AN EXELON COMPANY

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September 25, 2025

VIA E-Filing
Matthew Homsher, Secretary
Pennsylvania Public Utility Commission
Commonwealth Keystone Building
400 North Street, 2nd Floor
Harrisburg, PA 17120

Re: PUC Docket No. M-2020-3020830
Phase IV Energy Efficiency and Conservation Program Final Annual Report for June 1, 2024 through May 31, 2025

Dear Secretary Homsher:

In accordance with Section IV.F.2 of the Commission's Opinion and Order Letter dated March 25, 2021 (Docket No. M-2020-3020830), enclosed is PECO's ("PECO" or "the Company") Phase IV Annual Energy Efficiency & Conservation Report for the period June 1, 2024 through May 31, 2025.

PECO is providing a copy of the report to the Act 129 Statewide Evaluator (NMR Group) and is also posting the report on the PECO website.

Thank you for your assistance in this matter and please direct any questions regarding the above to Megan McDevitt, Senior Manager, Retail Rates at 267-533-1942 or via email: megan.mcdevitt@exeloncorp.com.

Sincerely,

Enclosures

CC: K. Brown, Law Bureau (e-mail only)
D. Gill, Deputy Director, Bureau of Technical Utility Services (e-mail only)
J. Sherrick, Policy & Planning/Conservation Supervisor (e-mail only)
K. A. Hafner, Director, Office of Special Assistants (e-mail only)
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Office of Consumer Advocate (e-mail only)
Office of Small Business Advocate(e-mail only)
McNees, Wallace & Nurick (e-mail only)

Final Annual Report to the Pennsylvania Public Utility Commission

Phase IV of Act 129

Program Year 16
(June 1, 2024 - May 31, 2025)

Prepared for:

peco℠
AN EXELON COMPANY

For Pennsylvania Act 129 of 2008
Energy Efficiency and Conservation Plan

Submitted by:

Guidehouse Inc.
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Boulder, Colorado 80304
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September 25, 2025

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Acronyms

ASHP	Air Source Heat Pump
ATE	Average Treatment Effect
BAS	Building Automation System
C&I	Commercial and Industrial
CACS	Central Air Conditioner Switch
CADR	Clean Air Delivery Rate
CAP	Customer Assistance Program
CF	Coincidence Factor
CFL	Compact Fluorescent Lamp
CHP	Combined Heat and Power
CI	Confidence Interval
CSP	Conservation Service Provider, Curtailment Service Provider
CV	Coefficient of Variation
DLC	Direct Load Control
DR	Demand Response
DRA	Demand Response Aggregator
ECM	Energy Conservation Measure
EDC	Electric Distribution Company
EDT	Eastern Daylight Time
EE	Energy Efficiency
EE&C	Energy Efficiency and Conservation
EEMF	Energy Efficiency Marketing Firm
EISA	Energy Independence and Security Act of 2007
EM&V	Evaluation, Measurement, and Verification
EPA	US Environmental Protection Agency
ETDF	Energy to Demand Factor
EUL	Effective Useful Life
FPL	Federal Poverty Level
GNI	Government/Education/Nonprofit
HER	Home Energy Report
HIM	High Impact Measure
HOU	Hours of Use
HSPF	Heating Seasonal Performance Factor
HVAC	Heating, Ventilating, and Air Conditioning
ICSP	Implementation Conservation Service Provider
IE	Income-Eligible
IMC	Incremental Measure Cost
IMEF	Integrated Modified Energy Factor

IMP	Interim Measure Protocol
kBtu	Kilo British Thermal Units
kW	Kilowatt
kWh	Kilowatt-Hour
L	Liter
LAH	Lighting, Appliances, and HVAC
LDV	Lagged Dependent Variable
LED	Light-Emitting Diode
LIURP	Low Income Usage Reduction Program
M&V	Measurement and Verification
MF	Multifamily
MMBtu	Million British Thermal Units
MSRP	Manufacturer Suggested Retail Price
MW	Megawatt
MWh	Megawatt-Hour
MWh/yr	Megawatt-Hour per Year
NPV	Net Present Value
NTG	Net-to-Gross
NTGR	Net-to-Gross Ratio
O&M	Operations and Maintenance
P3TD	Phase III to Date
P4TD	Phase IV to Date
PA PUC	Pennsylvania Public Utility Commission
PILD	PECO Instant Lighting Discounts
PSA	Phase IV to Date Preliminary Savings Achieved; equal to VTD+PYRTD
PSA+CO	PSA Savings plus Carryover from Phase III
PSD	Performance Systems Development
PUF	Part-Use Factor
PY	Program Year—e.g., PY8, from June 1, 2016, to May 31, 2017
PYRTD	Program Year Reported to Date
PYTD	Program Year to Date
PYVTD	Program Year Verified to Date
QC	Quality Control
RCx	Retrocommissioning
RTD	Phase IV to Date Reported Gross Savings
RTO	Regional Transmission Organization
RUL	Remaining Useful Lifetime
SEER	Seasonal Energy Efficiency Ratio
SF	Single-Family
SIDS	Smart Ideas Data System

SKU	Stock Keeping Unit
SO	Spillover
SSMVP	Site-Specific Measurement and Verification Plan
SWE	Statewide Evaluator
T&D	Transmission and Distribution
TDR	Tracking Database Ratio
TRC	Total Resource Cost
TRM	Technical Reference Manual
UEC	Unit Energy Consumption
VFD	Variable Frequency Drive
VR	Verification Ratio
VTD	Phase IV to Date Verified Gross Savings
VTD+CO	Phase IV to Date Verified Gross Savings plus Carryover from Phase III
W	Watt

Types of Savings

Gross Savings: The change in energy consumption and/or peak demand that results directly from program-related actions taken by participants in an energy efficiency and conservation (EE&C) program, regardless of why they participated.

Net Savings: The total change in energy consumption and/or peak demand that is attributable to an EE&C program. Depending on the program delivery model and evaluation methodology, the net savings estimates may differ from the gross savings estimates due to adjustments for the effects of free riders, changes in codes and standards, market effects, participant and non-participant spillover, and other causes of changes in energy consumption or demand not directly attributable to the EE&C program.

Reported Gross: Also referred to as ex ante (Latin for “beforehand”) savings. The energy and peak demand savings values calculated by the electric distribution company (EDC) or its program implementation conservation service providers (ICSPs) and stored in the program tracking system.

Unverified Reported Gross: The Phase IV Evaluation Framework allows EDCs and the evaluation contractors the flexibility to not evaluate each program every year. If an EE&C program is being evaluated over a multiyear cycle, the reported savings for a program year where evaluated results are not available are characterized as unverified reported gross (referred to as unverified savings in this report) until the impact evaluation is completed and verified savings can be calculated and reported.

Verified Gross: Also referred to as ex post (Latin for “from something done afterward”) gross savings. The energy and peak demand savings estimates reported by the independent evaluation contractor after the gross impact evaluation and associated measurement and verification (M&V) efforts have been completed.

Verified Net: Also referred to as ex post net savings. The energy and peak demand savings estimates reported by the independent evaluation contractor after application of the results of the net impact evaluation. Typically calculated by multiplying the verified gross savings by a net-to-gross (NTG) ratio (NTGR).

Adjusted Database Savings: Energy and peak demand savings resulting from adjustments made to the reported gross savings to align the inputs and algorithms with the technical reference manual (TRM) and interim measure protocols (IMPs). The independent evaluation contractor calculates these savings as an interim step in determining the verified gross savings.

Tracking Database Ratio (TDR): The ratio of the adjusted database savings to reported gross savings (excluding unverified savings).

Verification Ratio: The ratio of the verified gross savings to the adjusted database savings.

Annual Savings: Energy and demand savings expressed on an annual basis, or the amount of energy and/or peak demand an EE&C measure or program can be expected to save over the course of a typical year. Annualized savings are noted as MWh/year or MW/year. The Pennsylvania TRM[1] provides algorithms and assumptions to calculate annual savings, and Act 129 compliance targets for consumption reduction are based on the sum of the annual savings estimates of installed measures or behavior change.

Lifetime Savings: Energy and demand savings expressed in terms of the total expected savings over the useful life of the measure. Typically calculated by multiplying the annual savings of a measure by its effective useful life (EUL). The total resource cost (TRC) test uses savings from the full lifetime of a measure to calculate the cost-effectiveness of EE&C programs.

Program Year Reported to Date (PYRTD): The reported gross energy and peak demand savings achieved by an EE&C program or portfolio within the current program year. Program year to date (PYTD) values for energy efficiency will always be reported gross savings in a semiannual or preliminary annual report.

Program Year Verified to Date (PYVTD): The verified gross energy and peak demand savings achieved by an EE&C program or portfolio within the current program year as determined by the impact evaluation findings of the independent evaluation contractor.

Phase IV to Date (P4TD): The energy and peak demand savings achieved by an EE&C program or portfolio within Phase IV of Act 129. Reported in several permutations described here:

- **Phase IV to Date Reported Gross Savings (RTD):** The sum of the reported gross savings recorded to date in Phase IV of Act 129 for an EE&C program or portfolio.
- **Phase IV to Date Verified Gross Savings (VTD):** The sum of the verified gross savings recorded to date in Phase IV of Act 129 for an EE&C program or portfolio, as determined by the impact evaluation finding of the independent evaluation contractor.

[1] Pennsylvania Public Utility Commission, Technical Reference Manual; State of Pennsylvania Act 129 Energy Efficiency and Conservation Program & Act 213 Alternative Energy Portfolio Standards, dated August 2019, reissued February 2021, https://www.puc.pa.gov/filing-resources/issues-laws-regulations/act-129/technical-reference-manual/.

- **Phase IV to Date Preliminary Gross Savings Achieved (PSA):** The sum of the verified gross savings (VTD) from previous program years in Phase IV where the impact evaluation is complete plus the reported gross savings from the current program year (PYTD).
- **Phase IV to Date Preliminary Gross Savings Achieved + Carryover (PSA+CO):** The sum of the verified gross savings from previous program years in Phase IV plus the reported gross savings from the current program year plus any verified gross carryover savings from Phase III of Act 129. This value is the best estimate of an EDC's progress toward the Phase IV compliance targets.
- **Phase IV to Date Verified Gross Savings + Carryover (VTD+CO):** The sum of the verified gross savings recorded to date in Phase IV plus any verified gross carryover savings from Phase III of Act 129.

Note that all values in the report are summed prior to rounding. Therefore, table totals may not equal the sum of all rows.

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Portfolio
at a glance

Implementation of Phase IV of the Act 129 programs began on June 1, 2021. Phase IV includes Program Years 13-17 (PY13-PY17).

