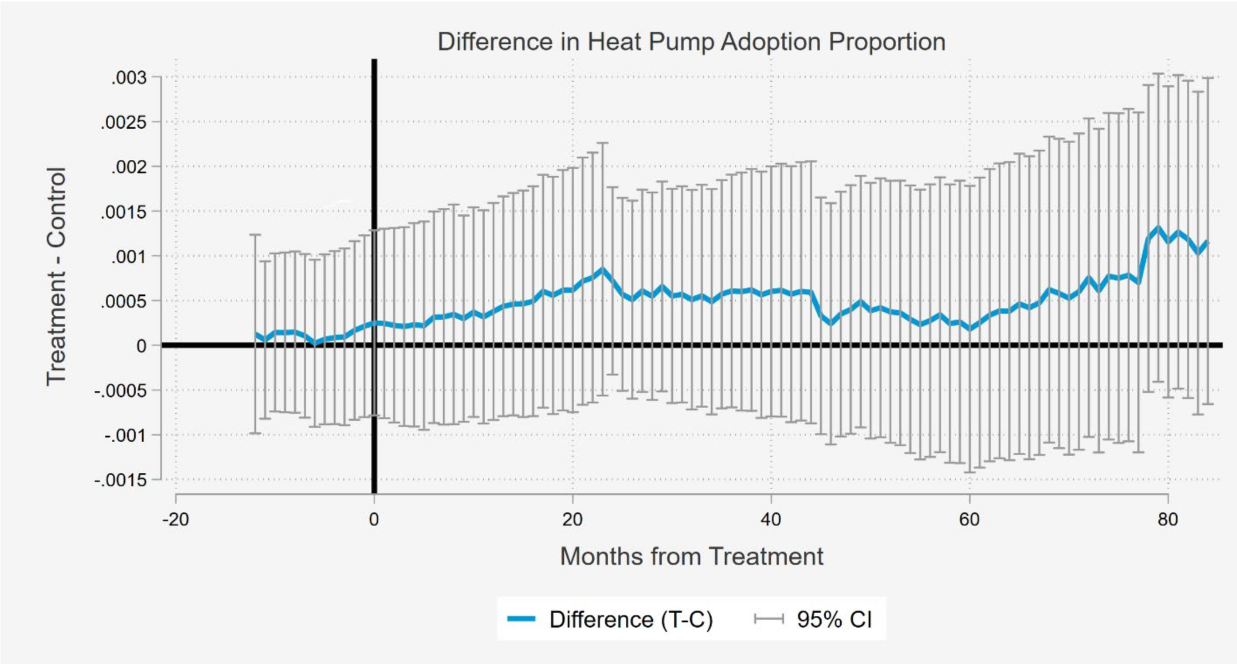
As noted earlier, HERs can boost participation in energy efficiency programs (uplift), which can lead to double counting since programs also claim the savings. To avoid double counting, we also conducted a dual participation analysis to see if there was significantly higher participation in other energy efficiency programs in the treatment group compared to the control group. Customers engage in energy efficiency through either rebate programs (downstream) or through in-store discounts (upstream). Figure 22 shows the results of the dual participation analysis for rebate programs. Both the treatment and control groups gradually accrued additional efficient installations from the start of each wave, so the average savings go up gradually over time for both groups, with a small difference occurring between the treatment and control groups. The uplift analysis led to a downward adjustment from 68.3 kWh to 65.0 kWh in the annual savings per participant, a difference of 3.2 kWh.

Figure 22: Downstream Dual Participation Analysis Output



In addition to uplift, the evaluation team examined if there was any difference between the proportion of households that installed a heat pump between those who received the HEM treatment and those who did not. The proportions of households with installs were compared for each month and cohort, and test of proportions was conducted to measure the 95% confidence intervals. If HEM treatment was impacting installations, we would expect to see similar proportions in the months before treatment, and then a positive difference in proportions afterwards. Figure 23 shows that there was no observed difference in installs before versus after treatment, and therefore the evaluation team concluded that there is no detectable heat pump uplift.

Figure 23: Difference in Adoption Rate of Heat Pumps between Treatment and Control



8.6 COMPARISON TO PRIOR PROGRAM YEARS

Table 81 compares per-customer savings from the past four program years. In PY2024, the savings were flat for the two most mature cohorts, while Cohort 3 had a relatively large increase in savings, possibly due to it fully maturing having been treated for three full years. Cohort 4 and 5 have smaller savings, but are still on the trajectory to meeting expectations, given they have been treated for only two years. Overall, the HEM program saw higher per customer impacts. This aligns with the expectation that customers' savings will increase over time with HER exposure.

Table 81: Unadjusted Ex-Post Savings by Cohort and Evaluation Year

Cohort	2021 Energy Impact Per account		2022 Energy Impact Per account		2023 Energy Impact Per account		2024 Energy Impact Per account	
	kWh Impact	% Impact	kWh Impact	kWh Impact	% Impact	% Impact	% Impact	% Impact
Cohort 1	75.29	0.73%	93.84	0.93%	112.08	1.20%	102.31	1.05%
Cohort 2	87.35	0.86%	83.88	0.83%	80.01	0.85%	101.57	1.04%
Cohort 3	n/a	n/a	20.29	0.25%	39.39	0.51%	97.06	1.20%
Cohort 4	n/a	n/a	n/a	n/a	39.59	0.32%	27.14	0.18%
Cohort 5	n/a	n/a	n/a	n/a	-8.35	-0.15%	35.77	0.51%
Cohort 6	n/a	n/a	n/a	n/a	n/a	n/a	-2.70	-0.07%

8.7 CONCLUSIONS AND RECOMMENDATIONS

PSEG Long Island's HEM program remains a significant component of PSEG Long Island's portfolio, currently reaching over 650,000 electric accounts. While home energy reports deliver small individual percentage changes in energy use, they typically yield large aggregate savings because they reach a considerable number of customers and do not require rebates or installations. In PSEG Long Island, the program yielded 4,594 MWh (or 145,329 MMBtu) of electric savings. With the adjusted expectations for per customer savings, the realization rate for the program is also substantially higher than the previous program year. Table 82 presents key findings and recommendations from the 2024 HEM evaluation.

Table 82: HEM Findings and Recommendations

Finding	Recommendation
▪ HEM saw a 137% realization rate in 2024. Since PSEG Long Island claims ex-ante savings on a per-paper report basis, the May launch lowered ex-ante claims for 2024.	▪ Instead of claiming ex-ante savings on a per-report basis, consider a per-household basis. We recommend assuming 65 kWh per treatment group household.
▪ HEM's percent savings (0.76%) are generally lower than other HER programs, but this is likely to improve as the cohorts mature.	▪ The savings rate for the mature cohorts are all at or slightly above 1%, which is closer to what could be expected from other HER programs. We recommend claiming ex-ante savings on a per-household basis rather than a per-HER basis
▪ PSEG Long Island does not claim peak demand savings for HEM.	▪ The 2024 evaluation used AMI data to estimate peak demand savings. We recommend that PSEG Long Island use an assumption of 0.016 kW/household to claim ex-ante peak demand savings in 2024.

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9 ALL ELECTRIC HOMES

PSEG Long Island's All Electric Homes Program provides approved developers and contractors rebates for building new single-family all-electric homes or for converting existing single-family homes to all-electric appliances and HVAC units. The All Electric Homes program was designed and launched in 2021 and saw its first completed project in 2022. Participation grew in 2024 to five homes, but All Electric Homes is still by far the smallest program in PSEG Long Island's portfolio. The All Electric Homes program is not part of the 2025 Energy Efficiency and Beneficial Electrification portfolio. PSEG Long Island decided to close the program based on the limited participation since program inception and upcoming changes to New York State's residential building code which will require newly built homes to have all electric systems and appliances.

9.1 ALL ELECTRIC HOMES PROGRAM DESIGN AND PARTICIPATION

The following sections detail the program design, implementation strategies, participation, and performance for the All Electric Homes program in PY2024.

9.1.1 PROGRAM DESIGN AND IMPLEMENTATION

The All Electric Homes program is an extension of New York state policy goals to reduce reliance on fossil fuel combustion appliances in homes. As the electric grid in New York becomes decarbonized, this transition from fossil fuel space heating, domestic hot water, and appliances to electricity will lower greenhouse gas emissions. New construction participants are not allowed to have fossil fuel connections in the home other than an emergency backup generator and existing home participants must disconnect their natural gas service and remove any equipment that relies on delivered fuel. The All Electric Homes program offers two participation pathways, or tiers:

- **Tier 1 Pathway**: includes cold climate air source heat pumps, tankless water heaters, and ENERGY STAR appliances and a 10% bonus on all required rebated measures.
- **Tier 2 Pathway**: includes cold climate air source heat pumps, geothermal heat pumps, heat pump water heaters, and ENERGY STAR Most Efficient appliances and a 25% bonus on all required rebated measures.

Both pathways included a $2,000 contractor bonus to stimulate the market. Electric cooking equipment like induction stoves are encouraged, but PSEG Long Island does not claim savings from cooking equipment.

TRC implements the All Electric Homes program and leverages its existing relationships with Home Comfort Partners, Home Performance Partners, and Multi-Family partners and developers to drive participation. All partners who participate in All Electric Homes have already been trained and vetted by others PSEG Long Island program to ensure customers will have a positive "All Electric" participation experience.

9.1.2 PROGRAM PARTICIPATION AND PERFORMANCE

The All Electric Homes program recorded five completed projects in 2024. Each project represents a single home. Two projects were new construction and three were major renovations of existing homes. Based on verified ex-ante estimates, the All Electric Homes program reached 95% of its energy savings goal in 2024. Table 83 presents 2024 All Electric Homes programs verified ex-ante gross MMBtu savings compared to goal.

Table 83: All Electric Homes Program Verified Ex-Ante Gross MMBtu Savings versus Goals

Metric	MMBtu
Goal	574
Verified Ex-Ante Gross Savings	543
% of Goal	95%

9.2 ALL ELECTRIC HOMES PROGRAM IMPACTS

The following sections provide the results of the impact analysis for the All Electric Homes program.

9.2.1 OVERVIEW OF IMPACTS BY RESOURCE TYPE

Table 84 shows ex-post gross MMBtu impacts by measure category. Table 85 and Table 86 show the ex-post kWh and kW impacts, respectively. Realization rates are calculated by dividing ex-post gross savings values by ex-ante gross savings values. Overall, the All Electric Homes program realized 87% of its ex-ante gross MMBtu energy savings claims. The realization rate for cooking measures is listed as "n/a" in Table 84 because no ex-ante savings were claimed, but the evaluation team used savings calculations from an induction cooktop measure in the 2026 PSEG Long Island TRM to estimate ex-post results. The electric energy realization rate was 435%. This can be attributed to the removal of LED lighting savings during ex-post. Overall, the claimed savings were negative in aggregate due to beneficial electrification. The peak demand realization rate was 79% for 2024. Section 9.2.1.1 explores the beneficial electrification impacts of the All Electric Homes program in more detail.

Table 84: 2024 All Electric Homes Program Ex-Post Gross MMBtu Impacts

Measure	N	Ex-Ante Gross Savings (Claimed)	Ex-Post Gross Savings	Realization Rate
		MMBtu	MMBtu	%
Lighting	283	33.2	0.0	0%
Heat Pump	10	441.1	441.1	100%
ENERGY STAR Appliances	34	81.6	12.4	15%
Cooking	14	0.0	19.6	n/a
Thermostats	13	8.6	12.2	142%
HPWH	5	44.4	44.4	100%
Totals[1]	**359**	**608.8**	**529.6**	**87.0%**

[1] Totals may not sum due to rounding.

Table 85: 2024 All Electric Homes Program Ex-Post Gross kWh Impacts

Measure	N	Ex-Ante Gross Savings (Claimed)	Ex-Post Gross Savings	Realization Rate
		kWh [2]	kWh [2]	%
Lighting	283	9,720	0	0%
Heat Pump	10	-14,786	-14,786	100%
ENERGY STAR Appliances	34	2,360	2,361	100%
Cooking	14	0	-2,730	n/a
Thermostats	13	2,516	3,577	142%
HPWH	5	-3,212	-3,212	100%
Totals[1]	**359**	**-3,402**	**-14,790**	**435%**

[1] Totals may not sum due to rounding.
[2] These kWh impacts include both energy efficiency (EE) and beneficial electrification (BE) components. The kWh impacts are negative measures that involve displacement of fossil fuel combustion with electricity

Table 86: 2024 All Electric Homes Program Ex-Post Gross kW Impacts

Measure	N	Ex-Ante Gross Savings (Claimed)	Ex-Post Gross Savings	Realization Rate
		kW	kW	%
Lighting	283	2.31	0.00	0%
Heat Pump	10	10.41	10.41	100%
ENERGY STAR Appliances	34	0.35	0.35	99%
Cooking	14	0.00	-0.30	n/a
Thermostats	13	0.00	0.00	n/a
HPWH	5	-0.37	-0.37	100%
Totals[1]	**359**	**12.71**	**10.10**	**79%**

[1] Totals may not sum due to rounding.

9.2.1.1 Beneficial Electrification Impacts

Table 87 shows the breakdown of Energy Efficiency (EE) and Beneficial Electrification (BE) components of MMBtu and kWh savings for measures where a BE component exists. The Heat Pump, HPWH, Appliance, and Cooking measures include a mixture of electric energy efficiency and beneficial electrification impacts.

Table 87: Breakdown of Ex-Post Gross Impacts by EE and BE Components

Measure	kWh_{ee}	kWh_{be}	kWh Total (EE - BE)	$MMBtu_{ee}$	$MMBtu_{be}$	MMBtu Total (EE + BE)
Heat Pump	9,103	23,889	-14,786	31.1	410.0	441.1
HPWH	249	3,461	-3,212	0.8	43.5	44.4
Appliances	3,329	968	2,361	11.4	1.0	12.4
Cooking	0	2,730	-2,730	0.0	19.6	19.6
Total	**12,681**	**31,048**	**-18,367**	**43.3**	**474.2**	**517.4**

9.2.2 Overview of Impacts by Disadvantaged Community and Low Income Identifiers

Table 88 shows the All Electric program ex-post Engineering impacts subdivided into four categories: 1) Non-Disadvantaged Community (DAC) & Non-Low Income, 2) DAC Only, 3) Low Income Only, and 4) DAC & Low-Income. A more detailed definition of each category can be found in the Introduction. No Low Income nor DAC impacts were claimed.

Table 88: Ex-Post Impacts with DAC and Low Income Breakouts

Category	Ex-Post Gross Savings (MMBtu)	% of Ex-Post MMBtu
Non-DAC & Non-Low Income	530	100%
DAC Only	0	0%
Low Income Only	0	0%
DAC & Low Income	0	0%
Total	**530**	**100%**

9.2.3 Key Drivers for Differences in Impacts

Table 89 discusses the factors which led to realization rates above or below 100%. Although the All Electric Homes program is not part of the 2025 portfolio, we offer recommendations for savings claims as these measures may appear in other programs.

Table 89: Key Contributors to AEH Realization Rates and Recommended Adjustments

Component	Summary of Contributing Factors	Recommendation
LED Lighting	▪ As of August 2023, only LED bulbs are legally available for sale in the United States. The lighting measure characterization for AEH has historically mirrored EEP and screw-based LED lighting was removed from EEP in August 2023. Given the new construction and major renovation nature of AEH, the evaluation team felt that savings from screw-based LED lighting should not have been eligible in 2024.	▪ Carefully monitor changes to codes and standards for key measure categories and remove savings from technologies once they become the code-minimum option in the market.
ENERGY STAR Appliances	▪ Like the 2022 & 2023 AEH evaluations, a workbook configuration error led to significantly over claimed MMBtu savings for the ENERGY STAR Refrigerator measure. The project workbook recorded 14.0 MMBtu for the measure, which is the intended EUL (14 years). The kWh and kW savings claims for the measure were unaffected by this issue.	▪ For measures that rely on deemed savings values, review the per-unit MMBtu, kWh, and kW savings values to ensure the ratios make sense and are consistent with the PSEG Long Island TRM.

Component	Summary of Contributing Factors	Recommendation
Smart Thermostats	▪ Fossil fuel EFLH assumptions were used for Smart Thermostats instead of heat pump EFLH. The increase in heating and cooling EFLH values led to 142.2% EE kWh & MMBtu realization rates for the measure.	▪ Given the large difference in average heating capacity and EFLH between fossil fuel systems and heat pumps, build a check into savings workbooks to align key parameters with the applicable heating fuel and system type.
Cooking	▪ No ex-ante savings were claimed for induction cooktops; however, the evaluation team applied savings calculations from an induction cooktop measure in the 2026 PSEG Long Island TRM to estimate ex-post results, leading to the change in realization rate.	▪ Under PSEG Long Island's MMBtu at site accounting method, the conversion of any appliance from fossil fuel to electricity should result in MMBtu savings due to the inefficiencies in thermal combustion. Request new measure characterizations from the evaluation team for technologies as they begin to appear in programs.

APPENDIX A DETAILED METHODOLOGY

A. CEP METHODOLOGY

Evaluation Methodology: Commercial Efficiency Program	
Key Considerations	• Availability of project-specific inputs in Capture queries vs. supporting workbooks for Comprehensive Lighting • Waste Heat Factors included in the results for Commercial Lighting. DNV will estimate impacts with and without WHF.
General Approach (Ex-post gross)	• Engineering calculations rooted in PSEG-LI TRM algorithms and informed by install tracking (Captures) database
Sampling Method(s)	• **Fastrack, Refrigerated Case and Multifamily Lighting:** A census of all measure installs for measures where Captures data includes all parameters • **Comprehensive Lighting:** A stratified random sample of 43 projects (90%confidence interval, and 10% relative precision) where the parameters and calculations are housed in supporting workbooks. We pulled a random sample of 11 projects for VEA based on 90/20 CI/RP. • **Multifamily Non-lighting Categories:** A combination of EEP Ex-post Evaluation by DSA for appliances, PSEG-LI TRM, and review of the sample of HVAC projects within the clean heat tool. • **Refrigeration, Motors & VFDs, Compressed Air, Refrigeration, HVAC, Nonroad Vehicle Electrification, Other Commercial Equipment and Building Operator Certification:** A census of all measure installs for measures where Captures data includes all parameters. • **Custom:** A stratified sample of 27 projects that collectively represent 57% of ex-ante MMBtu savings.
Primary Data	• Captures install tracking data for PY2024 CEP measures • Project specific pre- and post-inspection details • Clean Heat Tool for Multifamily custom measures
Secondary Sources	• New York State TRM and PSEG Long Island TRM • Lighting cut sheets and other manufacturer equipment specifications • PSEG-LI Planning documents and workbooks • New York Clean Heat Calculator Output (CEP Custom Measures, Variable Refrigerant Flow Heat Pumps)

Evaluation Methodology: Commercial Efficiency Program	
Other Evaluation Techniques	• Engineering Calculations
Opportunities for Refinement	• **Track more project-level and measure-level data in Captures** and make it available to be downloaded for evaluations • **Align with PSEG Long Island TRM** on full load heating and cooling hours, lighting operating hours and coincidence factors based on building type, savings algorithms, and savings estimation methods

B. EEP METHODOLOGY

Evaluation Methodology: Energy Efficiency Products	
Key Considerations	• Prescriptive measures with thorough tracking data • Low-to-moderate measure complexity • Moderate uncertainty of key savings parameters • High program contribution to portfolio savings • Ex-post MMBtu savings are highly skewed to two measure categories: Thermostats (69%), and Heat Pump Pool Heaters (23%).
General Approach (Ex-post gross)	• Engineering calculations rooted in PSEG-LI TRM algorithms and informed by install tracking (Captures) database
Sampling Method(s)	• Census of all measure installs
Primary Data	• Captures install tracking data for PY2024 EEP measures • Phone conversations with Long Island pool equipment contractors
Secondary Sources	• PSEG-LI Technical Reference Manuals 2023-2026 • New York State TRM v12 • ENERGY STAR Qualified Product Lists • Department of Energy Codes and Standards • Other manufacturer equipment specifications • PSEG-LI Planning documents and workbooks
Net-to-Gross Approach	• Stipulated NTG ratios
Other Evaluation Techniques	• Regression analysis, deemed savings used for certain measures

Evaluation Methodology: Energy Efficiency Products	
	• Diverged from TRM algorithm when enough data is available • Assumed baseline is federal standard for end-of-life replacement measures
Opportunities for Refinement	• Conduct primary research into thermostat and heat pump pool heater net-to-gross ratios • Capture ES IDs consistently and thoroughly, especially for heat pump water heaters

C. HOME COMFORT METHODOLOGY

Evaluation Methodology: Home Comfort	
Key Considerations	• Beneficial Electrification measures result in an increase in site-level electric consumption by displacing fossil fuel systems, which typically result in negative MWh savings for those measures.
General Approach (Ex-post gross)	• Engineering calculations are rooted in the PSEG-LI TRM algorithms and informed by install tracking (Captures) database.
Sampling Method(s)	• Census of all measure installs • Stratified random sample of GSHP measures
Primary Data	• Captures install tracking data for PY2024 Home Comfort measures
Secondary Sources	• New York State TRM and PSEG Long Island TRM • Department of Energy Codes and Standards • Other manufacturer equipment specifications • PSEG-LI Planning documents and workbooks • Northeast/Mid-Atlantic Air-Source Heat Pump Market Strategies Report 2016 Update • NYSERDA Heat Pump Study: "Analysis of Residential Heat Pump Potential and Economics" -May 2019
Other Evaluation Techniques	• Engineering Calculations
Opportunities for Refinement	• **Align with PSEG-LI TRM** on non-Quality Install savings algorithms, full load heating and cooling hours, savings algorithms, and savings estimation methods

Evaluation Methodology: Home Comfort	
	• **Track preexisting boiler and furnace heating system data** to improve accuracy of ex-ante savings • **Adopt deemed savings values** that vary based on the HVAC equipment controlled by the thermostats

D. HOME PERFORMANCE METHODOLOGY

Evaluation Methodology: Home Performance	
Key Considerations	• Beneficial Electrification measures result in an increase in site-level electric consumption by displacing fossil fuel systems, typically resulting in negative kWh and kW savings for those measures • Impact Evaluation values are a combination of engineering calculations and consumption analysis
General Approach (Ex-post gross)	• Engineering calculations rooted in PSEG-LI TRM algorithms and informed by install tracking database (Captures). Consumption calculations were rooted in participant billing data and used to estimate kWh energy efficiency realization rates • Ex-post gross kWh energy efficiency savings were calculated by applying consumption analysis realization rate to EE savings. Ex-post gross kWh beneficial electrification impacts were calculated from engineering analysis • Ex-post gross kW and MMBtu savings were calculated using kW/kWh and MMBtu/kWh ratios from engineering calculations applied to ex-post gross kWh savings derived from the consumption analysis
Sampling Method(s)	• Engineering calculations applied a sample of 68 projects across all measure categories. Ex-post results are estimated from 2026 PSEG-LI TRM savings methodologies with project documentation review to verify savings inputs. Realization rates are calculated for each measure category (duct sealing, air sealing, envelope, ducted air-source heat pumps, ductless mini-split heat pumps, thermostats, and domestic hot water systems) and applied to ex-ante MMBtu, MWh, and kW savings for category • The consumption analysis includes an attempted census of HPwES participants that did not install BE measures.
Primary Data	• Captures install tracking data for PY2024 Home Performance measures and related project documents • Hourly AMI data from 2023 Home Performance participants

Evaluation Methodology: Home Performance	
Secondary Sources	• New York State and PSEG-LI Technical Reference Manuals • Department of Energy Codes and Standards • Other manufacturer equipment specifications • PSEG-LI Planning documents and workbooks
Net-to-Gross Approach	• Heat Pump NTG developed in the 2022 EEP and Home Comfort participant survey efforts • Stipulated NTG ratios for all other measures
Other Evaluation Techniques	• Engineering Analysis • Consumption Analysis using participant matching and fix effects panel linear regression model
Opportunities for Refinement	• Ensure savings estimates align with the HVAC systems installed on site. Projects with air conditioners and heat pumps should have cooling-based electricity and demand savings • Increase scrutiny on heat pump system details such as primary or supplemental designation, associated controls, and application of site calculated heating and cooling loads from Manual J in place of system capacities • Focused effort on tracking measure-level parameters in Captures: specifically, CFM values and conditioned square footage for air and duct sealing projects; HVAC system type; and fuel type.