PY16

321,631 MWh/yr
claimed of electric energy savings, or 89% of target

62.09 MW/yr
claimed of peak demand savings, or 96% of target

$79,355,714
spent in the program year

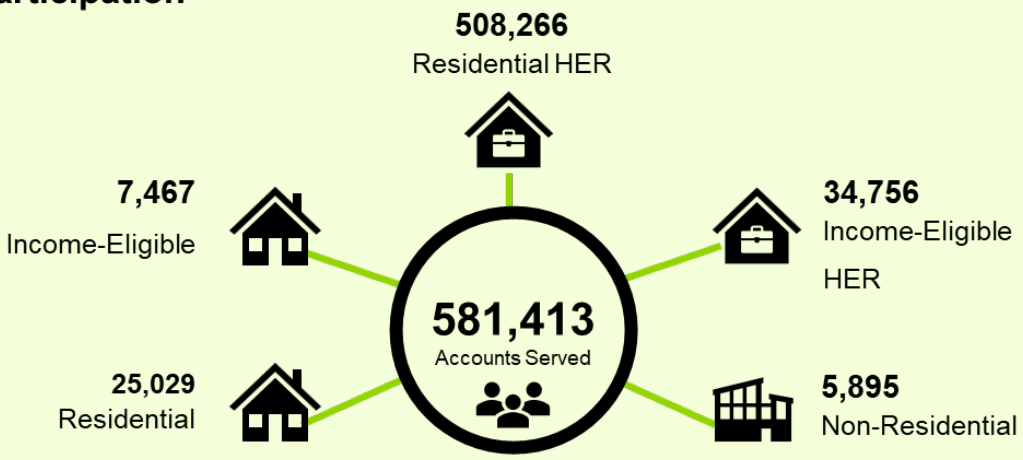
Phase IV

1,339,898 MWh/yr
claimed of electric energy savings (including Phase III carryover), or 97% of target

229.98 MW/yr
claimed of peak demand savings, or 90% of target

$320,901,834
spent in the phase to date

Participation



Benefit-Cost Ratios

1.71
Residential

1.23
Portfolio TRC

1.13
Non-Residential

Accounts served excludes the Residential Rebates and Marketplace Point of Purchase delivery pathway and Giveaways through the Residential In-Home Assessment, Income-Eligible Single-Family, Multifamily, and Multifamily Income-Eligible components. Details on participation counts are found in Section 2.4. TRC results are P4TD.

1. Introduction

Pennsylvania Act 129 of 2008, signed on October 15, 2008, mandated energy savings and demand reduction goals for the largest electric distribution companies (EDCs) in Pennsylvania for Phases I (2008 through 2013), II (2013 through 2016), and III (2016 through 2021). In late 2020, each EDC filed a new energy efficiency and conservation (EE&C) plan with the Pennsylvania Public Utility Commission (PA PUC) detailing the proposed design of its portfolio for Phase IV. These plans were updated based on stakeholder input and subsequently approved by the PUC in 2021.

Implementation of Phase IV of the Act 129 programs began on June 1, 2021. This report documents the progress and effectiveness of the Phase IV EE&C accomplishments for PECO in Program Year 16 (PY16), which spans June 1, 2024, through May 31, 2025, as well as the cumulative accomplishments of the Phase IV programs since inception. This report additionally documents the energy savings carried over from Phase III. The Phase III carryover savings count toward EDC savings compliance targets for Phase IV.

This report details the participation, spending, reported gross, verified gross energy (MWh) and peak demand (MW), and verified net impacts of the energy efficiency (EE) programs in PY16. Compliance with Act 129 savings goals is based on verified gross savings. This report also includes estimates of cost-effectiveness according to the total resource cost (TRC) test.

PECO has retained Guidehouse Inc. (Guidehouse) as an independent evaluation contractor for Phase IV of Act 129. Guidehouse is responsible for the measurement and verification (M&V) of the savings and calculation of gross verified and net verified savings. Guidehouse also performed a process evaluation for selected program components in PY16 to examine the design, administration, implementation, and market response to the EE&C program. This report presents the key findings and recommendations identified by evaluation activities and documents any changes to EE&C program delivery based on the recommendations.

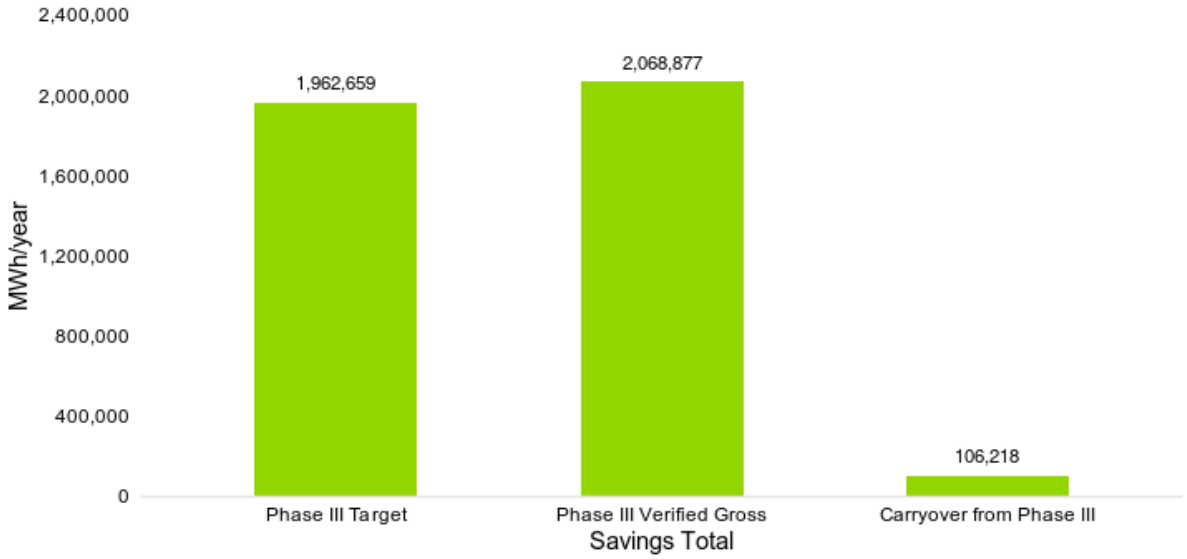
Guidehouse worked with the statewide evaluator (SWE) throughout the report's development to address questions related to compliance as they arose and appreciates the SWE's collaboration to confirm this final report is accurate and agreeable to relevant parties.

2. Summary of Achievements

2.1 Carryover Savings from Phase III of Act 129

PECO has a total of 106,218 MWh/year of portfolio-level carryover savings from Phase III. Figure 2-1 compares PECO's Phase III verified gross savings total with the Phase III compliance target to illustrate the carryover calculation.

Figure 2-1. Portfolio Carryover Savings from Phase III of Act 129



Source: SWE Phase III Report[2]

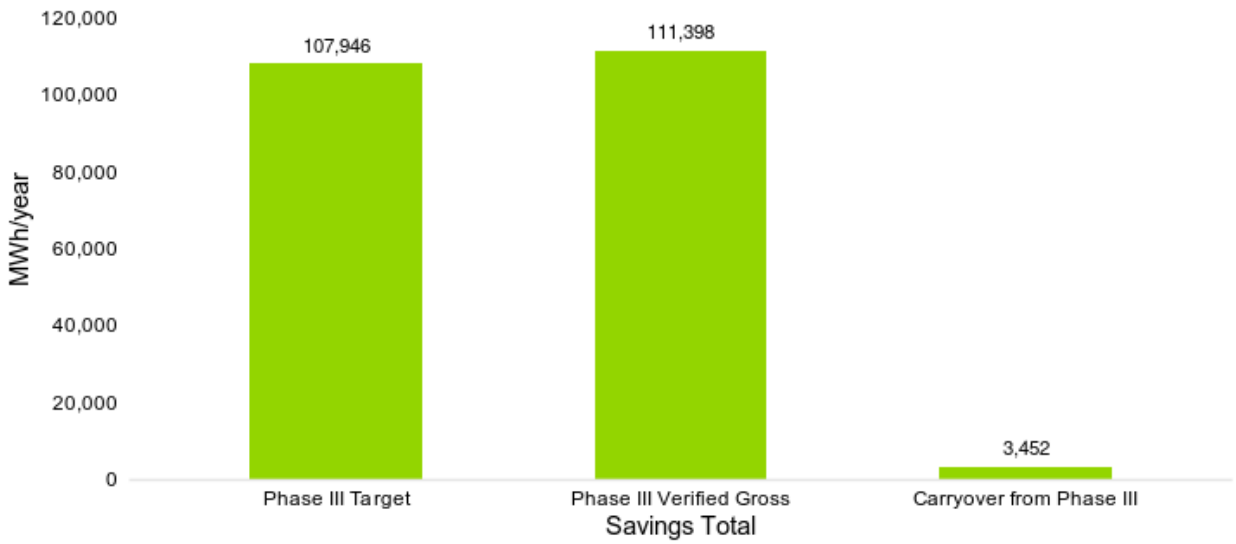
The Commission's Phase IV Implementation Order[3] also allowed EDCs to carry over savings in excess of the Phase III income-eligible (IE) savings goal.[4] Figure 2-2 shows the calculation of carryover savings for the IE customer segment.

[2] Pennsylvania Statewide Evaluator, *SWE Annual Report Act 129 Phase III and Program Year 12*, March 31, 2022, https://www.puc.pa.gov/pcdocs/1746475.pdf.

[3] Pennsylvania Public Utility Commission, *Energy Efficiency and Conservation Program Implementation Order*, at Docket No. M-2020-3015228, (*Phase IV Implementation Order*), entered June 18, 2020.

[4] Proportionate to those savings achieved by dedicated Phase III IE programs.

Figure 2-2. Income-Eligible Carryover from Phase III



Source: SWE Phase III Report[5]

2.2 Phase IV Energy Efficiency Achievements to Date

Phase IV energy savings targets (MWh) were established at the meter level and peak demand reduction targets (MW) were set at the system level. Accordingly, the MWh totals in this report are presented at the meter level, while peak demand savings are adjusted for transmission and distribution (T&D) losses to reflect system-level savings. Since the beginning of PY16 on June 1, 2024, PECO has claimed:

- 334,509 MWh/yr of reported gross electric energy savings (PYRTD)
- 59.69 MW/yr of reported gross peak demand savings (PYRTD)
- 321,631 MWh/yr of verified gross electric energy savings (PYVTD), including 3,912 MWh/yr of verified gross electric energy savings from PY15 unverified savings
- 62.09 MW/yr of verified gross peak demand savings (PYVTD), including 0.01 MW/yr of verified gross peak demand savings from PY15 unverified savings
- 746 MWh/yr of unverified gross electric energy savings
- 0.01 MW/yr of unverified gross peak demand savings

Since the beginning of Phase IV of Act 129 on June 1, 2021, PECO has claimed:

- 1,253,512 MWh/yr of reported gross electric energy savings (RTD)
- 224.87 MW/yr of reported gross peak demand savings (RTD)
- 1,233,680 MWh/yr of verified gross electric energy savings (VTD)

[5] Pennsylvania Statewide Evaluator, *SWE Annual Report Act 129 Phase III and Program Year 12*, March 31, 2022, https://www.puc.pa.gov/pcdocs/1746475.pdf.

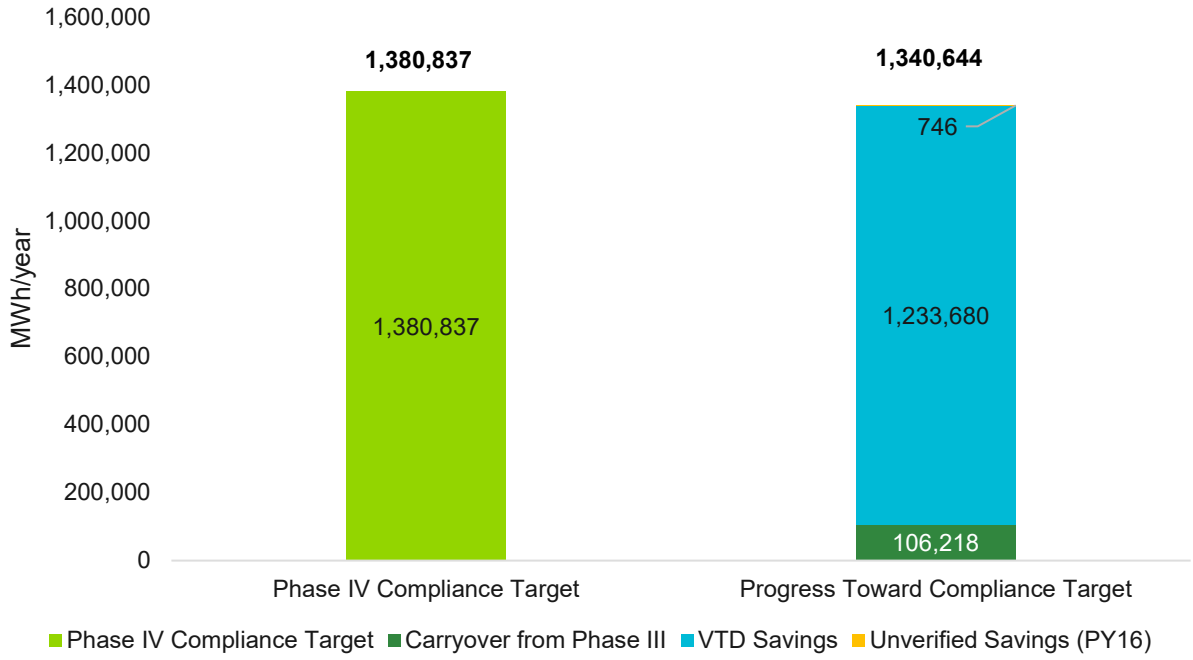
- 229.98 MW/yr of verified gross peak demand savings (VTD)
  - These savings represent 90% of the May 31, 2026, peak demand savings compliance target of 256 MW/yr.

Including carryover savings from Phase III, PECO has achieved:

- 1,339,898 MWh/yr of VTD + portfolio-level carryover energy savings.
  - These savings represent 97% of the May 31, 2026, energy savings compliance target of 1,380,837 MWh/yr.

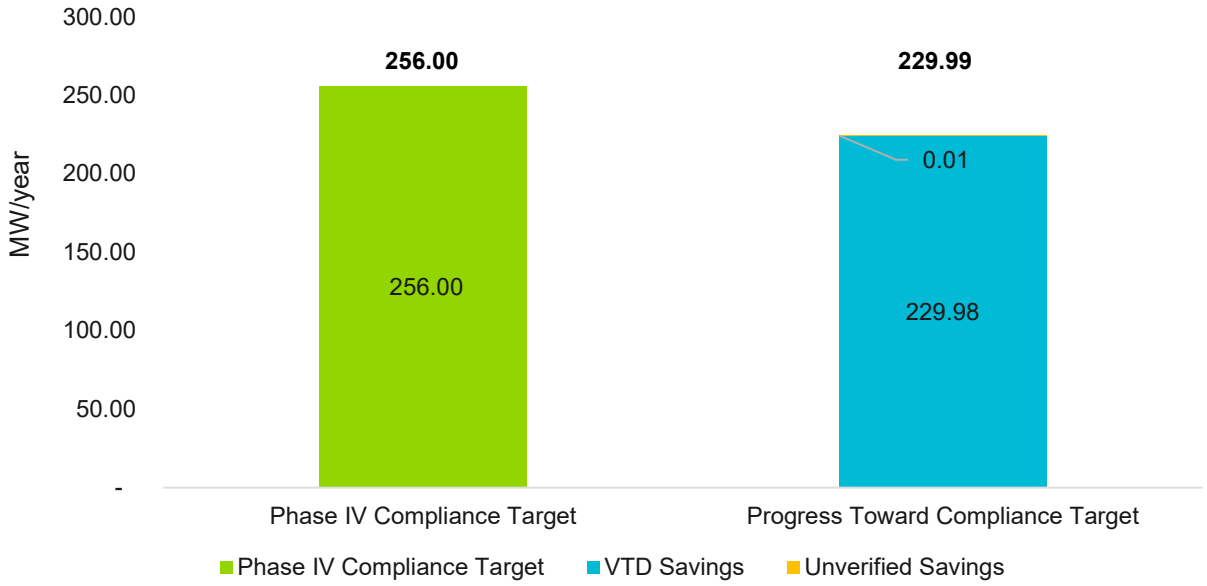
Figure 2-3 summarizes PECO's progress toward the Phase IV MWh portfolio compliance target, and Figure 2-4 summarizes progress toward the Phase IV MW portfolio compliance target.

Figure 2-3. EE&C Plan Performance Toward Phase IV Portfolio Compliance Target (MWh)



Source: Guidehouse analysis

Figure 2-4. EE&C Plan Performance Toward Phase IV Portfolio Compliance Target (MW)



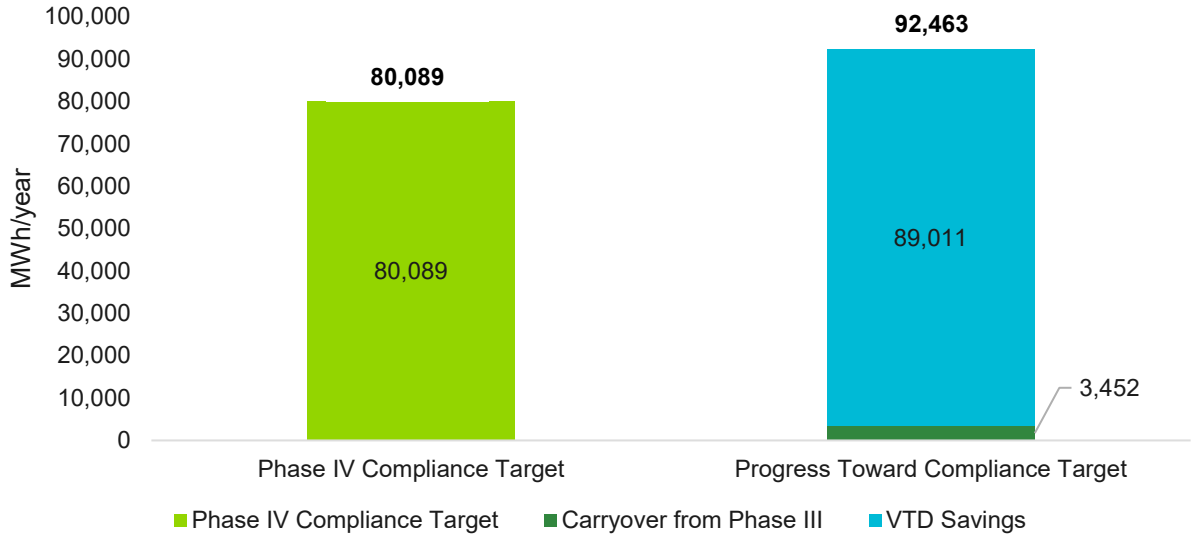
Source: Guidehouse analysis

The Phase IV Implementation Order directed EDCs to offer conservation measures to the IE customer segment based on the proportion of electric sales attributable to IE households. The proportionate number of measures target for PECO is 8.8%. PECO offers a total of 85 EE&C measures to its residential and non-residential customer classes. There are 26 measures available to the IE customer segment at no cost to the customer. This number of measures represents 30.6% of the total measures offered in the EE&C Plan[6] and exceeds the proportionate number of measures target.

The PA PUC also established an IE energy savings target of 5.8% of the portfolio savings goal. The IE savings target for PECO is 80,089 MWh/yr and is based on verified gross savings. Figure 2-5 compares the VTD performance for the IE customer segment with the Phase IV savings target. Based on the latest available information, PECO has achieved 115% of the Phase IV IE energy savings target.

[6] PECO, *PECO Program Years 13 to 17 Act 129 – Phase IV Energy Efficiency and Conservation Plan*, filed June 19, 2024, https://www.puc.pa.gov/pcdocs/1834379.pdf.

Figure 2-5. EE&C Plan Performance Toward Phase IV Income-Eligible Compliance Target



Source: Guidehouse analysis

2.2.1 Phase IV Performance, Multifamily Housing

PECO has achieved 6,464 MWh/yr of verified gross electric energy savings (PYVTD) from multifamily housing. This savings includes 1,719 MWh/yr of verified gross electric savings through the Residential Program Multifamily component; 2,680 MWh/yr of verified gross electric energy savings (PYVTD) through the Income-Eligible Program Multifamily component; and 2,065 MWh/yr PYVTD in multifamily common areas, which is incentivized through the Non-Residential Program.

2.3 Phase IV Performance by Customer Segment

Table 2-1 presents the participation, savings, and spending by customer sector for PY16. The residential, small commercial and industrial (C&I), and large C&I sectors are defined by EDC tariff, and the residential IE and governmental/educational/nonprofit (GNI) sectors are defined by statute (66 Pa. C.S. § 2806.1). The residential IE segment is a subset of the residential customer class and the GNI segment and includes customers who are part of the small C&I or large C&I rate classes. The savings, spending, and participation values for the IE and GNI segments have been removed from the parent sectors in Table 2-1.

Table 2-1. PY16 Summary Statistics by Customer Segment

Parameter	Residential (Non-IE)	Income-Eligible[4]	Small C&I (Non-GNI)	Large C&I (Non-GNI)	Small C&I (GNI)[4]	Large C&I (GNI)[4]	Municipal Lighting	Total
Number of participants[1]	532,472	42,995	4,251	959	452	265	19	**581,413**
PYVTD MWh/yr[3]	73,892	18,775	107,821	75,326	14,683	18,860	12,273	**321,631**

Parameter	Residential (Non-IE)	Income-Eligible[4]	Small C&I (Non-GNI)	Large C&I (Non-GNI)	Small C&I (GNI)[4]	Large C&I (GNI)[4]	Municipal Lighting	Total
PYVTD MW/yr (system)[3]	16.16	2.23	23.85	13.33	3.00	3.53	0.00	**62.09**
Incentives[2] ($1000)	7,035	4,270	16,331	10,123	2,975	2,905	2,938	**46,576**

[1] Excludes giveaways and upstream measures (lighting and spray foam) from participants.
[2] Incentive totals also include Giveaway Costs as listed in the tracking data.
[3] For the Non-Residential Program, 746 MWh and 0.01 MW of reported savings are unverified in PY16. These unverified savings are included in reported savings values and excluded from verified savings values.
[4] The savings, spending, and participation values for the IE and GNI segments have been removed from the parent sector.

Source: Guidehouse analysis

Table 2-2 summarizes plan performance by sector since the beginning of Phase IV.

Table 2-2. Phase IV Summary Statistics by Customer Segment

Parameter	Residential (Non-IE)	Income-Eligible[4]	Small C&I (Non-GNI)	Large C&I (Non-GNI)	Small C&I (GNI)[4]	Large C&I (GNI)[4]	Municipal Lighting	Total
Number of participants[1]	709,765	36,644	17,810	3,902	2,033	985	64	**771,203**
VTD MWh/yr[3]	283,983	76,926	422,314	321,014	50,306	63,664	15,473	**1,233,680**
VTD MW/yr (system)[3]	53.7	8.10	90.3	54.9	10.7	12.1	0.01	**229.98**
Incentives[2] ($1000)	26,146	24,041	77,913	40,731	10,469	8,835	3,556	**192,690**

[1] Excludes giveaways and upstream measures (lighting and spray foam) from participants.
[2] Incentive totals also include Giveaway Costs as listed in the tracking data.
[3] For the Non-Residential Program, 746 MWh and 0.01 MW of reported savings are unverified in PY16. These unverified savings are included in reported savings values and excluded from verified savings values.
[4] The savings, spending, and participation values for the IE and GNI segments have been removed from the parent sector.