E. REAP METHODOLOGY

Evaluation Methodology: Residential Energy Affordability Partnership Program	
Key Considerations	• In prior years, the REAP evaluation was a combination of engineering calculations and consumption analysis. For PY2024, we removed the consumption analysis • MMBtu savings were dominated by smart thermostat measures, and MWh and MW savings were dominated by lighting measures
General Approach (Ex-post gross)	• Engineering calculations rooted in PSEG-LI TRM algorithms and informed by audit and measure information stored in the Captures database. These calculations were used to calculate MMBtu to kWh and kW to kWh ratios.
Sampling Method(s)	• Census of all projects from the measure categories that comprised 95% of program savings
Primary Data	• Captures install tracking data for PY2024 REAP participants

Evaluation Methodology: Residential Energy Affordability Partnership Program	
Secondary Sources	• PSEG-LI Technical Reference Manuals 2021-2026 • New York State and PSEG-LI Technical Reference Manuals • Department of Energy Codes and Standards • Other manufacturer equipment specifications • PSEG-LI Planning documents and workbooks
Net-to-Gross Approach	• Stipulated NTG ratio of 100% for REAP due to the income-qualified program design
Other Evaluation Techniques	• Engineering Analysis
Opportunities for Refinement	• Align baseline and installed wattage values with the assumptions in the PSEG-LI TRM • Leverage the DHW fuel type collected by auditors to calculate either electric or fossil fuel savings rather than an assumed blend of the two

F. ALL ELECTRIC HOMES METHODOLOGY

Evaluation Methodology: All Electric Homes	
Key Considerations	• Heating and cooling load of the home as specified in the contractor's Manual J calculations and efficiency of installed heat pump system. • HVAC interactive effects on heat pump water heater measures given the all-electric home construction.
General Approach (Ex-post gross)	• Engineering analysis similar to other residential programs. Ground source heat pump calculations mirror Home Comfort. The LED lighting, appliance, connected thermostat, and HPWH measure calculations mirror their EEP counterparts.
Sampling Method(s)	• No sampling required. Detailed review of the five AEH projects completed during the 2024 program year.
Primary Data	• Program tracking data from the Captures system • TRC measure workbook • Contractor invoices and Manual J calculations • Manufacturer specification sheets
Secondary Sources	• ENERGY STAR Qualified Products List • New York State TRM and PSEG Long Island TRM

Evaluation Methodology: All Electric Homes	
Net-to-Gross Approach	• Net-to-gross factors for heat pumps and HPWH are based on the results of 2022 EEP and Home Comfort participant survey efforts. ENERGY STAR appliances and connected thermostats NTG factors come from previous EEP program analysis.
Other Evaluation Techniques	• Long Island market baseline blend of space heating and domestic water heating assumed for baseline fuel and efficiency blend.
Opportunities for Refinement	• Inclusion of savings for electric induction cooktop • Removal of savings for LEDs • Include a flag for zoned HVAC systems to allow for multiple thermostats controlling a single condensing unit without double-counting the capacity.

G. HOME ENERGY MANAGEMENT METHODOLOGY

The primary challenge of an impact evaluation is the need to accurately detect changes in energy consumption while systematically eliminating plausible alternative explanations for those changes, including random chance. Did the introduction of HERs cause a decrease in customer energy consumption? Or can the differences be explained by other factors? To estimate energy savings, it is necessary to estimate what these patterns would have been in the absence of treatment—this is called the counterfactual. At a fundamental level, the ability to measure energy reductions accurately depends on four key components:

1. **The effect or signal size:** The effect size is most easily understood as the percentage change. It is easier to detect large changes than it is to detect small ones. For most HER programs, the expected impact is between 0.5% and 2.5%, a relatively small effect.
2. **Inherent data volatility or background noise:** The more volatile a customer's billing data is from month to month (or bimonthly billing period), the more difficult it is to detect small changes.
3. **The ability to filter out noise or control for volatility:** At a fundamental level, statistical models, baseline techniques, and control groups—no matter how simple or complex—are tools to filter out noise (or explain variation) and allow the effect or impact to be more easily detected.
4. **Population size:** It is easier to estimate average impacts for a large population than a small one because individual customer behavior patterns smooth out and offset across large populations.

Approach Overview

Because the expected percent reduction from HERs is typically small (i.e., less than 5%), we ensure accurate results by following these principles:

1. **Verify that participant and control customers had similar usage before the introduction of HERs.** By design, randomized control trials ensure that the only systematic difference between the two groups is that one receives the HER and one does not. However, random assignment is sometimes not implemented correctly or maintained. Thus, we compare the treatment and control groups across a host of characteristics—electricity use, location, etc.—in order to ensure the implementer did indeed randomly assign customers to the treatment and control groups.
2. **Include at least one year of pre-treatment data and post-treatment data for both HER and control groups.** The pre-treatment data is useful for assessing if energy consumption changed and allows the evaluation team to use more powerful statistical techniques such as difference-in-differences and lagged dependent variable models. If HERs reduce consumption, we should observe a change in consumption for customers who received the HER treatment but no similar change for the control group. Thus, participant and control customers that lacked pre-intervention data were not included in the analysis. For Cohort 6, we used the 7 months after treatment in 2024 as the post period.
3. **Ensure sample sizes large enough to detect meaningful differences.** If sample sizes are too small, it is not possible to distinguish meaningful differences from random noise. When evaluated on their own, each wave tends to have wider confidence bands (i.e., they lack statistical power). Thus, this study's focus is on the overall program savings rather than on the savings delivered by specific waves.
4. **Apply the same data management procedures to both the HER and control groups.** Because of random assignment, data management decisions should impact the treatment and control group similarly.
5. **Pre-specify the analysis method and segmentation in advance of the study.** This required documenting the hypothesis, specifying the intervention, randomly assigning customers to treatment and control conditions, establishing the sample size and the ability to detect meaningful effects, identifying the data that will be collected and analyzed, and identifying the outcomes that will be analyzed.
6. **Ensure impacts are robust.** Impacts can be estimated using both a difference-in-difference approach and by using a post-only model. A difference-in-difference approach compares energy usage before and after the intervention for both the participant group and the control group and net out any pre-existing differences. A post-only model leverages data from the pre-treatment period as an explanatory variable, but only includes observations from the

post-treatment period in the regression. In the evaluation, we estimated impacts using both approaches in order to ensure the different methods did not produce significantly different results.

MODEL SPECIFICATION

DSA used the lagged dependent variable (LDV) model to estimate ex-post impacts. The LDV model is a "post-only" model because only observations from the post-treatment period are included in the regression. However, as its name suggests, the LDV model does leverage data from the pre-treatment period as an explanatory variable.

The formal model specification is shown in Equation 1 below with additional detail on the terms provided in Table 90.

Equation 1: LDV Model Equation to Estimate HEM Ex-Post Impacts

$$Daily\ Use_{im} = \beta_0 + \beta_{1m} * AvgPre_{im} + \beta_{2m} * CDD_m + \beta_{3m} * HDD_m + \tau_m * \mathrm{treatment}_{im} + \sum_{m=1}^{12} \beta_4 * m + \varepsilon_{im}$$

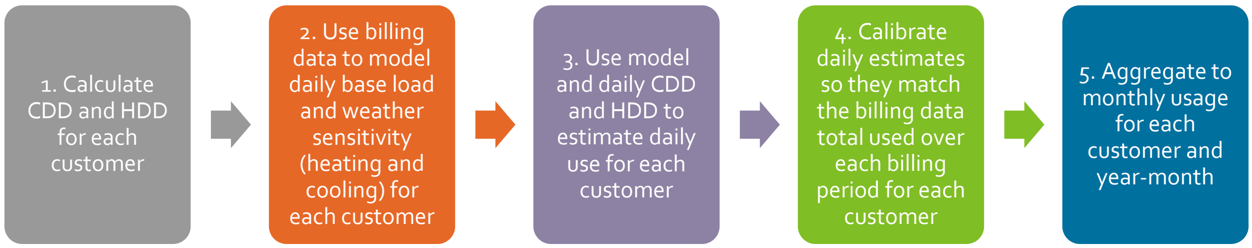
Table 90: Lagged Dependent Variable Model Definition of Terms

Variable	Definition
$\mathrm{Daily}\ Use_{\mathrm{im}}$	Customer i's average daily usage in bill month m.
β_0	Intercept of the regression equation.
β_{1m}	Coefficient explaining any variation that occurs as a result of pre-treatment usage for month m.
$AvgPre_{im}$	Average daily usage for customer i in the pre-treatment period for month m.
β_{2m}	Coefficient explaining any variation that occurs as a result of average monthly CDD for month m.
CDD_m	Difference between average temperature and 60 for month m.
β_{3m}	Coefficient explaining any variation that occurs as a result of average monthly HDD for month m.
HDD_m	Difference between 60 and average temperature for month m.
$\mathrm{treatment}_{\mathrm{im}}$	The treatment indicator variable. Equal to one when the treatment is in effect for the treatment group. Zero otherwise. Always zero for the control group.
τ_m	The estimated treatment effect in kWh per day per customer; the main parameter of interest.
β_4	Coefficient for Year Month Variable.
m	Year month indicator.
$\varepsilon_{\mathrm{im}}$	The error term.

Calendarizing Billing Data

The time of the month when customer meters are read and the number of days between billing statements varies. Thus, we prorated billing data into a standard calendar month basis. The process of converting bills to usage is known as calendarization. Figure 24 summarizes the process employed to calendarize the data.

Figure 24: Calendarization of Billing Data



Opt Outs and Attrition

Over time, some homes assigned to the HER program will close their accounts with PSEG Long Island. The most common reason for this is that the occupant is moving, but other possibilities exist. This account churn happens at a predictable rate and can be forecasted with some degree of certainty. It is also completely external to the program, so there is no reason to suspect that it happens differently in the treatment and control when the groups were randomly assigned. The analysis includes all active accounts for a given month and all participation counts used to calculate aggregate savings. Once an account closes, there will no longer be consumption records in the billing data set, so the home is removed naturally from the analysis without requiring any special steps.

Treatment group homes are allowed to opt-out of receiving HER mailings if they choose. Typically, only a small proportion of the treatment group exercises this option. Those who opt out must not be removed from the analysis because doing so could compromise the randomization (control group homes do not opt-out).

Uplift Analysis

Exposure to behavioral program messaging often motivates participants to take advantage of other energy efficiency and beneficial electrification programs. This creates a situation where the treatment group participates in other programs at a higher rate than control group homes. To avoid double counting these impacts, our team calculated savings from program uplift and subtracted them from the aggregate savings.

For downstream programs where participation is tracked at the account level, dual participation was calculated using the following steps:

1) Match the energy efficiency and beneficial electrification program tracking data to the treatment and control homes.
2) Assign each transaction to a month based on the participation date field in the tracking data.
3) Exclude any installations that occurred before the home was assigned to the treatment or control group.
4) Calculate the daily kWh savings of each efficient measure. This value is equal to the reported kWh savings of the measure divided by 365.
5) Sum the daily kWh impact, by account, for all measures installed prior to a given month.
6) Calculate the average kWh savings per day for the treatment and control groups by month. Multiply by the number of days in the month.
7) Calculate the incremental daily kWh from energy efficiency (treatment – control). The evaluation team subtracted this value from the treatment effect determined via regression analysis prior to calculating gross verified savings for behavioral programs.

Upstream programs present a unique challenge for dual participation analysis because participation is not tracked at the customer level and therefore cannot be tied back to treatment and control group homes for comparison. While incremental uptake of upstream measures by the treatment group has been observed in multiple studies, the size of the effects that are typically subtracted is disproportionate to the evaluation resources required to estimate it.

Table 91 provides default values that can be used to calculate a dual participation adjustment factor for upstream offerings. To account for the growing separation between the treatment and control groups over time, **Error! Reference source not found.** relies on a conditional lookup based on the number of years since cohort inception to calculate the reduction factor.