Source: Guidehouse analysis

2.4 Summary of Participation by Program

Participation is defined differently for certain programs and program components depending on the program delivery pathway and data tracking practices. The nuances of the participant definition vary by program and are summarized by program in the following bullets. Participants are defined as a unique account number by program, program component, customer segment, and program year, with the following notes and exceptions:

- For Residential New Construction, participation is defined as the count of unique job identifiers by program year.

- P4TD participant counts are additive across program years for all program components, except for the behavioral program component where participation is equal to the highest program year participation count observed in any program year during Phase IV.
- Master metered buildings with a single account number are counted as a single participant even if the program serves multiple units.
- Account numbers are not tracked for the Residential Rebates and Marketplace Point of Purchase delivery channel and Giveaways through the Residential In-Home Assessment, Income-Eligible Single-Family, Multifamily, and Multifamily Income-Eligible components. Participation for those delivery channels and components is calculated as the sum of rebated measures. These numbers are summarized separately in Table 2-4.

Table 2-3 provides the current participation for PY16 and Phase IV, and Table 2-4 provides participation for upstream lighting and giveaways.

Table 2-3. EE&C Portfolio Participation by Program

Program and Component	PYTD Participation	P4TD Participation
Residential Rebates and Marketplace (excluding Point of Purchase)	14,591	60,042
Residential Appliance Recycling	1,243	21,129
Residential In-Home Assessment (excluding giveaways)	4,579	14,638
Residential New Construction	2,600	8,500
Residential Multifamily (excluding giveaways)	1,219	2,934
Residential Multifamily Income-Eligible (excluding giveaways)	797	15,081
Residential Total	**25,029**	**122,324**
Income-Eligible Single-Family (excluding giveaways)	6,943	30,573
Income-Eligible Appliance Recycling	524	4,913
Income-Eligible Total	**7,467**	**35,486**
Residential HER	**508,266**	**550,187**
Income-Eligible HER	**34,756**	**39,429**
Non-Residential Downstream Rebates	769	3,155
Non-Residential Midstream Rebates	4,572	17,932
Non-Residential Small Business Direct Install	506	2,489
Non-Residential New Construction	48	201
Non-Residential Total	**5,895**	**23,777**
Portfolio Total	**581,413**	**771,203**

HER = home energy report

Source: Guidehouse analysis

Table 2-4. Point of Purchase and Giveaway Measures

Program and Component	PYTD Participation	P4TD Participation
Rebates and Marketplace - Point of Purchase	400,005	4,580,265
Income-Eligible Single-Family - Giveaways	141,312	481,668
Residential In-Home Assessment - Giveaways	428,909	525,518

Program and Component	PYTD Participation	P4TD Participation
Residential Multifamily - Giveaways	-	18,858
Residential Multifamily Income-Eligible - Giveaways	-	47,265
Point of Purchase and Giveaway Total	**970,226**	**5,653,574**

Participation is calculated as the sum of rebated measure units.

Source: Guidehouse analysis

2.5 Summary of Impact Evaluation Results

During PY16, Guidehouse completed impact evaluations for several program components in the portfolio. Table 2-5 summarizes the realization rates and net-to-gross (NTG) ratios (NTGRs) by evaluation component. Guidehouse outlines the process to arrive at the following realization rates in Section 3.

Table 2-5. Impact Evaluation Results Summary

Program and Component	Energy Realization Rate	Demand Realization Rate	NTGR
Residential Rebates and Marketplace	0.81	1.13	0.37
Residential Appliance Recycling	0.98	0.99	0.51
Residential In-Home Assessment	0.86	1.24	0.82
Residential New Construction	1.00	1.17	0.55
Residential Multifamily	0.87	0.87	0.82
Residential Multifamily Income-Eligible	0.81	0.86	1.00
Residential Total	**0.84**	**1.12**	**0.49**
Income-Eligible Single-Family	1.19	1.17	1.00
Income-Eligible Appliance Recycling	1.04	1.02	1.00
Income-Eligible Total	**1.19**	**1.16**	**1.00**
Residential HER	**0.90**	**1.64**	**1.00**
Income-Eligible HER	**0.55**	**0.83**	**1.00**
Non-Residential Downstream Rebates	0.94	0.90	0.72
Non-Residential Midstream Rebates	1.00	0.99	0.67
Non-Residential Small Business Direct Install	0.95	0.94	0.93
Non-Residential New Construction	1.13	1.13	0.30
Non-Residential Total	**0.98**	**0.96**	**0.69**
Portfolio Total	**0.95**	**1.04**	**0.70**

Source: Guidehouse analysis

2.6 Summary of Energy Impacts by Program

Act 129 compliance targets are based on annualized savings estimates (MWh/year). Each program year, the annual savings achieved by EE&C program activity is recorded as incremental annual, or first-year, savings and added to an EDC's progress toward compliance. Incremental annual savings estimates are presented in Section 2.6.1. Lifetime energy savings

incorporate the effective useful life (EUL) of installed measures and estimate the total energy savings associated with EE&C program activity. Lifetime savings are used in the TRC test by program participants when assessing the economics of upgrades and by the SWE when calculating the emissions benefits of Act 129 programs. Section 2.6.2 presents the lifetime energy savings by program.

2.6.1 Incremental Annual Energy Savings by Program

Table 2-6 presents a summary of the PY16 and P4TD energy savings by program. The energy impacts in this report are presented at the meter level and do not reflect adjustments for T&D losses. The verified gross savings are adjusted by the energy realization rate and the verified net savings are adjusted by both the realization rate and NTGR.

Table 2-6. Incremental Annual Energy Savings by Program (MWh/Yr)

Program	PYRTD (MWh/yr)	PYVTD Gross (MWh/yr)	PYVTD Net (MWh/yr)	RTD (MWh/yr)	VTD Gross (MWh/yr)	VTD Net (MWh/yr)
Residential	59,476	50,084	24,501	208,613	188,688	123,636
Residential Income-Eligible	13,943	16,542	16,542	73,413	74,341	74,341
Residential HER	28,911	26,156	26,156	108,558	105,303	105,303
Income-Eligible HER	1,465	807	807	3,421	2,473	2,473
Non-Residential[1]	230,715	228,042	156,764	859,506	862,875	590,336
Portfolio Total	**334,509**	**321,631**	**224,769**	**1,253,512**	**1,233,680**	**896,090**

[1] For the Non-Residential Program, 746 MWh and 0.01 MW of reported savings are unverified in PY16. These unverified savings are included in reported savings values and excluded from verified savings values.

Source: Guidehouse analysis

The previously reported VTD savings from prior years for the following programs have changed since the PY15 final annual report was submitted:

- **Residential:** SWE audit activities recommended an adjustment of -37 MWh/year to the PY15 gross verified savings due to adjustments to assumptions around multifamily education measures.
- **Income-Eligible:** SWE audit activities recommended an adjustment of -203 MWh/year to the PY15 gross verified savings due to adjustments to assumptions around multifamily and single-family IE education measures.

2.6.2 Lifetime Energy Savings by Program

Table 2-7 presents the PYTD lifetime energy savings by program. The rebate programs' weighted average measure EULs in PY16 range from 9-12 years while the home energy report (HER) programs' EULs are between 1 and 3 years. The weighted average portfolio EUL is ~10 years.

Table 2-7. Lifetime Energy Savings by Program (MWh)

Program	PYVTD Gross Lifetime (MWh)	PYVTD Net Lifetime (MWh)	VTD Gross Lifetime (MWh)	VTD Net Lifetime (MWh)
Residential	658,710	322,236	2,371,068	1,574,812
Residential Income-Eligible	146,362	146,362	785,905	785,905
Residential HER	104,623	104,623	314,756	314,756
Income-Eligible HER	3,227	3,227	7,458	7,458
Non-Residential	2,090,367	1,436,988	8,247,493	5,627,373
Portfolio Total	**3,003,289**	**2,013,435**	**11,726,680**	**8,310,305**

Source: Guidehouse analysis

The previously reported VTD lifetime savings from prior years, for the following programs, have changed since the PY15 final annual report was submitted:

- **Residential:** SWE audit activities recommended an adjustment of -37 MWh/year to the PY15 gross verified savings primarily due to adjustments to assumptions around multifamily education measures. This recommendation corresponds to an adjustment of -560 MWh to the VTD gross lifetime savings and -459 MWh to the VTD net lifetime savings.
- **Income-Eligible:** SWE audit activities recommended an adjustment of -203 MWh/year to the PY15 gross verified savings due to adjustments to assumptions around multifamily and single-family IE education measures. This recommendation corresponds to an adjustment of -3,040 MWh to both the VTD gross and net lifetime savings.

2.7 Summary of Peak Demand Reduction Impacts by Program

Act 129 defines peak demand savings from energy efficiency as the average expected reduction in electric demand from 2:00 p.m. to 6:00 p.m. EDT on non-holiday weekdays from June through August. Peak demand impacts from energy efficiency in this report are presented at the system level, meaning they have been adjusted to account for T&D losses. PECO uses the following line loss multipliers by sector:

- Residential = 1.0799
- Small C&I = 1.0799
- Large C&I = 1.0799

Table 2-8 presents a summary of the peak demand impacts by energy efficiency program through the current reporting period.

Table 2-8. Peak Demand Savings by Energy Efficiency Program (MW/Yr)

Program	PYRTD (MW/yr) (system)	PYVTD Gross (MW/yr) (system)	PYVTD Net (MW/yr) (system)	RTD (MW/yr)	VTD Gross (MW/yr)	VTD Net (MW/yr)
Residential	7.83	8.77	4.36	31.15	30.92	19.56
Residential Income-Eligible	1.60	1.85	1.85	7.73	7.67	7.67
Residential HER	4.70	7.73	7.73	17.67	24.51	24.51
Income-Eligible HER	0.24	0.20	0.20	0.56	0.12	0.12

Program	PYRTD (MW/yr) (system)	PYVTD Gross (MW/yr) (system)	PYVTD Net (MW/yr) (system)	RTD (MW/yr)	VTD Gross (MW/yr)	VTD Net (MW/yr)
Non-Residential[1]	45.32	43.54	30.06	167.76	166.75	114.91
Portfolio Total	**59.69**	**62.09**	**44.20**	**224.87**	**229.98**	**166.78**

[1] For the Non-Residential Program, 746 MWh and 0.01 MW of reported savings are unverified in PY16. These unverified savings are included in reported savings values and excluded from verified savings values.

Source: Guidehouse analysis

There are no changes to previously reported VTD peak demand savings from prior years since the PY15 final annual report was submitted.