Table 91: Default Upstream Adjustment Factors[8]

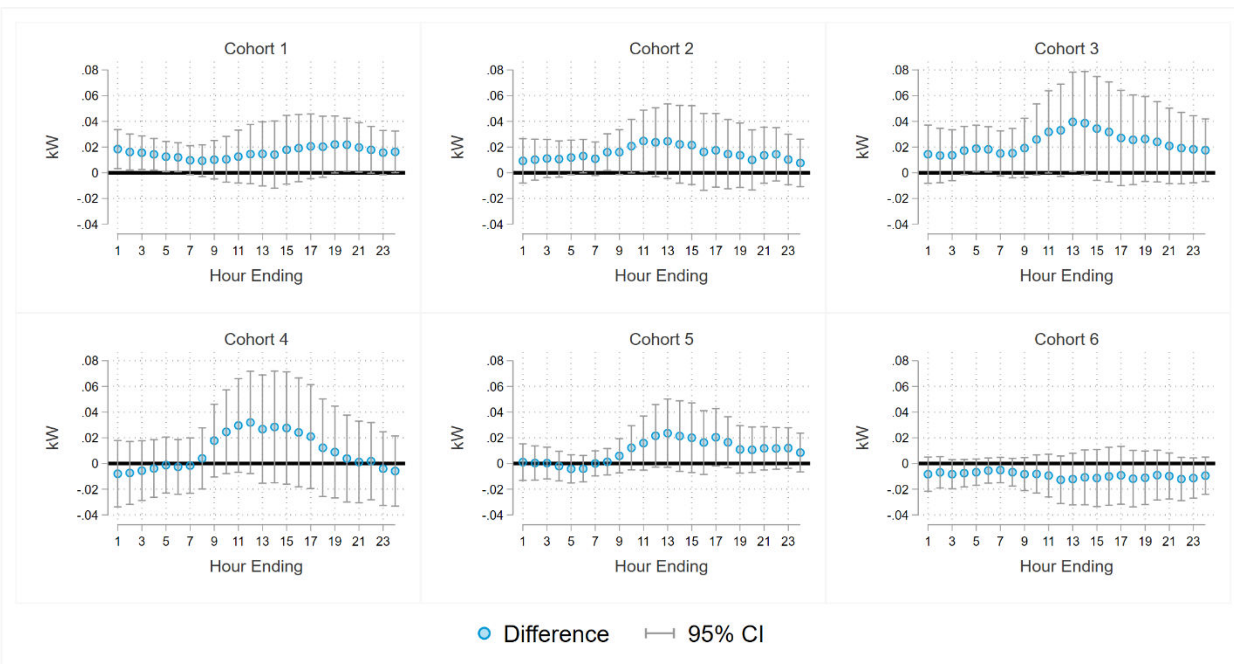
Years Since Cohort Inception	Default Upstream Reduction Factor
1	0.75%
2	1.5%
3	2.25%
4 and beyond	3.0%

[8] Default values were developed via a review of two studies that used primary data collection with large sample sizes to estimate a dual participation adjustment for upstream lighting. A 2012 PG&E evaluation found values larger than those in this table.
http://www.calmac.org/publications/2012_PGE_OPOWER_Home_Energy_Reports__4-25-2013_CALMAC_ID_PGE0329.01.pdf A 2014 Puget Sound evaluation found values lower than those in this table. https://conduitnw.org/_layouts/Conduit/FileHandler.ashx?RID=2963.

PEAK DEMAND REDUCTION ANALYSIS

While no kW demand savings were claimed for HEM during the program year, we assessed the kW demand reduction for the program as a part of the ex-post analysis. The demand reduction analysis utilized hourly metered household data (referred to here as advanced metering infrastructure or AMI data) to estimate demand reduction for HEM customers at the hourly level. As no pre-treatment AMI data was available, we utilized a simple difference in means comparison, which examined differences in raw averages between the treatment and control groups for each hour. For this analysis, we defined peak demand as hour-ending 4-5 PM and looked at customer demand reductions for the top 20 system load days in 2024. Figure 25 depicts the average raw differences between the treatment and control group for each hour and each wave on the top 20 system load days from 2024. While there is a clear directionality in the difference between the treatment and control group, the differences overall are very small and not statistically significant. We can also see that the shape of the savings differs for each wave. Cohort 1 and 2 savings are flatter, with slightly higher savings in the morning and evening while both Cohort 3 and Cohort 4 savings are higher overall and concentrated in the middle of the day.

Figure 25: HEM Hourly Demand Reduction on Peak Summer Days



H. CONSUMPTION ANALYSIS METHODOLOGY FOR HOME PERFORMANCE

The consumption analysis compares energy usage before and after the implementation of energy efficiency upgrades. For the 2024 evaluation, we employed a matched control design to address potential selection bias. Specifically, households that received only Home Energy Assessment (HEA) kits served as the control group, while those participating in the Home Performance with ENERGY STAR program were classified as treated. This design assumes that HEA-only recipients provide an appropriate baseline for isolating the effects of the comprehensive HPwES upgrades, as focusing on HEA participants likely mitigates selection bias—these customers, by virtue of receiving the assessment, tend to be more similar in motivation and behavior to those who choose to install actual upgrades. Detailed steps regarding the preparation of billing data and the selection of the matched control group are presented in subsequent sections.

AMI Data Cleaning

We lean on Advanced Metering Infrastructure (AMI) data for comprehensive and accurate consumption analysis, as it provides more granular data than monthly bills and allows us to create regression models with more explanatory power. This approach was like 2023 and represents a methodological enhancement compared to the monthly billing data used for prior Home Performance consumption analyses.

To ensure the accuracy and relevance of our data for analysis, we follow a series of steps to clean the AMI data.

1. **Adjust for Daylight Savings:** We check and adjust the data for daylight saving time changes to ensure that the time stamps accurately reflect actual usage periods and avoid misinterpreting consumption patterns.

2. **Collapse Data to Daily Intervals:** The data is initially in 15-minute intervals, then collapsed into daily intervals. This reduction in data granularity simplifies analysis while still capturing detailed consumption trends.

3. **Drop Missing kWh Readings:** Missing kWh readings are removed as they may indicate periods of non-usage or data errors, which could distort the analysis of energy efficiency impacts.

4. **Filter by Program Participation:** Only data from customers exclusively involved in HEA and HPwES programs are retained. This eliminates any confounding effects from participants engaged in multiple programs, such as Home Comfort, ensuring a clean and focused analysis of the targeted energy efficiency interventions.

Matching

In 2024, we elected to use propensity score matching process to create comparable treatment and control groups. Below is a summary of that process for our analysis:

Data Preparation
We started by cleaning and refining our dataset. This involved:

- **Data Quality Filtering**: Removed observations with insufficient pre- or post-intervention data and records missing key variables such as weather sensitivity coefficients, consumption metrics, and performance measures.

- **Integrating Additional Information**: Merged supplementary program details (e.g., participation indicators) to enrich the dataset.

- **Temporal and Contextual Filtering**: Generated a 'year' variable from billing dates and applied filters to include only observations up to 2023 for the control group, while excluding post-intervention data for the treated group.
- **Feature Creation**:
  - Identified holidays and flagged each day as either "Weekday" or "Weekend."
  - Extracted the month from the date and combined it with the day type to create a composite grouping variable, capturing both the day of the week and the month for more nuanced matching.

Defining Matching Models

We implemented propensity score matching to pair treated homes (HPwES participants) with control homes (HEA-only participants). This process included:

- **Feature Selection and Segmentation:** Homes were first "hard-matched" within the same three-digit ZIP code to control for regional climate and housing stock effects.
- **Estimated Propensity Scores:** Within each ZIP-3 segment, we ran logistic regressions predicting program participation using a range of household and weather-sensitivity characteristics. We tested multiple specifications—including raw and normalized annual consumption, binned consumption quantiles, cooling- and heating-degree-day coefficients, and model fit statistics (adjusted R^2)—to see which covariate set best balanced treated and control groups.
- **Evaluated and Selected the Best Model:** We compared match quality across all specifications using bias and fit metrics (MAE, MAPE, percent bias, etc.) and chose the model that yielded the lowest absolute bias and best overall balance before proceeding with outcome analysis.

Finalizing the Matched Sample

After matching, we retained only well-paired observations, yielding a final matched dataset. This approach allowed us to robustly compare treated and control groups, ensuring that differences in outcomes can be more confidently attributed to the program intervention rather than pre-existing differences between the homes.

Figure 26 displays the distribution of annual, weather-normalized consumption for two groups before any matching: households that only received a Home Energy Assessment (HEA) and those that participated in Home Performance with ENERGY STAR (HPwES). Although some differences exist, both histograms exhibit broadly similar shapes and central tendencies, indicating that the two groups had comparable overall usage ranges prior to matching.

Figure 27 shows the average monthly consumption (kWh) of the HPwES (treated) and HEA (control) during pre-period after applying the propensity score matching procedure. While the lines are not perfectly overlapping, they track closely throughout the pre-participation periods, illustrating strong alignment. Any residual discrepancies in pre-treatment usage are accounted for in the subsequent regression model, ensuring that the measured post-participation impacts can be attributed more confidently to the program itself.

Figure 26: Distribution of Annual Consumption Prior to Matching, Home Performance

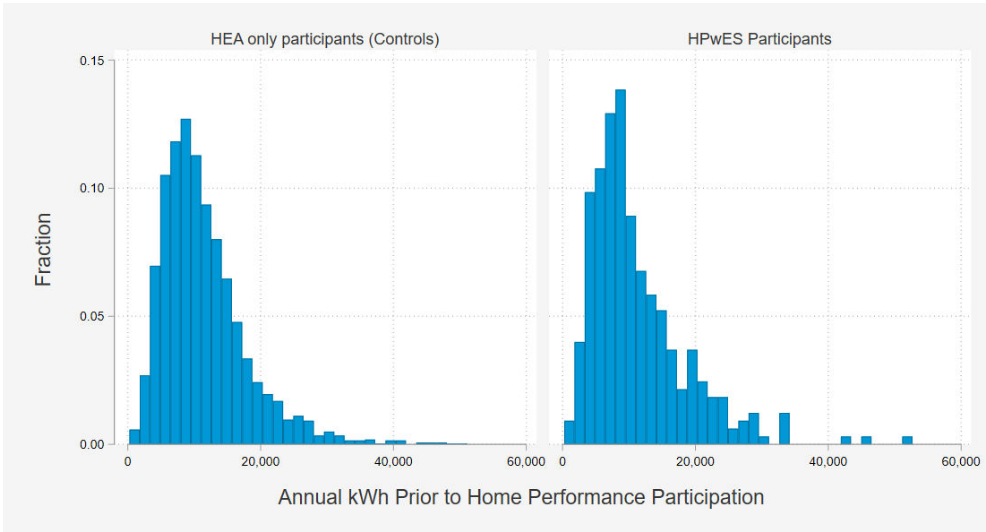
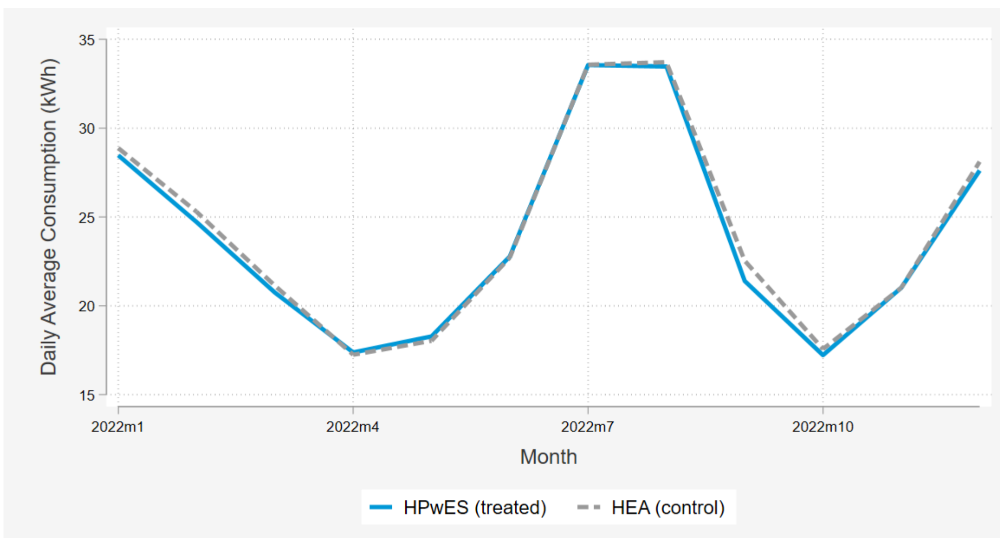


Figure 27: Average Monthly Usage of Treatment and Comparison Groups (kWh), Home Performance



Impact Analysis

We use a weather-normalized linear fixed effects panel regression to analyze energy consumption. In a fixed effects framework, each household's time-invariant characteristics are captured by assigning a unique intercept to every account in both the treatment and comparison groups. Equation 2 details the full model specification.

Treatment Effect

The treatment effect measures the change in daily energy consumption associated with program participation. To account for weather, the model includes interactions between the treatment-post indicator and both cooling degree days (CDD) and heating degree days (HDD). The CDD and HDD values are based on NOAA's 1991–2020 climate normals.