2.7.1 Peak Demand Savings Nominated to PJM Forward Capacity Market

For Phase IV of Act 129, EDCs are expected to retain the capacity rights to Act 129 projects and nominate a portion of the resources acquired to PJM Forward Capacity Market (FCM). If the resources clear, proceeds flow back to the rate class that generated the Act 129 savings to offset cost recovery via riders. In September 2024, PJM filed a proposal with FERC to end payments to energy efficiency resource providers and prevent future participation in auctions starting with the Base Residual Auction (BRA) for the 2026/2027 delivery year (DY).

PECO plans to submit no less than 10 MW and up to 50 MW of PJM-verified peak demand savings associated with each Act 129 program year eligible into the PJM FCM on behalf of its customers over the 5-year Phase IV EE&C Plan. PECO will target installed energy efficiency measures from the Residential, Non-Residential, and Income-Eligible Programs. PECO will prioritize PJM-qualified energy efficiency measures for submittal to PJM based on PJM eligibility and M&V requirements as well as anticipated resulting MW savings in the PJM FCM. The measures may include lighting, retrocommissioning (RCx), variable speed drives, new construction, and more.

PECO hired a turnkey service provider to manage the strategy and details for bidding into PJM's FCM. [7] This approach balances the benefits to PECO customers with the risk posed to customers by the potential for deficiency charges from PJM. All revenue, net of those paid to the provider, will be returned to customers as an offset to plan costs. Table 2-9 summarizes PECO's plans for wholesale recognition of Phase IV peak demand savings by Act 129 program year and PJM delivery year.

Table 2-9. Planned FCM Nominations by Act 129 Program Year and PJM Delivery Year

Act 129 Program Year	Estimated MW Acquisition for FCM	DY 23/24 MW	DY 24/25 MW Range	DY 25/26 MW Range	DY 26/27 MW Range	DY 27/28 MW Range	DY 28/29 MW Range	DY 29/30 MW Range
PY13	24.9	24.9	23.9					
PY14	26.6	25.2	26.6					
PY15	24.9		24.9	23.8				
PY16	23.4			23.4				
PY17	-							
Phase IV Total	**99.8**	**50.1**	**75.4**	**47.2**				

[7] PECO has assigned capacity rights to CPower to nominate to the PJM FCM.

DY = Demand Year for PJM
Source: Guidehouse analysis

2.8 Summary of Fuel Switching Impacts

Act 129 allows EDCs to achieve electric savings by converting electric equipment to non-electric equipment. Table 2-10 summarizes key fuel switching metrics to date in Phase IV. No fuel switching measures were implemented in PY16.

Table 2-10. Fuel Switching Summary

Metric	PY16	P4TD
Fuel Switching Measures Offered	CHP	CHP
Fuel Switching Measures Implemented	0	2
VTD Gross Energy Savings Achieved via Fuel Switching (MWh/yr)	0	54,528
P4TD Gross Increased Fossil Fuel Consumption Due to Fuel Switching Measures (MMBtu/yr)	0	231,787
P4TD Incentive Payments for Fuel Switching Measures ($1,000)	0	$2,055

Source: Guidehouse analysis

2.9 Summary of Renewable Energy Impacts

Act 129 allows EDCs to incentivize behind-the-meter solar photovoltaics and other renewable energy generation measures that offset the need for electricity from the grid. Table 2-11 summarizes the energy savings, peak demand reduction, and incentive totals for renewable energy measures in PY16 and Phase IV to date.

Table 2-11. Renewables Summary

Metric	PY16	P4TD
Renewable Energy Measures Implemented	Solar	Solar
VTD Residential Energy Savings Achieved via Renewables (MWh/yr)	8,545	8,545
VTD Residential Peak Demand Savings Achieved via Renewables (MW/yr)	2.83	2.83
Incentive Payments for Residential Renewable Energy Measures ($1000)	467	467
VTD Non-Residential Energy Savings Achieved via Renewables (MWh/yr)	8,743	9,820
VTD Non-Residential Peak Demand Savings Achieved via Renewables (MW/yr)	2.06	2.48
Incentive Payments for Non-Residential Renewable Energy Measures ($1000)	856	1,025

Source: Guidehouse analysis

2.10 Summary of Cost-Effectiveness Results

Table 2-12 presents a detailed breakdown of portfolio finances and cost-effectiveness. TRC benefits in Table 2-12 were calculated using gross verified impacts. Net present value (NPV)

PY16 costs and benefits are expressed in 2024 dollars. NPV costs and benefits for Phase IV values are expressed in 2021 dollars.

Table 2-12. Summary of Portfolio Finances – Gross Verified

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	**Incremental Measure Costs (IMCs)**	**$119,486**		**$495,164**	
2	Rebates to Participants and Trade Allies	$24,121		$90,005	
3	Upstream/Midstream Incentives	$17,091		$76,288	
4	Material Cost for Self-Install Programs (EE&C Kits)	$1,998		$9,165	
5	Direct Installation Program Materials and Labor	$3,367		$19,024	
6	Participant Costs (row 1 minus the sum of rows 2-5)	$72,909		$300,681	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$0	$0	$0	$0
8	Administration and Management	$25,458	$0	$25,458	$0
9	Marketing	$3,773	$0	$3,773	$0
10	Program Delivery	$0	$0	$0	$0
11	EDC Evaluation Costs	$3,548		$11,287	
12	SWE Audit Costs	$0		$0	
13	**Program Overhead Costs (sum of rows 7-12)**	**$32,779**		**$128,213**	
14	**Total NPV TRC Costs (sum of rows 1 and 13)**	**$152,265**		**$623,377**	
15	Total NPV Lifetime Electric Energy Benefits	$89,458		$338,854	
16	Total NPV Lifetime Electric Capacity Benefits	$82,597		$294,392	
17	Total NPV Lifetime Operations and Maintenance (O&M) Benefits	$9,878		$70,224	
18	Total NPV Lifetime Fossil Fuel Impacts	$15,597		-$16,740	
19	Total NPV Lifetime Water Impacts	$13,312		$77,255	
20	**Total NPV TRC Benefits (sum of rows 15-19)**	**$210,841**		**$763,985**	
21	**TRC Benefit-Cost Ratio (row 20 divided by row 14)**	**1.38**		**1.23**	

* Rows 1-13 are presented in nominal dollars (PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025).

Source: Guidehouse analysis

TRC benefit-cost ratios are calculated by comparing the total NPV TRC benefits and the total NPV TRC costs. It is important to note that TRC costs are materially different from the EDC spending and rate recovery tables presented later in the report. TRC costs include estimates of the full cost incurred by program participants to install efficient equipment, not just the portion covered by the EDC rebate. Appendix D shows the TRC ratios by program and for the portfolio.

2.11 Comparison of Performance to Approved EE&C Plan

Table 2-13 presents PY16 expenditures compared with the budget estimates set forth in the EE&C Plan for PY16 and P4TD. PY16 values are presented in 2024 dollars and P4TD values are presented in 2021 dollars. Program-level comparisons of expenditures to plans are presented in Appendix D.

Table 2-13. Comparison of Expenditures to Phase IV EE&C Plan ($1,000)

Expenditures	Budget from EE&C Plan	Actual Expenditures	Ratio (Actual/Plan)
PY16 Portfolio	$88,650	$68,950	0.78
P4TD	$314,900	$278,557	0.88

Source: Guidehouse analysis

Table 2-14 compares PY16 and P4TD verified gross program savings with the energy savings projections set forth in the EE&C Plan. Program-level comparisons of expenditures to plans are presented in Appendix D.

Table 2-14. Comparison of Actual Program Savings to EE&C Plan Projections

Savings	EE&C Plan Projections	VTD Gross MWh Savings	Ratio (Actual/Plan)
PY16 Portfolio MWh	360,968	321,631	0.89
P4TD MWh	1,297,916	1,233,680	0.95
PY16 Portfolio MW	64.0	62.1	0.97
P4TD MW	238.00	229.98	0.97

Source: Guidehouse analysis

The following list briefly discusses specific reasons verified savings exceeded or fell short of projected savings in PY16:

- The Residential EE Program achieved 101% of EE&C Plan projections for PY16 for energy savings and 117% of EE&C Plan projections for PY16 for demand savings. This achievement is a result of verified savings differing from reported savings for a variety of Technical Reference Manual (TRM)-based measures, as well as adjustments made based on installation rates determined by online surveys. Detailed evaluation activities can be found in Section 3.1 of this report.
- The Income-Eligible EE Program achieved 94% of EE&C Plan projections for PY16 for energy savings and 35% of EE&C Plan projections for PY16 for demand savings. This achievement is a result of the program measure mix. For example, ductless heat pumps and heat pump water heaters are costly for IE programs because they incentivize 100% of each project. The program budget makes these measures prohibitive, and therefore the portfolio has had to achieve demand savings from other residential program components. Detailed evaluation activities can be found in Section 3.2 of this report.
- The Residential HER Program achieved 119% of EE&C Plan projections for PY16 for energy savings and 179% of EE&C Plan projections for PY16 for demand savings. Differences between verified savings and EE&C Plan projections for PY16 are due to modeled evaluation findings, discussed in Section 3.3 of this report.
- The Income-Eligible HER Program achieved 57% of EE&C Plan projections for PY16 for energy savings and 866% of EE&C Plan projections for PY16 for demand savings. Differences between verified savings and EE&C Plan projections for PY16 are discussed in Section 3.4 of this report.
- The Non-Residential EE Program achieved 84% of EE&C Plan projections for PY16 for energy savings and 88% of EE&C Plan projections for PY16 for demand savings. This achievement is a result of lower activity and participation in the Midstream Rebates and

Small Business Direct Install program components. Details are discussed in Section 3.5 of this report.

Guidehouse and PECO will continue to conduct targeted evaluation activities on an ongoing basis to quantify performance and continually improve the programs.

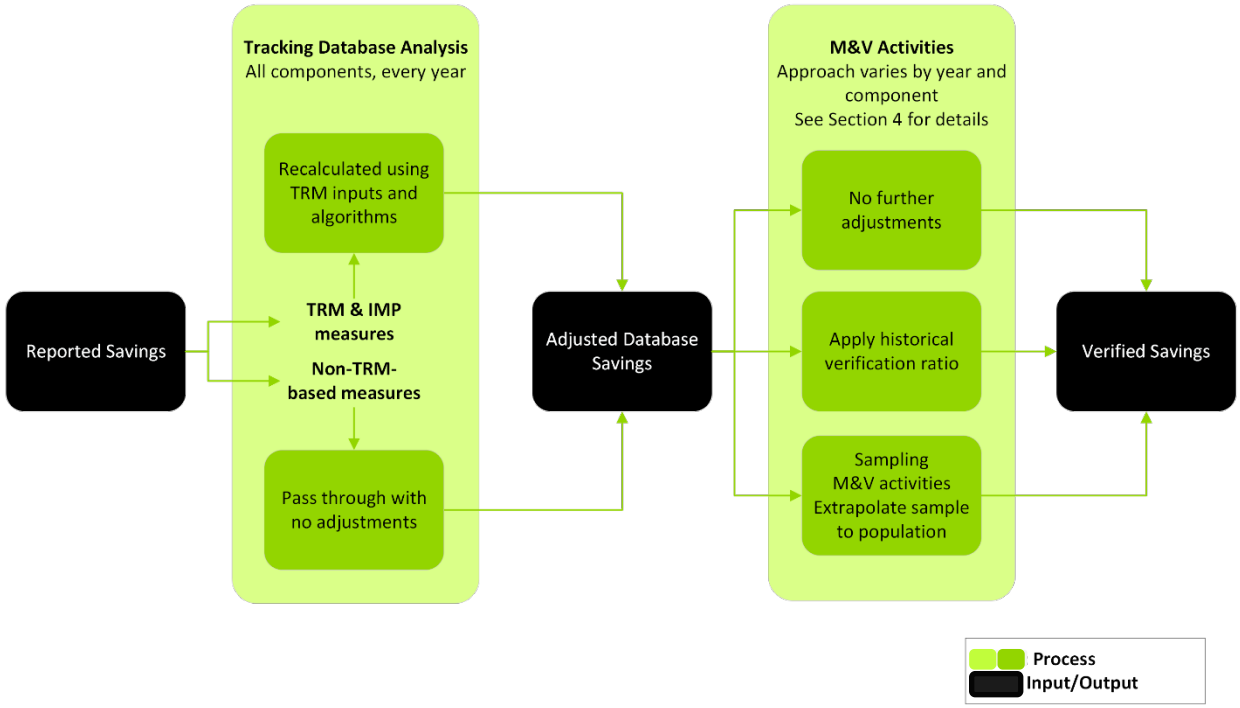
2.12 Findings and Recommendations

Guidehouse makes no overarching portfolio recommendations this year. See Sections 3.1.7, 3.2.7, 3.3.7, 3.4.7, and 3.5.7 for program-specific findings and recommendations.

3. Evaluation Results by Program

This section documents the gross impact, net impact, and process evaluation activities conducted in PY16 along with the outcomes of those activities. Guidehouse used a two-part approach to determine verified gross impacts as described in the Evaluation Plan[8] and illustrated in Figure 3-1. In the first part, Guidehouse conducted a tracking database analysis for each program component to determine the adjusted database savings.

Figure 3-1. PECO Phase IV Verified Savings Pathways



Note: This graphic does not show unverified savings. PY16 unverified savings do not go through the PY16 analysis activities; they will be evaluated in PY17 and are reported separately throughout the report.

Source: Guidehouse Evaluation Plan

In the second part, Guidehouse determined the verified savings following the PY16 evaluation activities shown in Table 3-1, where "X" denotes M&V activities and a blank value denotes application of a historical verification ratio. The relative impact of each step in the two-part process was characterized by calculating the ratio between each output. The tracking database ratio (TDR) is defined as the adjusted database savings divided by the reported savings. The verification ratio is defined as the verified savings divided by the adjusted database savings. A ratio close to one indicates that step in the process had minimal impact on the gross savings. A ratio further from one indicates that step had a larger impact on the gross savings.

[8] Guidehouse, Phase IV Evaluation Plan, Energy Efficiency and Conservation Portfolio, revised November 18, 2024.

Table 3-1. Gross Impact Evaluation Activities

Program	Component	PY13	PY14	PY15	PY16	PY17
Residential	Rebates and Marketplace	X	X[1]	X[2]	X[4]	
Residential	Appliance Recycling		X			
Residential	In-Home Assessment		X		X	
Residential	New Construction	X		X		
Residential	Multifamily		X	X		
Residential HER	HER	X	X	X	X	X
Income-Eligible	Single-Family		X		X	
Income-Eligible	Appliance Recycling		X			
Income-Eligible	Long-Term Savings		X		X	
Income-Eligible HER	HER	X	X	X	X	X
Non-Residential	Downstream Rebates	X	X	X[3]	X[3]	X
Non-Residential	Midstream Rebates	X	X	X	X	X
Non-Residential	New Construction	X		X		X
Non-Residential	Small Business Direct Install		X		X	

Note: X denotes M&V activities. A blank value denotes application of a historical verification ratio.
[1] Guidehouse conducted limited additional verification in PY14 of thermostat installations for the Marketplace delivery pathway because of meaningful changes to implementation in PY13, including using more detailed installation collateral, offering wiring kits to expand compatibility with a variety of wiring configurations, and connecting customers to installation contractors as needed.
[2] Guidehouse conducted an intercept survey (based on QR codes scanned in-store by participants) for spray foam measures, which are not fully deemed in the TRM in PY15 to verify savings.
[3] Guidehouse reviewed reported projects for RCx projects that use IPMVP Option C to assess their implementation date. IPMVP Option C projects lacking 12 months of post-measure data at the time of the evaluation were classified as "unverified savings" during that year, to be evaluated and verified the following program year.
[4] Guidehouse evaluated ductless heat pumps and residential solar in PY16.
Source: Guidehouse Evaluation Plan[9]

Guidehouse similarly conducted process evaluation activities and determined verified net impacts as described in the Evaluation Plan[10] and shown in Table 3-2, where "X" denotes both process and NTG evaluation activities, and a blank value denotes no specific research was undertaken in PY16.

[9] Guidehouse, Phase IV Evaluation Plan, Energy Efficiency and Conservation Portfolio, revised November 18, 2024.
[10] Guidehouse, Phase IV Evaluation Plan, Energy Efficiency and Conservation Portfolio, revised November 18, 2024.

Table 3-2. Process and NTG Evaluation Activities

Program	Component	PY13	PY14	PY15	PY16	PY17
Residential	Rebates and Marketplace		X	X	X[1]	NTG
Residential	Appliance Recycling		Process			
Residential	In-Home Assessment		X			
Residential	New Construction		X			
Residential	Multifamily		X			
Residential HER	HER	Process				
Income-Eligible	Single-Family			Process		
Income-Eligible	Appliance Recycling		Process			
Income-Eligible	Long-Term Savings			Process		
Income-Eligible HER	HER	Process				
Non-Residential	Downstream Rebates		X		NTG[2]	
Non-Residential	Midstream Rebates	X			X[3]	X
Non-Residential	New Construction		X	X		
Non-Residential	Small Business Direct Install		Process		NTG	

Note: X indicates both process and NTG activities will be conducted in the same year. If only process or NTG activities occur in a given year, it is specified.

[1] Guidehouse performed Process and NTG evaluations for solar projects in the Downstream pathway and spray foam projects in the Point of Purchase pathway. Guidehouse contacted Upstream retail store managers in the Point of Purchase pathway only.

[2] Guidehouse performed NTG research for select high impact measures (HIMs) and solar projects through customer surveys.

[3] Guidehouse contacted lighting distributors in PY13 for the Non-Residential Midstream Rebates component and conducted lighting distributor interviews again in PY16 to estimate a new NTG result for use in Phase V planning. Guidehouse also conducted non-lighting NTG and process research in PY16, with the intention to continue the research into and provide results in PY17. The PY16-PY17 evaluation will use all available non-lighting midstream projects across the phase. Non-lighting participation in the Midstream component has been low to-date, limiting available projects for NTG and process research activities

Source: Guidehouse Evaluation Plan[11]

3.1 Residential EE Program

The Residential EE Program offers customers in single-family and multifamily buildings opportunities to save energy across their electric end uses. The Residential Program includes five components, with some components having multiple pathways to participate. The Residential EE Program is designed to serve customers who have a household income greater

[11] Guidehouse, Phase IV Evaluation Plan, Energy Efficiency and Conservation Portfolio, revised November 18, 2024.

than 150% of the federal poverty level (FPL), also referred to as market-rate customers.[12] The Appliance Recycling and Multifamily components serve both the Residential and Income-Eligible EE Programs.

CMC Energy is the prime conservation service provider (CSP) for the program, managing additional CSPs to implement specific program components:

- **Rebates and Marketplace:** The Rebates and Marketplace component includes customer instant discounts and rebates for HVAC, appliances, and energy-saving devices. There are multiple delivery pathways to receive product rebates: Downstream, Marketplace, and Point of Purchase. Additionally, a rebate for solar projects was added in PY16. CLEAResult implements the Rebates and Marketplace component.
- **Appliance Recycling:** The Appliance Recycling component traditionally has focused on responsibly recycling refrigerators, freezers, dehumidifiers, and window air conditioning units. The component serves both IE and market-rate customers. Historically, ARCA implemented the Appliance Recycling component. However, ARCA was unable to fulfill their obligations early in the phase, which resulted in the program being put on hold until an alternative implementation methodology could be adopted. In PY16, the program started to partner with eForce Recycling, which facilitates drop-off events within the greater Philadelphia area. These drop-off events collect only dehumidifiers and window air conditioners. The program continues to investigate ways to again offer the collection of refrigerators and freezers.
- **In-Home Assessment (Single-Family):** The In-Home Assessment component provides in-home assessments and comprehensive audits to educate customers, install energy efficient measures, and identify additional, potentially larger, energy efficiency opportunities (such as insulation and air sealing). CLEAResult implements the In-Home Assessment (market-rate) component.
    - All In-Home Assessment component participants receive an assessment of their home's energy performance and direct installation of basic efficiency measures (e.g., LED lighting, water conservation devices, hot water pipe insulation, smart strips). A subset of eligible participants may opt in for additional In-Home Assessment instant rebates for more comprehensive measures (such as insulation, air sealing, and HVAC services).
    - The In-Home Assessment component also provides a small kit to any new PECO customer who has recently opened a new account as a result of a recent move. These kits include outlet gaskets, advanced power strips, and a low flow faucet aerator.
- **New Construction:** The Residential New Construction component supports the construction of more comfortable, durable, and energy efficient homes compared with those simply built to code. This component works with Home Energy Rating System raters and builders to create more energy efficient homes during the design and construction phases. PSD implements the New Construction component.

[12] The Residential EE programs are designed to serve customers who have a household income greater that 150% of the FPL, also referred to as market-rate customers. However, customers who fall under the 150% FPL, also known as Income-Eligible, are not excluded from participating in the residential programs as some programs (such as the online marketplace) are open to all customers.

- **Multifamily:** The Multifamily component provides an energy efficiency audit of the building, direct install measures, and larger, investment-level upgrades to improve the energy efficiency of multifamily buildings, both in tenant units and common areas. The component serves buildings with market-rate customers, IE customers, and a mix of residential and commercial customer types. CMC implements the Multifamily component for both the residential and IE segments. The IE and market-rate services are delivered consistently across sectors, although incentives may vary. Verifying, sampling, and reporting program savings will differentiate between and allocate savings to either the residential or IE customer segment accordingly.
    - Program participants receive an assessment of their building's energy performance and direct installation of basic efficiency measures (e.g., LED lighting, water conservation devices, hot water pipe insulation, smart strips). A subset of participants may opt in for additional rebates of more comprehensive measures (such as insulation and air sealing).

3.1.1 Participation and Reported Savings by Customer Segment

Table 3-3 presents the participation counts, reported energy and demand savings, and incentive payments for the Residential EE Program in PY16 by customer segment.

Table 3-3. Residential EE Program Participation and Reported Impacts

Parameter	Residential (Non-IE)	Income-Eligible	Small C&I (Non-GNI)[1]	Large C&I (Non-GNI)[1]	Total
PY16 # Participants[2]	24,206	772	32	19	**25,029**
PYRTD MWh/yr	56,604	1,759	631	482	**59,476**
PYRTD MW/yr	7.44	0.21	0.13	0.05	**7.83**
PY16 Incentives ($1,000)	7,035	178	648	703	**8,564**

[1] In certain circumstances, customers in the Small C&I or Large C&I rate classes participate in the Residential EE Program. Savings for those measures are captured in the Residential EE Program.
[2] Participant counts exclude upstream measures (lighting and spray foam).