Annualizing Savings

After estimating the regression coefficients, the annual energy savings are calculated by summing three components:

1. The treatment-post coefficient multiplied by the number of days in a year.
2. The interaction coefficient between treatment-post and CDD multiplied by the total annual CDD.
3. The interaction coefficient between treatment-post and HDD multiplied by the total annual HDD.

Equation 2: Linear Fixed Effects Regression Model Specification

$$\mathrm{kWh}_{\mathrm{it}} = \beta_0 + \beta_1 * Post_{it} + \beta_2 * CDD_t + \beta_3 * TreatPost_{it} * CDD_t + \beta_4 * HDD_t + \beta_5 * TreatPost_{it} * HDD_t + \beta_6 * TreatPost_{it} + \beta_7 * DOW_{it} + \varepsilon_{\mathrm{it}}$$

Table 92 defines the terms and coefficients used in this equation. By incorporating both time-invariant household effects and weather-related variables, the model isolates the impact of program participation on daily energy use and provides a clear framework for calculating annualized energy savings.

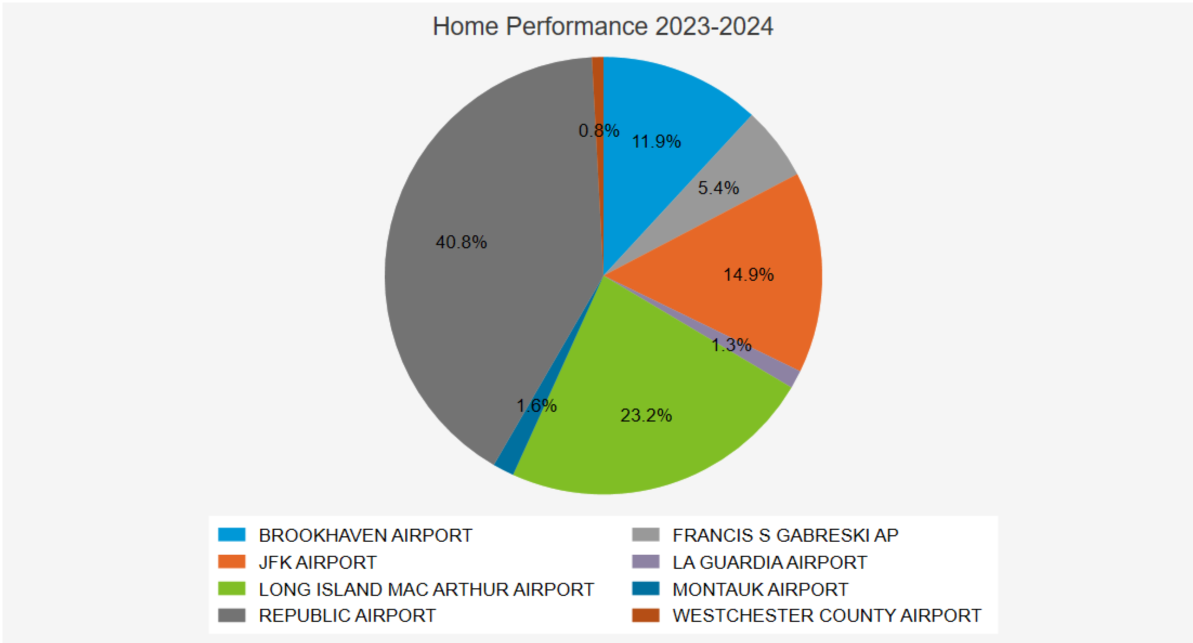
Table 92: Regression Model Parameter Definitions

Variable	Definition
$\mathrm{kWh}_{\mathrm{it}}$	Customer i's average daily electric usage in day t.
β_0	The intercept term for customer i, or the "fixed effect" term. Equal to the mean daily energy use for each customer.
$\mathrm{Post}_{\mathrm{it}}$	An indicator equal to one if customer i participated in the program prior to day t and zero otherwise. Coding of the post term for each member of the comparison group mirrors its matched participant.
β_1	The coefficient on the post indicator variable. This variable captures the change in consumption in the matched control group during the post-period due to exogenous factors such as the COVID-19 pandemic.
CDD_t	The average daily cooling degree days at base 60 degrees (F) for the nearest weather station in day t
β_2	The coefficient on the cooling degree day variable.

Variable	Definition
β_3	The coefficient on the interaction between cooling degreed day and the post indicator. This captures weather-related factors driving customer consumption behavior during the summer months.
HDD_t	The average daily heating degree days at base 60 degrees (F) for the nearest weather station in day t
β_4	The coefficient on the heating degree day variable.
β_5	The coefficient on the interaction between cooling degreed day and the post indicator. This captures weather-related factors driving customer consumption behavior during the winter months.
$\mathrm{TreatPost}_{\mathrm{it}}$	The indicator variable for post-period of treatment customers. Equal to one for the participant group in the post period, zero for the participant group in the pre-period, and zero for the matched control group.
β_6	The estimated treatment effect in kWh per day; the main parameter of interest. The change in daily kWh consumption attributable to program participation.
DOW_{it}	A set of indicator variables for the day of the week.
β_7	The coefficient on the day of week indicator variables. This captures day-specific factors driving consumer consumption behavior.
$\varepsilon_{\mathrm{it}}$	The error term.

The Evaluation Team used service zip code to map each participating household to one of eight weather stations. Figure 28 shows the distribution of participants across the weather stations.

Figure 28: Weather Station Mapping



Annual Savings Estimate for Home Performance

Our analysis indicates that Home Performance participants achieved an estimated annual energy savings of 198.36kWh, with a 95% confidence interval ranging from -72.76 kWh/year to 469.49 kWh/year. These results are visualized in Figure 29, via prediction for how the HPwES treated participants will behave when compared to the non-HPwES participants, while Figure 30 presents the detailed regression output for the Home Performance models.

Key Regression Terms

1. **TreatPost:** Represents the change in average daily consumption for the treatment group after participation.
2. **TreatPost × CDD:** Shows how the change in daily consumption is affected by summer weather (cooling degree days).
3. **TreatPost × HDD:** Shows how the change in daily consumption is affected by winter weather (heating degree days).

The inclusion of cooling and heating degree day coefficients ensures that the reported savings are appropriately weather-normalized.

Figure 29: Home Performance Consumption Analysis Results Visualized

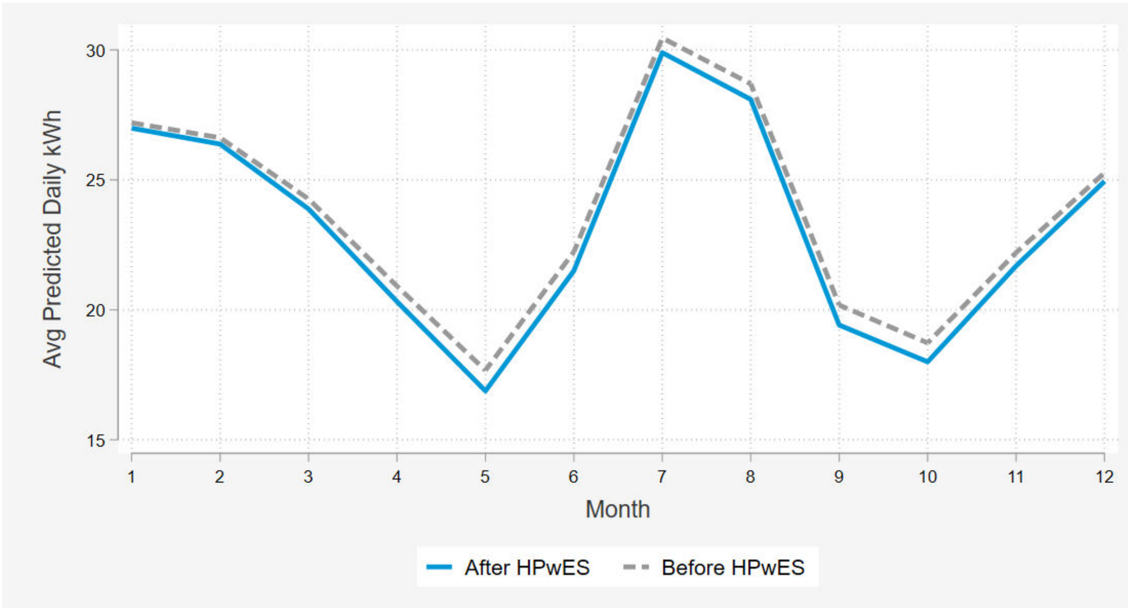


Figure 30: Regression Output – Home Performance

```
Linear regression, absorbing indicators            Number of obs     = 379,719
Absorbed variable: account                         No. of categories =     492
                                                   F(14, 521)        =  107.20
                                                   Prob > F          =  0.0000
                                                   R-squared         =  0.5333
                                                   Adj R-squared     =  0.5327
                                                   Root MSE          = 12.7025

                                        (Std. err. adjusted for 522 clusters in id)
```

daily_kwh	Coefficient	Robust std. err.	t	P>|t|	[95% conf.	interval]
post	.2501383	.3478265	0.72	0.472	-.4331764	.933453
1.treatpost	-.8300894	.5977076	-1.39	0.165	-2.004303	.3441238
daily_cdd65	1.511221	.0533959	28.30	0.000	1.406323	1.616118
treatpost#c.daily_cdd65						
1	.0273519	.0875305	0.31	0.755	-.1446041	.199308
daily_hdd60	.3858081	.0328762	11.74	0.000	.3212219	.4503943
treatpost#c.daily_hdd60						
1	.0219553	.0586372	0.37	0.708	-.0932391	.1371497
dow						
1	-.9463662	.111214	-8.51	0.000	-1.164849	-.7278831
2	-1.06602	.1302189	-8.19	0.000	-1.321839	-.8102017
3	-1.22193	.1302689	-9.38	0.000	-1.477847	-.9660131
4	-1.132397	.1305573	-8.67	0.000	-1.388881	-.8759139
5	-.978601	.1255473	-7.79	0.000	-1.225242	-.7319598
6	-.268712	.0906432	-2.96	0.003	-.446783	-.090641
post#c.daily_cdd65						
1	-.1314494	.0553969	-2.37	0.018	-.2402783	-.0226206
post#c.daily_hdd60						
1	-.0297678	.0339812	-0.88	0.381	-.0965249	.0369892
_cons	17.62679	.3170909	55.59	0.000	17.00386	18.24973

APPENDIX B COST EFFECTIVENESS EX-POST NET TABLES

Table 93: Commercial Ex-Post Net Data for Cost Effectiveness

Resource	End Use	Measure	Ex-Post Gross Savings	Net-to-Gross Ratio	Line Loss Factor	Ex-Post Net
MMBtu	Lighting	Comprehensive Lighting	116,155	67%	1.00	77,498
		Fast Track Lighting	30,028	67%	1.00	20,035
		Refrigerated Case Lighting	968	67%	1.00	646
		Lighting Subtotal	**147,151**			**98,179**
	Multi-Family	Multi-Family	37,204	100%	1.00	37,204
	Standard	Refrigeration	3,507	72%	1.00	2,509
		Motors & VFDs	1,737	72%	1.00	1,243
		Compressed Air	3,201	72%	1.00	2,290
		Nonroad Vehicle Electrification	8,509	72%	1.00	6,088
		Other Comm. Equipment	53	72%	1.00	38
		Standard Subtotal	**17,006**			**12,168**
	Custom	Custom	45,852	72%	1.00	32,807
	HVAC	HVAC	2,060	72%	1.00	1,474
	Training	BOC	17,083	100%	1.00	17,083
		MMBtu Total	**266,356**			**198,915**
MWh	Lighting	Comprehensive Lighting	43,263	67%	1.06	30,600
		Fast Track Lighting	11,184	67%	1.06	7,911
		Refrigerated Case Lighting	284	67%	1.06	201
		Lighting Subtotal	**54,731**			**38,711**
	Multi-Family	Multi-Family	496	100%	1.06	526
	Standard	Refrigeration	844	72%	1.06	640
		Motors & VFDs	509	72%	1.06	386
		Compressed Air	938	72%	1.06	712
		Nonroad Vehicle Electrification	0	72%	1.06	-
		Other Comm. Equipment	7	72%	1.06	5
		Standard Subtotal	**2,298**			**1,743**
	Custom	Custom	7,760	72%	1.06	5,886
	HVAC	HVAC	301	72%	1.06	228
	Training	BOC	3,070	100%	1.06	3,255
		MWh Total	**68,655**			**50,349**

Resource	End Use	Measure	Ex-Post Gross Savings	Net-to-Gross Ratio	Line Loss Factor	Ex-Post Net
kW	Lighting	Comprehensive Lighting	10,301	67%	1.08	7,405
		Fast Track Lighting	1,144	67%	1.08	823
		Refrigerated Case Lighting	67	67%	1.08	48
		Lighting Subtotal	**11,512**			**8,276**
	Multi-Family	Multi-Family	150	100%	1.08	162
	Standard	Refrigeration	95	72%	1.08	73
		Motors & VFDs	113	72%	1.08	87
		Compressed Air	149	72%	1.08	115
		Nonroad Vehicle Electrification	-214	72%	1.08	(166)
		Other Comm. Equipment	1	72%	1.08	1
		Standard Subtotal	**144**			**111**
	Custom	Custom	1,089	72%	1.08	843
	HVAC	HVAC	121	72%	1.08	93
	Training	BOC	295	100%	1.08	318
kW Total			**13,311**			**9,804**

Table 94: EEP Ex-Post Net Data for Cost Effectiveness

Resource	Measure	Ex-Post Gross Savings	Net-to-Gross Ratio	Line Loss Factor	Ex-Post Net
MMBtu	Lighting	1,185	55%	1.00	652
	Heat Pump Pool Heaters	43,711	97%	1.00	42,304
	Pool Covers	6	90%	1.00	6
	Thermostats	129,578	77%	1.00	99,775
	Appliances	11,863	90%	1.00	10,676
	Water Heaters	2,801	100%	1.00	2,808
	Advanced Power Strips	239	100%	1.00	239
MMBtu Total		**189,384**	**83%**	**1.00**	**156,460**
MWh	Lighting	606	55%	1.06	353
	Heat Pump Pool Heaters	-1,478	97%	1.06	-1,516
	Pool Covers	2	90%	1.06	2
	Thermostats	4,062	77%	1.06	3,316
	Appliances	2,944	90%	1.06	2,809
	Water Heaters	-132	100%	1.06	-141
	Advanced Power Strips	70	100%	1.06	74
MWh Total		**6,074**	**76%**	**1.06**	**4,897**
kW	Lighting	109	55%	1.08	65
	Heat Pump Pool Heaters	0	97%	1.08	0
	Pool Covers	0	90%	1.08	0

Resource	Measure	Ex-Post Gross Savings	Net-to-Gross Ratio	Line Loss Factor	Ex-Post Net
	Thermostats	0	77%	1.08	0
	Appliances	533	90%	1.08	517
	Water Heaters	-14	100%	1.08	-15
	Advanced Power Strips	8	100%	1.08	8
kW Total		**636**	**84%**	**1.08**	**574**

Table 95: Home Comfort Ex-Post Net Data for Cost Effectiveness

Resource	Measure	Ex-Post Gross Savings	Net-to-Gross Ratio	Line Loss Factor	Ex-Post Net
MMBtu	Ductless ccASHP	84,780	91%	1.00	77,268
	Ducted ccASHP	73,010	91%	1.00	66,542
	EO Ducted and Ductless Heat Pumps	17,465	100%	1.00	17,465
	Geothermal Heat Pumps	5,505	100%	1.00	5,505
	Smart Thermostats	30	100%	1.00	30
	Heat Pump Water Heaters	749	90%	1.00	674
	CAC Tune-up	0	100%	1.00	0
	Air-Water Heat Pump	54	100%	1.00	54
	Project Adjustments	137	100%	1.00	137
MMBtu Total		**181,730**			**167,675**
MWh	Ductless ccASHP	(8,272)	91%	1.06	(7,992)
	Ducted ccASHP	(6,347)	91%	1.06	(6,132)
	EO Ducted and Ductless Heat Pumps	(1,187)	100%	1.06	(1,258)
	Geothermal Heat Pumps	(131)	100%	1.06	(139)
	Smart Thermostats	9	100%	1.06	9
	Heat Pump Water Heaters	(43)	90%	1.06	(41)
	CAC Tune-up	0	100%	1.06	0
	Air-Water Heat Pump	(11)	100%	1.06	(12)
	Project Adjustments	2	100%	1.06	2
MWh Total		**(15,981)**			**(15,564)**
kW	Ductless ccASHP	116	91%	1.08	114
	Ducted ccASHP	102	91%	1.08	101
	EO Ducted and Ductless Heat Pumps	(72)	100%	1.08	(78)
	Geothermal Heat Pumps	125	100%	1.08	134
	Smart Thermostats	-	100%	1.08	-
	Heat Pump Water Heaters	(4)	90%	1.08	(4)
	CAC Tune-up	0	100%	1.08	0
	Air-Water Heat Pump	0	100%	1.08	0
	Project Adjustments	(4)	100%	1.08	(4)
kW Total		**262**			**262**

Table 96: Home Performance Ex-Post Net Data for Cost Effectiveness

Resource	Ex-Post Gross Savings	NTG	Line Loss Factor	Ex-Post Net Savings
MMBtu	22,377	87%	1.00	19,447
MWh	(955)	93%	1.06	(942)
kW	125	75%	1.08	101

Table 97: REAP Ex-Post Net Data for Cost Effectiveness

Resource	Ex-Post Gross Savings	NTG	Line Loss Factor	Ex-Post Net
MMBtu	12,902	100%	1.00	12,902
MWh	1,932	100%	1.06	2,048
kW	244	100%	1.08	262

Table 98: HEM Ex-Post Net Data for Cost Effectiveness

Resource	Measure	Ex-Post Gross Savings	Net-to-Gross Ratio	Line Loss Factor	Ex-Post Net
MMBtu	HER	145,329	100%	1.00	145,329
MWh	HER	42,594	100%	1.06	45,154
kW	HER	10,515	100%	1.08	11,329

Table 99: AEH Ex-Post Net Data for Cost Effectiveness

Resource	Measure	Ex-Post Gross Savings	Net-to-Gross Ratio	Line Loss Factor	Ex-Post Net
MMBtu	Lighting	-	55%	1.00	-
	Heat Pump	441.1	91%	1.00	402.0
	Appliances	12.4	90%	1.00	11.1
	Cooking	19.6	90%	1.00	17.6
	Thermostats	12.2	77%	1.00	9.4
	HPWH	44.4	100%	1.00	44.5
MMBtu Total		**529.6**			**484.6**
MWh	Lighting	-	55%	1.06	-
	Heat Pump	(14,786)	91%	1.06	(14,284)
	Appliances	2,361	90%	1.06	2,252
	Cooking	(2,730)	90%	1.06	(2,605)
	Thermostats	3,577	77%	1.06	2,920
	HPWH	(3,212)	100%	1.06	(3,413)
kWh Total		**(14,790)**			**(15,130)**

Resource	Measure	Ex-Post Gross Savings	Net-to-Gross Ratio	Line Loss Factor	Ex-Post Net
kW	Lighting	-	55%	1.08	-
	Heat Pump	10.41	91%	1.08	10.23
	Appliances	0.35	90%	1.08	0.34
	Cooking	(0.30)	90%	1.08	(0.29)
	Thermostats	-	77%	1.08	-
	HPWH	(0.37)	100%	1.08	(0.40)
kW Total		**10.10**			**9.88**

APPENDIX C EX-POST RESULTS WITHOUT LIGHTING WASTE HEAT FACTOR ADJUSTMENTS

The ex-post results for LED lighting measures presented in this report are adjusted downward to account for interactive effects on the fossil fuel heating systems in participating homes and businesses. This "waste heat factor" adjustment or "waste heat penalty" captures the increased heating consumption attributable to installation of efficient LED lighting in spaces heated by fossil fuel. LED lighting emits less waste heat than inefficient lighting. During the summer, a reduction in waste heat means less work for the air conditioner and additional cooling savings. During the winter, the heating system must work harder to make up for the reduction in waste heat from lighting. Figure 31 shows the HVAC interaction parameters in the commercial lighting savings algorithms in the New York TRM.

Figure 31: HVAC Interaction Factors in the NYS TRM

Method for Calculating Annual Energy and Summer Peak Coincident Demand Savings

Annual Electric Energy Savings

$$\Delta kWh = \left[\frac{(W \times units)_{baseline} - (W \times units)_{ee}}{1{,}000}\right] \times hrs \times (1 + HVAC_c)$$

Summer Peak Coincident Demand Savings

$$\Delta kW = \left[\frac{(W \times units)_{baseline} - (W \times units)_{ee}}{1{,}000}\right] \times (1 + HVAC_d) \times CF$$

Annual Fossil Fuel Energy Savings

$$\Delta MMBtu = \left[\frac{(W \times units)_{baseline} - (W \times units)_{ee}}{1{,}000}\right] \times hrs \times HVAC_{ff}$$

The $HVAC_c$ and $HVAC_d$ terms deal exclusively with interactive effects on the *electric* cooling and heating systems. These terms are included in the ex-ante and ex-post savings for all lighting measures. The $HVAC_{ff}$ term pertains exclusively to heating penalty in homes and businesses with fossil fuel heat. In 2024, the $HVAC_{ff}$ term was excluded from ex-ante and verified ex-ante savings to align with the reporting conventions of New York's investor-owned utilities (IOUs). The IOUs classify their energy efficiency programs as electric or natural gas and only report impacts from the target fuel. Lighting programs are electric efficiency programs, so the IOUs calculate and report kWh and kW savings. This means that heating penalties are ignored for sites with fossil fuel heat, which is most New York homes and businesses.

PSEG Long Island's fuel-agnostic "MMBtu at site" reporting metric handles this type of cross-fuel impact more robustly than the IOU fuel-specific reporting convention. The evaluation team maintains that defensible ex-post gross and ex-post net results should not ignore cross-fuel interactive effects. However, since the IOUs report progress towards their share of the New York CLCPA goal of 185 trillion Btu (TBtu) by 2025 without waste heat penalties for lighting measures, PSEG Long Island's primary reporting metric is not apples-to-apples with the rest of the state. For consistency with the IOUs, PSEG Long Island reports progress towards its share of the CLCPA goal (7.85 TBtu) without waste heat penalty for lighting measures.

Table 100 shows the 2024 ex-post results at the portfolio level along with PSEG Long Island's cumulative progress towards is 7.85 TBtu by 2025 goal.

Table 100: Ex-Post MMBtu Results without Lighting Waste Heat Penalty

Parameter	Value	Notes
Total MMBtu 2019-2023	5,887,950	Without waste heat penalty
2024 Ex-Post Gross	818,607	With waste heat penalty
2024 MMBtu Penalty	44,096	Reduction in lighting ex-post savings
2024 Alternate Ex-Post Gross	862,704	Without waste heat penalty
Cumulative MMBtu 2019-2024	6,750,654	Progress toward CLCPA 7.85 TBtu goal. 1 TBtu = 1,000,000 MMBtu

APPENDIX D VERIFIED EX-ANTE MEMO

2024 VERIFIED EX-ANTE SAVINGS MEMO

Date: January 31, 2025

To: Dan Zaweski, Mike Voltz, Dimple Gandhi, Ronan Murphy, and Gabrielle Scibelli (PSEG Long Island)

CC: Brian Levite and Louisa Chan (LIPA)

From: 2024 Evaluation Team (Demand Side Analytics, DNV, Mondre Energy, and BrightLine Group)

Re: 2024 Verified Ex-Ante Savings for Energy Efficiency and Beneficial Electrification Programs

Background

PSEG Long Island asked the Demand Side Analytics evaluation team to verify ex-ante energy and peak demand savings as part of its evaluation of PSEG Long Island's 2024 energy efficiency and beneficial electrification programs. This memorandum defines "verified ex-ante" (VEA) savings and presents the 2024 verified ex-ante savings for each program.

Definition of Verified Ex-Ante

The verified ex-ante calculations seek to answer the question, "were the ex-ante gross energy impacts claimed by the implementation contractors calculated consistently with approved calculations and assumptions?" To answer this question, we independently calculated program impacts using the methods and assumptions approved by PSEG Long Island and compared the results to the ex-ante gross values submitted by the implementation contractors, TRC and Bidgely. The ratio of these two values is the verified ex-ante realization rate.