Source: Guidehouse analysis

3.1.2 Gross Impact Evaluation

Guidehouse conducted the gross impact evaluation for the Residential EE Program following the approach outlined in its Evaluation Plan[13] for PY16. The Residential EE Program gross impact evaluation included a comprehensive tracking database analysis of all TRM-based and interim measure protocols (IMPs)-based measures to confirm that reported savings align with TRM and IMP standards, including relevant PY16 codes and standards updates. Guidehouse reviewed all measures within the Residential EE Program. Guidehouse adjusted the reported savings based on discrepancies identified in the tracking database analysis. This adjustment results in adjusted database savings and the TDR.

Additionally, for the Rebates and Marketplace and In-Home Assessment components, in PY16, Guidehouse conducted the following verification activities:

[13] Guidehouse, Phase IV Evaluation Plan, Energy Efficiency and Conservation Portfolio, revised November 18, 2024.

- **Rebates and Marketplace:** Guidehouse conducted both a customer survey and engineering desk review verification activities for a sample of 12 customer responses for Ductless Heat Pumps and 46 Solar projects. The survey team also continued the PY15 spray foam survey and evaluation, increasing the total spray foam sample to 26 survey responses.
- **In-Home Assessment:** Guidehouse conducted both a customer survey and an engineering desk review for a sample of 103 projects in PY16.

Guidehouse defined the survey population based on customer activity data from eTRACK+. eTRACK+ customer activity data included contact information for the Rebates and Marketplace component and In-Home Assessment component but not for the Point of Purchase pathway of the Rebates and Marketplace component. To obtain contact information for survey efforts, Guidehouse collected customer data via an in-store digital contact form at the time of spray foam purchase. For spray foam, Guidehouse created a digital contact form that customers accessed via a QR code or URL on retail in-store shelf signs. This form collected customer names and email addresses for customers interested in participating in a future survey about their purchase. Eligible customers had the option to enter a monthly sweepstake to win a $50 e-gift card for providing their contact information. Guidehouse reached out to customers who completed the digital contact form with a follow-up survey and were offered a $15 e-gift card for completing the survey.

All samples were designed and implemented to meet the targets set in Guidehouse's sampling design memos.[14] Table 3-4 outlines the impact survey sample targets and completes.

Survey completes are defined as a survey where the participant successfully completed the entire survey through to the end and excludes partial completes and respondents who were screened out of the survey due to ineligibility. Additional detail of the impact evaluation completed in PY16 can be found in Appendix E. Details on the survey activities, approach, and incentives for the Rebates and Marketplace and In-Home Assessment surveys can be found in Appendix E.1.1.

Table 3-4. Residential Impact Sample Targets and Completes

Component	Stratum	Number Contacted	Target Completes	Actual Completes	Response Rate	Percentage of Target Achieved
Rebates and Marketplace- Downstream	Solar	121	26	46	38%	177%
	Ductless Heat Pumps	176	24	12	7%	50%
	Total	**397**	**50**	**58**	**15%**	**116%**
Rebates and Marketplace- Point of Purchase	Spray Foam[1]	110	80	26	24%	33%
In-Home Assessment	Kits	600	30	9	2%	30%
	High Impact	228	14	29	13%	207%
	Medium Impact	396	20	48	12%	240%
	Low Impact	400	20	17	4%	85%

[14] Guidehouse, PECO PY16 Residential Impact Sample Design Memo FINAL, dated March 31, 2025.

Component	Stratum	Number Contacted	Target Completes	Actual Completes	Response Rate	Percentage of Target Achieved
	Total	**1,624**	**84**	**103**	**6%**	**123%**

[1] Spray Foam Target Completes, Actual Completes, Number Contacted, and Response Rate are based on combined survey responses from PY15 and PY16.

Source: Guidehouse analysis

For the Spray Foam, Ductless Heat Pump, and Solar measures, new verification ratios were established for PY16. For all other Rebates and Marketplace measures, the results of the tracking database analysis were combined with the PY15 verification ratios to determine final verified gross savings. This result, combined with the survey results, led to the Rebates and Marketplace component overall realization rates.

Table 3-5 presents the gross impact results for energy, and Table 3-6 presents gross impact results for demand.

Table 3-5. Residential EE Program Gross Impact Results for Energy

Component	PYRTD MWh/yr	Energy Realization Rate	Sample CV or Error Ratio	Relative Precision at 85% C.L.
Rebates and Marketplace	40,888	0.81	0.54	0.07
Appliance Recycling	1,007	0.98	0.17	0.01
In-Home Assessment	7,611	0.86	2.04	0.20
New Construction	5,571	1.00	0.01	0.00
Multifamily	1,719	0.87	0.11	0.12
Multifamily Income-Eligible	2,680	0.81	0.26	0.10
Program Total	**59,476**	**0.84**	**0.68**	**0.06 [90% C.L.]**

Note: Guidehouse conducted tracking database analysis for all components and primary data collection and analysis for the Rebates and Marketplace and In-Home Assessment components in PY16. For the other Rebates and Marketplace measure types, and for Appliance Recycling, Multifamily, and New Construction components, Guidehouse applied the energy and demand verification ratios from the PY15 evaluation to the results of the PY16 adjusted database analysis.

Source: Guidehouse analysis

Table 3-6. Residential EE Program Gross Impact Results for Demand

Component	PYRTD MW/yr	Demand Realization Rate	Sample CV or Error Ratio	Relative Precision at 85% C.L.
Rebates and Marketplace	4.93	1.13	0.35	0.04
Appliance Recycling	0.38	0.99	0.14	0.01
In-Home Assessment	0.59	1.24	2.11	0.21
New Construction[1]	1.35	1.17	1.38	0.39
Multifamily	0.22	0.87	0.10	0.12
Multifamily Income-Eligible	0.36	0.86	0.21	0.12
Program Total	**7.83**	**1.12**	**1.03**	**0.09 [90% C.L.]**

[1] Guidehouse received additional hourly data for the PY15 Residential New Construction component after the PY15 evaluation was complete. This additional data allowed for the recalculation of demand savings, realization rates, and statistics. The Residential New Construction results in this table reflect updated results.

Note: Guidehouse conducted tracking database analysis for all components and primary data collection and analysis for the Rebates and Marketplace and In-Home Assessment components in PY16. For the other Rebates and Marketplace measure types, and for Appliance Recycling, Multifamily, and New Construction components,

Guidehouse applied the energy and demand verification ratios from the PY15 evaluation to the results of the PY16 adjusted database analysis.

Source: Guidehouse analysis

The introduction to Section 3 describes the two-step evaluation method that results in the ratios that Table 3-7 and Table 3-8 show. The tracking database analysis is conducted annually while the verification ratio may be historical based on the Evaluation Plan.[15] The TDR and the verification ratio together represent the overall energy or demand realization rate.

Table 3-7. Residential Energy Ratios

Component	Energy TDR	Energy Verification Ratio[1]	Energy Realization Rate
Rebates and Marketplace	0.98	0.83	0.81
Appliance Recycling	1.00	0.98	0.98
In-Home Assessment	1.04	0.83	0.86
New Construction	1.00	1.00	1.00
Multifamily	0.92	0.95	0.87
Multifamily Income-Eligible	0.97	0.84	0.81
Residential Total	**0.99**	**0.85**	**0.84**

[1] For the other Rebates and Marketplace measure types, and for Appliance Recycling, Multifamily, and New Construction components, Guidehouse applied the energy and demand verification ratios from the PY15 evaluation to the results of the PY16 adjusted database analysis.

Source: Guidehouse analysis

Table 3-8. Residential Demand Ratios

Component	Demand TDR	Demand Verification Ratio[1]	Demand Realization Rate
Rebates and Marketplace	1.00	1.14	1.13
Appliance Recycling	1.00	0.99	0.99
In-Home Assessment	1.06	1.17	1.24
New Construction	1.00	1.17	1.17
Multifamily	0.92	0.95	0.87
Multifamily Income-Eligible	0.97	0.89	0.86
Residential Total	**1.00**	**1.12**	**1.12**

[1] For the other Rebates and Marketplace measure types, and for Appliance Recycling, Multifamily, and New Construction components, Guidehouse applied the energy and demand verification ratios from the PY15 evaluation to the results of the PY16 adjusted database analysis.

Source: Guidehouse analysis

The following factors led to variation between the reported and verified savings and to the observed realization rates:

- **Tracking Database Analysis:** For all components, Guidehouse adjusted savings across several measures including ENERGY STAR air purifiers, electronically commutated motor (ECM) fans, and heat pump water heaters. The adjustment with the largest impact on savings was made for faucet aerators. The tracking database analysis resulted in an overall energy TDR of 0.99 and demand TDR of 1.00. Further measure-level details can be found in Appendix E. A TDR close to 1 indicates that PECO and

[15] Guidehouse, Phase IV Evaluation Plan, Energy Efficiency and Conservation Portfolio, revised November 18, 2024.

their CSPs are accurately reporting savings in accordance with the TRM and reducing the likelihood of systemic data errors.

- **Rebates and Marketplace Solar:** Reported solar savings did not consistently use the TRM's PVWatts methodology to estimate energy and demand savings. This issue was anticipated for the first, introductory year of the program. Solar installers used the estimation platform their company preferred. This approach caused high variability within the solar sample, with realization rates ranging from 0.44 to 1.96 on an individual project basis.
- **Rebates and Marketplace Ductless Heat Pumps:** Guidehouse made two changes that affected ductless heat pump measure savings. First, Guidehouse identified that reported savings use AHRI-reported and documented capacities as system capacities to calculate savings. The AHRI database only reports the complete system capacity in aggregate, but the tracking data claims savings on a per-indoor-unit basis. This discrepancy leads to double-counting system capacities for systems with more than one indoor unit.[16] Correcting this issue significantly reduced savings by as much as 75% per project. Second, Guidehouse verified pre-existing heating and cooling equipment types, and adjusted baseline equipment efficiencies based on pre-existing equipment. Some ductless heat pumps replaced electric resistance baselines, increasing savings. Adjusting baseline efficiencies increased savings by up to 200%. These two adjustments partially offset each other, resulting in final realization rates of 52% for energy and 97% for demand for ductless heat pumps in the Downstream pathway of the Rebates and Marketplace component.
- **Rebates and Marketplace Spray Foam:** Guidehouse continued its survey from PY15 to verify installations of spray foam. Combined across both PY15 and PY16, Guidehouse surveyed 110 customers and received 26 valid responses, representing the usage of 65 cans that were purchased through the program. Guidehouse found that these 65 cans were used to seal 43 windows, 15 doors, three sliding glass doors, 68 pipe or wire penetrations, and 71 other gaps or holes in the walls of conditioned spaces. Guidehouse used these totals and the SWE's guidance memo to estimate energy savings of 35.83 kWh per can sold and summer peak demand savings of 0.00042 kW per can sold, resulting in an energy realization rate for spray foam measures of 64% and a demand realization rate of 114%.
- **In-Home Assessment Faucet Aerators:** In-Home Assessment kits include a faucet aerator. Evaluated faucet aerator savings were higher than reported savings because of higher than expected installation rates and because one aerator was installed in a home with electric resistance water heating, resulting in a realization rate for kit faucet aerators of 451% for both energy and demand.
- **In-Home Assessment Changes to Heating and Cooling Types:** Customers surveyed sometimes reported different heating, cooling, or domestic hot water types from those

[16] For example, one project installed three indoor units with cooling capacities of 9 kBTU/hr and heating capacities of 10 kBTU/hr each. The AHRI database reported that the total system in aggregate has a cooling capacity of 22 kBTU/hr and a heating capacity of 25 kBTU/hr. The tracking data reported 22 kBTU/hr and 25 kBTU/hr for each indoor unit, claiming a total cooling capacity of 66 kBTU/hr and a total heating capacity of 75 kBTU/hr. The Guidehouse evaluation assigned the indoor unit capacities of 9 kBTU/hr and 10 kBTU/hr to each indoor unit, resulting in a total cooling capacity of 27 kBTU/hr and a total heating capacity of 30 kBTU/hr. This approach, among other factors, led to this specific project receiving realization rates of 32% for energy and 41% for demand.

reported in the tracking data. This discrepancy led to variability, both increases and decreases, in evaluated savings.