The details of the verified ex-ante calculations vary by program and measure. Some measures are assigned static per-unit impacts in the planning assumptions, so the verified ex-ante calculation only requires counting the number of units stored in the program tracking data and multiplying that total by the per-unit savings assumption used for planning. Other measures are more dynamic and require the use of algorithms and project-specific parameter values. PSEG Long Island generally uses a static set of algorithms and assumptions for a given calendar year. However, projects have varying lead times and processing lag, so it is not uncommon for a project to begin in one year and complete in the following calendar year. In practice, this means a subset of 2024 projects were completed using 2023 application workbooks with 2023 savings assumptions. For the purposes of VEA, we consider these "carryover" projects verified as long as 2023 algorithms and assumptions were correctly implemented. In the ex-post evaluation, we will use the latest available inputs and assumptions so carryover projects can be a source of realization rate volatility. Carryover projects were more common in 2024 than in any of the previous four years that Demand Side Analytics was the EM&V contractor for PSEG Long Island.

The verified ex-ante savings are the first milestone of the 2024 evaluation. They are a separate and distinct performance metric from the evaluated ex-post savings, which will be delivered later this spring. Both the claimed ex-ante and verified ex-ante savings are expressed on a gross basis – meaning they do not reflect adjustments for net-to-gross factors or line losses. The primary reporting metric for 2024 VEA is gross MMBtu savings, but we also report on several additional metrics of interest.

MMBtu Results

Table 1 summarizes the 2024 verified ex-ante savings for MMBtu. The verified ex-ante savings were 99.7% of the claimed ex-ante gross savings. The evaluation team's independent measure counts were nearly identical to the claimed measure counts. Per-unit MMBtu savings calculations and assumptions matched the approved values almost perfectly for nearly all measures. Any calculations and assumptions that deviated from approved values are documented in Appendix A: Supplemental Detail.

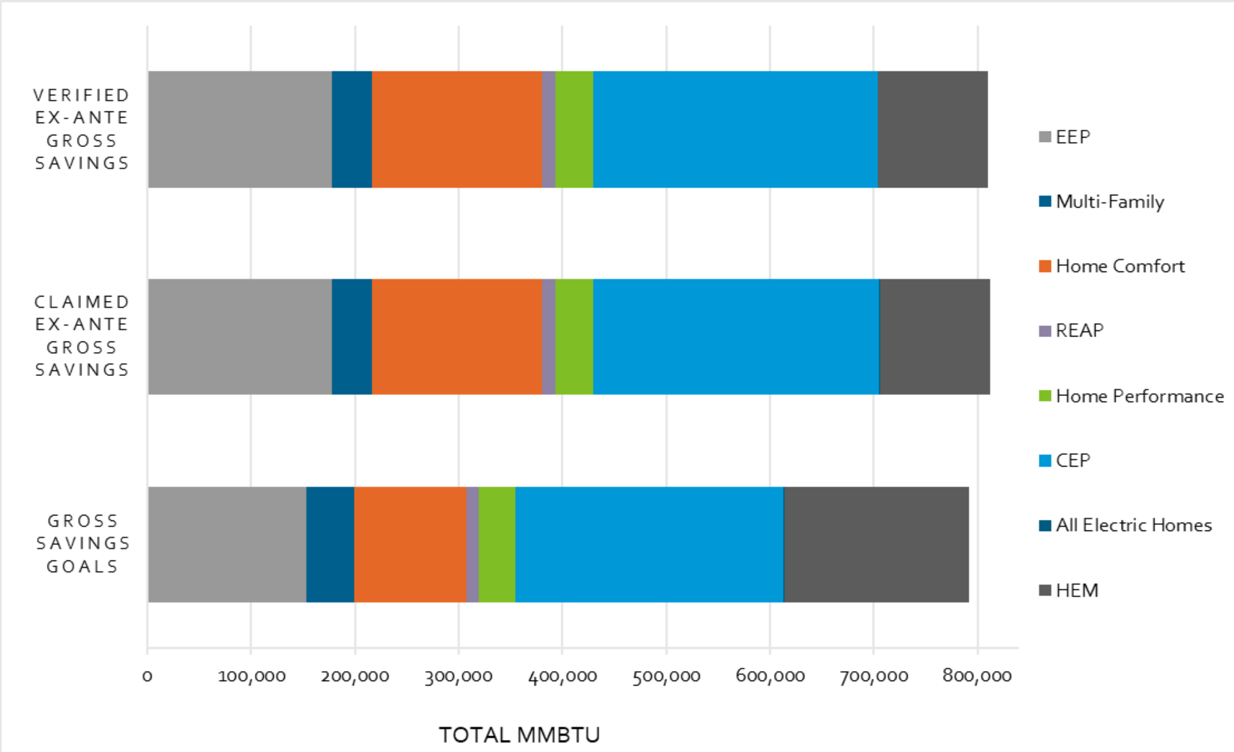
In a departure from prior years, note the claimed and verified ex-ante MMBtu savings in Table 1 do not incorporate fossil fuel heating penalties for lighting measures. This change was made to align PSEG Long Island with New York's other investor-owned utilities (IOUs) which operate fuel-specific energy efficiency programs where electric programs only report electric impacts and natural gas programs only report natural gas impacts. Excluding the fossil fuel waste heat penalties allows for a more balanced comparison between PSEG Long Island and the other IOUs in New York. It also allows for a simpler view of PSEG Long Island's contribution toward the state's New Efficiency: New York statewide goal of 185 million MMBtu in energy savings by 2025.

TABLE 1: SUMMARY OF 2024 VERIFIED EX-ANTE MMBTU SAVINGS AND GOALS

Program		2024 Gross Savings Goals	Ex-Ante Gross Savings	Verified Ex-Ante Gross Savings	Verified Ex-Ante Realization Rate	Verified as % of Goals
		MMBtu	MMBtu	MMBtu	%	%
Commercial	Commercial Efficiency Program (CEP)	259,011	275,758	274,219	99.4%	105.9%
	Multi-Family Homes	46,382	38,664	38,664	100.0%	83.4%
Residential	Energy Efficient Products (EEP)	153,269	177,654	177,610	100.0%	115.9%
	Home Comfort	107,678	164,552	164,552	100.0%	152.8%
	Residential Energy Affordability Partnership (REAP)	11,980	12,285	12,234	99.6%	102.1%
	Home Performance (HPwES & HEA)	35,014	36,593	36,593	100.0%	104.5%
	All Electric Homes (AEH)	574	609	543	89.2%	94.6%
	Home Energy Management (HEM)	177,816	106,265	105,330	99.1%	59.2%
Total Commercial		**305,393**	**314,422**	**312,883**	**99.5%**	**102.5%**
Total Residential		**486,332**	**497,958**	**496,862**	**99.8%**	**102.2%**
Total EE and BE Portfolio		**791,725**	**812,380**	**809,745**	**99.7%**	**102.3%**

Figure 1 visualizes MMBtu contributions by program. The Energy Efficient Products, Commercial Efficiency Program, and Home Comfort programs were the top three contributing programs, together comprising 76% of verified ex-ante savings in 2024.

FIGURE 1: MMBTU CONTRIBUTIONS BY PROGRAM



In addition to comparing verified ex-ante savings with claimed ex-ante savings, we also compared verified ex-ante savings with the established annual savings goals. The portfolio verified ex-ante gross savings were 102% of the 2024 savings goals, exceeding PSEG Long Island's goals by 18,020 MMBtu. Residential programs exceeded their 2024 goal by 10,530 MMBtu, while the Commercial programs exceeded their goal by 7,490 MMBtu. The Home Energy Management program fell about 72,000 MMBtu short of its goal due to issues related to the transition between program implementers, but this shortfall was buoyed by the EEP and Home Comfort programs which combined to exceed their relative goals by approximately 81,000 MMBtu.

MWh and MW Results

Table 2 shows the claimed ex-ante and verified ex-ante MWh savings. Both the claimed ex-ante and verified ex-ante savings are expressed on a gross basis, meaning they do not reflect adjustments for net-to-gross factors or line losses. In this context, gross MWh savings represent just the Energy Efficiency MWh (MWh_{ee}) value. Increased MWh consumption from Beneficial Electrification (MWh_{be}) are not considered in the ex-ante savings. This is different from the ex-post evaluation where we will report delta MWh impacts (representing the difference between MWh_{ee} and MWh_{be}).

All programs had realization rates around 100%. At the portfolio level, the realization rate was 99.9%. Drivers for minor differences between claimed and verified ex-ante savings are discussed in Appendix A: Supplemental Detail.

TABLE 2: SUMMARY OF 2024 VERIFIED EX-ANTE MWH SAVINGS

Program		Claimed Ex-Ante Gross Savings	Verified Ex-Ante Gross Savings	Verified Ex-Ante Realization Rate
		MWhee	MWhee	%
Commercial	Commercial Efficiency Program (CEP)	70,555	70,572	100.0%
	Multi-Family Homes Rebate	4,025	4,119	102.3%
Residential	Energy Efficient Products (EEP)	12,116	12,152	100.3%
	Home Comfort	3,012	3,012	100.0%
	Residential Energy Affordability Partnership (REAP)	1,661	1,662	100.0%
	Home Performance (HPwES & HEA)	1,636	1,636	100.0%
	All Electric Homes	24.9	26.0	104.3%
	Home Energy Management (HEM)	31,145	30,870	99.1%
Total Commercial		**74,581**	**74,690**	**100.1%**
Total Residential		**49,595**	**49,359**	**99.5%**
Total EE and BE Portfolio		**124,176**	**124,049**	**99.9%**

Table 3 shows claimed ex-ante and verified ex-ante peak demand (MW) values. Like with ex-ante MWh savings, ex-ante MW savings are not adjusted for net-to-gross factors or line losses. PSEG-LI does not claim MW savings for HEM, so we did not calculate verified ex-ante MW savings for this program. MW savings will be provided in the ex-post evaluation. Ex-ante peak demand savings are driven by the commercial programs which account for 89% of the claimed savings and 88% of the verified ex-ante savings. CEP is the only program with a realization rate below 99% and is the driver of the overall portfolio realization rate of 91%.

TABLE 3: SUMMARY OF 2024 VERIFIED EX-ANTE MW SAVINGS

Program		Claimed Ex-Ante Gross Savings	Verified Ex-Ante Gross Savings	Verified Ex-Ante Realization Rate
		MW	MW	%
Commercial	Commercial Efficiency Program (CEP)	14.54	13.09	90.0%
	Multi-Family Homes	0.12	0.13	108.2%
Residential	Energy Efficient Products (EEP)	1.06	1.07	100.9%
	Home Comfort	0.05	0.05	100.0%
	Residential Energy Affordability Partnership (REAP)	0.20	0.20	99.8%
	Home Performance (HPwES & HEA)	0.41	0.41	100.0%
	All Electric Homes	0.01	0.01	100.0%
	Home Energy Management (HEM)	n/a	n/a	n/a
Total Commercial		**14.66**	**13.22**	**90.2%**
Total Residential		**1.73**	**1.73**	**100.5%**
Total EE and BE Portfolio		**16.38**	**14.95**	**91.3%**

Non-Energy Metrics

In addition to energy conservation goals, PSEG Long Island set goals related to the uptake of specific technologies and program activity among historically underserved groups. For the 2024 program year, a goal was specifically set for the total number of unique housing units served by whole home heat pumps. This metric includes the installation of Whole House heat pumps through the Home Comfort, Multi-Family and Home Performance Programs. Two additional goals were established related to spending in Disadvantaged Communities (DACs). Specifically, PSEG Long Island set a goal that 35% of all rebates and incentives go to program participants in DACs and 35% of heat pump rebates and incentives go to program participants in DACs. This weblink provides additional information on New York state's official definition of DACs and their geographic locations.

Table 4 compares the verified values for these metrics with the goals and claimed values. Verified values mirror the claimed values and the goals were exceeded for each metric. Additional details regarding the rebate and incentive spending in DACs are shown in Table 5 and Table 6.

Further detail on what drives the differences between the claimed and verified counts and enrollments can be found in Appendix A: Supplemental Detail. Additionally, Appendix B: Validation of DAC Assignments contains more information on DAC boundaries.

Table 4: Summary of Verified Ex-Ante Non-Energy Metrics

Metric Description	Goal	Claimed	Verified
Housing Units Served by Whole House Heat Pumps	3,600	4,241	4,240
Total Rebate and Incentive Spending in DACs	35%	43.0%	42.0%
Heat Pump Only Rebate and Incentive Spending in DACs	35%	59.6%	59.7%

Table 5 and Table 6 show more granular breakouts for the DAC spending metrics. Table 5 shows claimed and verified rebate and incentive totals by program. Claimed and verified values show strong alignment. In most cases, differences between the claimed and verified values are due to disagreements between PSEG Long Island's master DAC assignment file and DAC status recorded in the Captures data. Additional details are provided in Appendix A: Supplemental Detail.

Table 6 also shows strong alignment between claimed and reported heat pump rebate totals. The small difference in claimed and verified totals is due to a commercial project that was incorrectly included in the total heat pump rebates and incentives value that served as the denominator of the claimed number.

Table 5: Summary of 2024 Rebate and Incentive Spending by Program and DAC Status

Program	Claimed Rebates and Incentives			Verified Rebates and Incentives		
	Total ($)	DAC ($)	% DAC	Total ($)	DAC ($)	% DAC
CEP	19,817,591	5,469,651	28%	19,820,407	5,209,800	26%
Multi-Family Homes	2,434,699	741,830	30%	2,434,699	466,965	19%
Energy Efficient Products	5,121,158	649,989	13%	5,121,651	657,906	13%
Home Comfort	17,376,355	8,893,658	51%	17,376,105	8,905,542	51%
REAP	3,458,477	2,659,416	77%	3,443,989	2,648,275	77%
Home Performance	5,620,902	4,742,752	84%	5,624,752	4,773,820	85%
All Electric Homes	80,806	0	0%	80,806	0	0%
Total Commercial	**22,252,290**	**6,211,481**	**28%**	**22,255,106**	**5,676,765**	**26%**
Total Residential	**31,657,698**	**16,945,815**	**54%**	**31,647,302**	**16,985,543**	**54%**
Total Portfolio	**53,909,988**	**23,157,296**	**43%**	**53,902,408**	**22,662,308**	**42.0%**

Table 6: Summary of 2024 Heat Pump Only Rebate and Incentive Spending

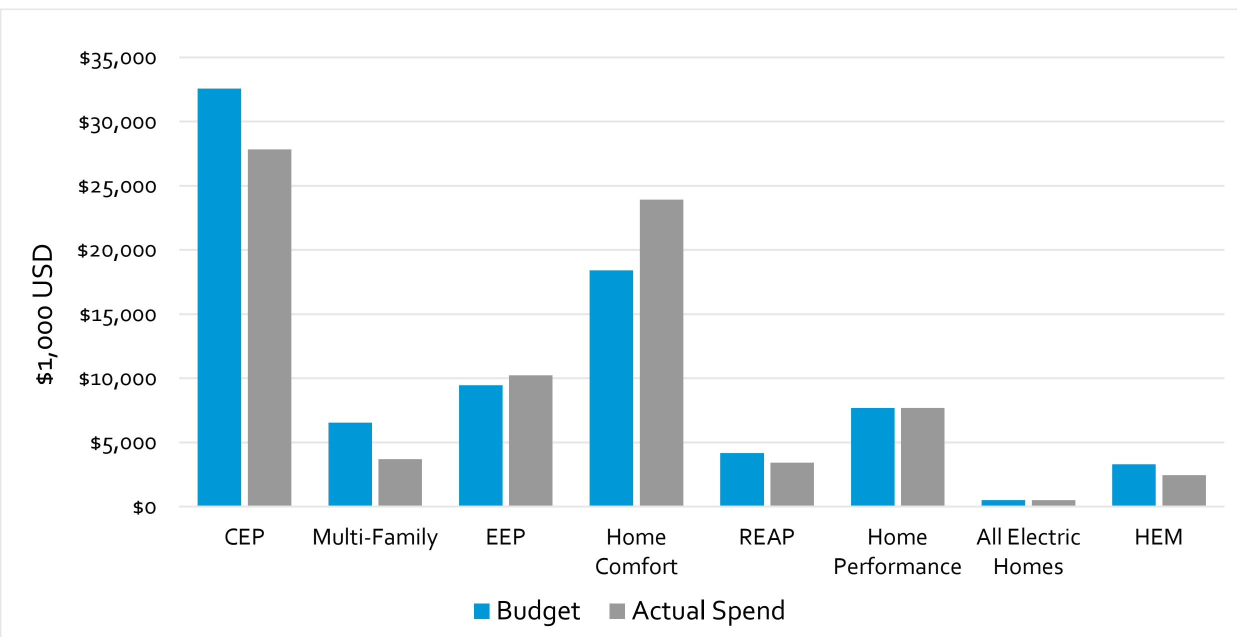
Metric	Rebates and Incentives		% DAC
	Total ($)	DAC ($)	
Claimed	16,460,549	9,817,394	59.6%
Verified	16,456,950	9,817,394	59.7%

Table 7 compares budgets and actual spending by program and Figure 2 visualizes the comparison. Actual spending for commercial programs was about 80% of the planned budget but VEA MMBtu savings for the commercial programs still exceeded their combined MMBtu goal for the year. Actual spending for Home Comfort was approximately 30% higher than planned and VEA MMBtu savings for this program exceeded the goal by more than 50%.

TABLE 7: SUMMARY OF 2024 BUDGET VERSUS ACTUAL SPENDING BY PROGRAM

Program		Budget	Actual Spend	Spending Ratio
		$1,000	$1,000	%
Commercial	Commercial Efficiency Program (CEP)	$32,576	$27,844	85.5%
	Multi-Family Homes	$6,525	$3,695	56.6%
Residential	Energy Efficient Products (EEP)	$9,456	$10,220	108.1%
	Home Comfort	$18,396	$23,914	130.0%
	Residential Energy Affordability Partnership (REAP)	$4,172	$3,424	82.1%
	Home Performance (HPwES & HEA)	$7,685	$7,675	99.9%
	All Electric Homes	$504	$513	101.8%
	Home Energy Management (HEM)	$3,289	$2,441	74.2%
Total Commercial		**$39,101**	**$31,539**	**80.7%**
Total Residential		**$43,500**	**$48,187**	**110.8%**
***Total EE and BE Portfolio**		**$82,602**	**$79,726**	**96.5%**
* Portfolio totals exclude $2.58M of advertising and $638k of EM&V expense.				

FIGURE 2: SUMMARY OF 2024 BUDGET VERSUS ACTUAL SPENDING BY PROGRAM



Appendix A: Supplemental Detail

The evaluation team verified the calculations and inputs for hundreds of measures. The table below shows additional detail on nuances observed in the data from Captures as well as the calculations and assumptions used that drove the realization rate away from 100%. Captures is the project tracking database used by the program implementer TRC.

Program	Sub-Component	Description	Implications
CEP	Refrigeration	▪ Ex-Ante kW was significantly overstated for six refrigerated case door retrofit measures.	▪ 6% kW realization rate for refrigeration
CEP	Multi-Family Homes Rebate	▪ During the verification process, we identified that MWh and MW savings were underreported for 11 projects which included ENERGY STAR Clothes Washers, ENERGY STAR Refrigerators and ENERGY STAR Dishwashers.	▪ A 102% MWh realization rate and 108% MW realization rate for multi-family program.
EEP	ES Linear Fixture	▪ The in-service rate assumption of 97% was doubly applied to kWh and kW for 67,017 units.	▪ Under-reported 51 MWh and 9 kW leading to 103% RR for those metrics. ▪ MMBtu RR is unaffected at 100%
EEP	EEP Most Efficient Clothes Washer	▪ Rounding error on kWh	▪ Under-reported 12 kWh (RR of 100%)
EEP	Heat Pump Pool Heater	▪ 1 project used 2022 planning assumptions	▪ Over-reported 15 kWh (RR of 99.5%) and 49 MMBtu (RR of 99.9%)
EEP	Heat Pump Water Heater	▪ 2 projects used 2022 planning assumptions ▪ 1 project used unknown planning assumptions	▪ Under-reported 100 kWh (RR of 100%) and 4 MMBtu (RR of 100%)

Program	Sub-Component	Description	Implications
All Electric Homes	Appliances	▪ An application workbook reference error leads to inflated savings for ENERGY STAR Refrigerators. The workbook referenced the EUL (14) rather than the per unit MMBtu savings for ENERGY STAR refrigerators (0.1605).	▪ 1.1% MMBtu realization rates for ENERGY STAR Refrigerator measure in AEH.
	Thermostats	▪ Fossil fuel equivalent full load hours (EFLH) assumptions were used for Smart Thermostats instead of heat pump EFLH.	▪ Increase in heating and cooling EFLH values led to 142.2% EE kWh & MMBtu realization rates for the Smart Thermostat measure.
Home Energy Management	Number of reports delivered	▪ The VEA claim for HEM is based on an expected savings level per paper report delivered and the number of paper reports that were delivered in 2024. ▪ The lookback report provided to the evaluation team by Bidgely showed 2,155,676 reports delivered in 2024. There were issues with the first batch of reports delivered in 2024, affecting 82,440 reports. After removing these reports from our count, there were 2,073,236 paper reports delivered. The claimed value is based on 2,091,640 reports.	▪ The MMBtu and MWh realization rates were less than 100% since the verified report count was less than the claimed report count. ▪ HEM does not claim peak demand savings, so the MW metric is unaffected.

In addition to energy savings impacts, PSEG Long Island has goals related to the number of housing units served by whole house heat pumps and the percentage of rebate and incentive dollars that go towards participants living in DACs or low-to-moderate income participants regardless of location within the territory. The table below further defines each metric and describes drivers of any differences between the reported values and our verified values.

Count Metric	Metric Definition	Description of Differences
Number of Whole Home Heat Pumps Installed	▪ This metric represents the number of housing units where whole house heat pumps were installed through the Home Comfort, Multi-Family, or Home Performance programs. ▪ Goal of 3,600 housing units in 2024	▪ For single family housing units, we counted 3,062 homes compared to TRC's 3,063. The difference is one home that had two unique projects in 2024. ▪ For multifamily units, our count matched TRC's count.
Rebate and Incentive Spending in DACs	▪ The metric represents the percentage of portfolio rebates and incentives that go towards customers living in DACs (or sold through stores located in DACs) ▪ Note the DAC definition includes geographic areas and any participants with incomes that fall at or below 60% of the state-median income ▪ Goal of 35% in 2024	▪ PSEG Long Island's master list of DAC designation by account number was merged into our tracking data extracts before calculating the verified numbers. A small number of accounts were flagged as DAC in the Captures data but non-DAC in the master list and vice-versa. We treated the PSEG Long Island master list as ground truth. ▪ Related to the point above, two Multi-Family projects accounting for approximately $275,000 in rebates and incentives were reclassified from DAC to non-DAC after we merged in the master list. ▪ For EEP online marketplace rebates, it seems the reported total for DACs did not include participants with incomes that fall at or below 60% of the state-median income.
Heat Pump Rebate and Incentives in DACs	▪ The metric represents the percentage of portfolio rebates and incentives for heat pumps only that go towards customers living in DACs ▪ Goal of 35% in 2024	▪ There was a discrepancy of about $3,600 in the reported and verified totals. The reported number included a commercial project that should not have been included because the performance metric is limited to the Home Comfort, Home Performance, and Multi-Family programs.

Appendix B: Validation of DAC Assignments

PSEG Long Island is committed to supporting New York state's goal of delivering at least 35% of Energy Efficiency and Clean Energy benefits to residential and business customers in DACs or in income-qualified households. PSEG-LI tracks and reports savings and spending accrued to households in DACs by flagging a "DAC" field in Captures. The evaluation team reviewed three stages of DAC data tracking and confirmed that DAC projects were tracked accurately during 2024.

- Each measure-level Captures record includes a "DAC" field that is either flagged Yes or No. This field is thoroughly populated and checked against PSEG Long Island's master list of DAC designations by account for all 1.3 million residential accounts. There were a small number of instances where the Captures data flagged a site as DAC, but the master list did not (or vice versa), but the two sources agreed on DAC status approximately 98% of the time. Our verified numbers reflect the DAC status from the master list.
- The geographic data for each DAC-designated location included in the master list was plotted against the DAC shapefile polygons available from NYSERDA to ensure that DAC-designated locations are within the DAC-designated census tracts. This exercise gave the evaluation team confidence that the master list was sound. When the evaluation team mapped the 205,059 DAC-designated locations with valid latitude and longitude attributes alongside the DAC shapefile, all but 10 of the DAC-designated locations are confirmed to fall within the DAC boundaries. Table 8 presents a summary and Figure 3 is a section of map including a sample of 200,000 locations.

TABLE 8: LOCATION COUNTS

Location Designation	Count
Locations in PSEG-LI master list	1,332,465
DAC-designated locations	207,617
DAC-designated locations with valid lat/long data	205,059
DAC-designated locations within DAC polygons	205,049
DAC-designated locations outside DAC polygons	10

FIGURE 3: SAMPLE OF DAC-DESIGNATED LOCATIONS AND DAC BOUNDARIES