- **In-Home Assessment Outlet Gaskets and Weather Stripping:** The TRM provides default deemed savings values for Outlet Gaskets, Weather Stripping, and other air sealing measures in homes with cooling and with electric resistance heat. The tracking data uses these deemed savings for all homes that received these measures, regardless of heating and cooling types. Using deemed savings for homes with cooling and electric resistance greatly overestimated savings for homes without cooling, homes with gas heat, and homes with heat pumps as their primary heating source. This overestimation resulted in energy and demand realization rates of 17% and 60%, respectively, for Kit Outlet Gaskets and of 36% and 102% for Direct Install Outlet Gaskets.
- **In-Home Assessment Education:** The CSP uses placeholder values of 1 kWh and 0 kW for tracked savings for education measures. Guidehouse used survey research to update these savings values in PY16. Evaluated savings values vary by measure type.

3.1.3 Net Impact Evaluation

As described in the Phase IV Evaluation Plan[17] for PY16 and in Table 3-2, Guidehouse conducted NTG research for the Residential EE Program Downstream and Point of Purchase pathways of the Rebates and Marketplace component. Table 3-9 summarizes the pathway-level NTGRs evaluated in PY16. Further details of the survey responses are in Section 3.1.5.1 and Table 3-15.

3.1.3.1 Methodology

Guidehouse followed the Evaluation Framework[18] for conducting NTG research and analysis for Upstream and Downstream programs. The guidance included details for gathering feedback from upstream retailers about changes in stocking and selling practices due to the Residential EE Program, and from downstream participants about the program's impact on their decisions for purchasing and installing energy efficiency equipment.

The following describes the general methodology for estimating the Residential EE Program NTGR including definitions of free ridership and spillover, and how each is used to calculate the final NTGR:

- **Free Ridership:** The self-reported free ridership survey battery is brief to avoid customer burden and includes two metrics to assess free ridership: 1) the intention to install the energy efficient equipment without program funds and 2) the influence of the program in the decision to install the energy efficient equipment at the time it was installed. When scored, each metric results in a value ranging from 0 to 0.5, and a combined total free ridership score from 0 to 1.0.

- **Spillover:** The self-reported spillover battery collects data on additional energy efficient equipment installations in homes that did not receive a program incentive but were installed at least in part because of the program. Survey questions gather high-level

[17] Guidehouse, Phase IV Evaluation Plan, Energy Efficiency and Conservation Portfolio, revised November 18, 2024.
[18] Pennsylvania Public Utilities Commission, *Evaluation Framework for Pennsylvania Act 129 Phase IV Energy Efficiency and Conservation Programs,* dated July 16, 2021, prepared by the Statewide Evaluation Team.

information on the type of equipment installed, including quantity and the replaced equipment, to allow for estimates of energy savings. Guidehouse divides the total spillover savings by the total gross savings for the sample to arrive at the spillover result.

Guidehouse estimated the final NTGR score using Equation 3-1.

Equation 3-1. NTGR Equation

$$NTG = 1 - Free\ Ridership + Spillover$$

Where:

$Free\ Ridership$	Quantifies the percentage of savings (reduction in energy consumption or demand) from participants who would have implemented the measure in the absence of the program or component
$Spillover$	Quantifies the percentage reduction in energy consumption or demand (that is, additional savings) caused by the presence of the program or component; spillover savings happen when customers invest in additional energy efficient measures or activities without receiving a financial incentive from the program or component

The following bullets summarize the methods used to estimate the NTG for each Residential EE Program component. Appendix E provides details on the NTG methods and algorithms used for the Rebates and Marketplace component.

- **Rebates and Marketplace Component – Downstream Pathway – Solar:** For the program known to customers as the PECO Rebates and Discounts Program, and in alignment with the process evaluation survey activity detailed in Section 3.1.5, Guidehouse completed online surveys with residential customers receiving a PECO rebate for solar projects through the Downstream pathway. Guidehouse defined the survey population and sample based on customer activity data from eTRACK+, as described in Section 3.1.2. As Table 3-10 presents, Guidehouse created target completes based on eTRACK+ participation data. The SWE reviewed and approved sample design memos and survey instruments prior to fielding. The survey asked participants to rate the amount of influence (on a 0-10 influence scale) the program had on their decision to purchase and install the solar project through the program. The survey also asked about the intentions of each participant if the program had not been available.
- **Rebates and Marketplace Component – Point of Purchase Pathway – Spray Foam:** For the program known to customers as the PECO Retail Instant Discounts program, and in alignment with the process evaluation survey activity detailed in Section 3.1.5, Guidehouse completed online surveys with residential customers who received an instant discount from brick-and-mortar retailers on canned spray foam. Guidehouse defined the survey population based on customer activity data from eTRACK+, as described in Section 3.1.2. As Table 3-10 presents, Guidehouse created target completes based on eTRACK+ participation data. The SWE reviewed and approved sample design memos and survey instruments prior to fielding. As mentioned in Section 3.1.2, the eTRACK+ customer activity data did not include participant contact information for the Point of Purchase pathway of the Rebates and Marketplace component. Guidehouse therefore collected customer data via an in-store intercept survey at the time of purchase for the canned spray foam online survey. The survey asked

participants to rate the amount of influence (on a 0-10 influence scale) the program had on their decision to purchase the canned spray foam. The survey also asked about the intentions of each participant if the discount had not been available. Guidehouse included consistency checks in the survey to resolve potential conflicting responses.

- **Rebates and Marketplace Component – Point of Purchase Pathway – All Instant Discount Measures:** Guidehouse completed interviews with retail store managers participating in the Point of Purchase pathway. As described in Section 3.1.2, the eTRACK+ customer activity data did not include participant contact information for the Point of Purchase pathway of the Rebates and Marketplace component. The CSP instead provided contact information for participating retail store managers and Guidehouse defined the survey population based on this participation data. Guidehouse also created target completes based on this participation data. The SWE reviewed and approved sample design memos and survey instruments prior to fielding. The interview asked store managers about the impacts of the incentive on their sales of all program-qualifying efficient equipment, including canned spray foam, room air conditioners, ENERGY STAR air purifiers and dehumidifiers, and advanced power strips. The interview also asked how influential the incentive was on the store's stocking and selling practices for these qualifying equipment types to understand the impact the program is having on the market. The interview effort yielded only two responses; the responses were not statistically significant and therefore are not included in the reported results.

3.1.3.2 NTG Results

Table 3-9 shows the NTG results and relative precision by Residential component and pathway.

Table 3-9. Residential EE Program Net Impact Evaluation Results

Component	PYVTD (MWh)	Free Ridership	Spillover	NTGR	Relative Precision (@ 85% CL)
Rebates and Marketplace – Downstream – Solar	8,574	0.72	0.002	0.29	0.23
Rebates and Marketplace –Point of Purchase – Spray Foam	12,183	0.73	-	0.27	0.06

Source: Guidehouse analysis

Table 3-10 shows sample targets and completes. As mentioned earlier, the SWE reviewed and approved sample design memos[19] prior to survey fielding. Sample design is described in Section 3.1.2.

Table 3-10. Residential EE Sample Targets and Completes

Component	Number Contacted	Target Completes	Actual Completes	Response Rate	Percentage of Target Achieved
Rebates and Marketplace – Downstream- Solar	121	20	43[1]	36%	215%
Rebates and Marketplace –Point of Purchase- Spray Foam	110	94	17	15%	18%

[1] Three respondents were excluded from the NTG results due to inconsistencies in their responses.

[19] Guidehouse, PECO PY16 Process and NTG Design Memo- FINAL, dated April 23, 2025.

Source: Guidehouse analysis

3.1.3.3 High Impact Measure Research

Guidehouse did not conduct high impact measure (HIM) research for the Residential Program in PY16.

3.1.4 Verified Savings Estimates

In Table 3-11, the realization rates and NTGRs determined by Guidehouse are applied to the reported energy and demand savings estimates to calculate the verified net savings estimates for the Residential EE Program in PY16. Additional detail of the savings calculations performed in PY16 can be found in Appendix E.

Table 3-11. Residential EE Program PY16 and P4TD Savings Summary

Savings Type	Energy (MWh/yr)	Demand (MW/yr)
PYRTD	59,476	7.83
PYVTD Gross	50,084	8.77
PYVTD Net	24,501	4.36
RTD	208,613	31.15
VTD Gross	188,688	30.92
VTD Net	123,636	19.56

Source: Guidehouse analysis

3.1.5 Process Evaluation

The PY16 process evaluation of the Residential EE Program included PECO program manager and CSP staff interviews, participant surveys for two components, and retail store manager interviews for one component. This section summarizes the evaluation methods, data collection techniques, sample design, and key results related to the surveys.

3.1.5.1 Methodology

Guidehouse interviewed the PECO program managers and CSP staff to understand the goals of the program in PY16, identify significant implementation changes, and identify current areas of strength and improvement. Guidehouse conducted interviews for each component of the program.

Guidehouse also fielded participant surveys and interviews for specific pathways of the Rebates and Marketplace component. For the Point of Purchase pathway, Guidehouse conducted a participant survey that focused only on the spray foam measure, plus interviews with upstream retail participants. For the Downstream pathway, Guidehouse conducted a participant survey with those who installed a solar PV system. Table 3-12 outlines these efforts. Additional details on methodology for each of the two surveys and one interview effort are provided below.

The surveys and interviews assessed participant satisfaction, likeliness to recommend the program to others (also known as net promoter score), and program awareness. These process evaluation surveys were fielded in conjunction with NTG and impact evaluation surveys to reduce burden on the participant base.

Table 3-12. Residential EE Program Process Activities by Component

Component	Pathway	PM/CSP Interview	Participant Survey/ Interview	Survey/Interview Recipient
Rebates and Marketplace	Downstream	✓	✓	Downstream pathway customers who installed solar PV
Rebates and Marketplace	Point of Purchase	✓	✓	Point of Purchase pathway customers who purchased spray foam
Rebates and Marketplace	Point of Purchase	✓	✓	Point of Purchase pathway upstream retail store managers
Appliance Recycling	NA	✓	-	-
In-Home Assessment	NA	✓	-	-
New Construction	NA	✓	-	-
Multifamily	NA	✓	-	-
Multifamily Income-Eligible	NA	✓	-	-

Source: Guidehouse analysis

Rebates and Marketplace Downstream Pathway Solar Measure

For the Downstream pathway solar measure (referred to throughout Section 3.1.5 as Solar) participants survey sample, Guidehouse defined the survey population and sample based on customer activity data from eTRACK+, as described in Section 3.1.2. As Table 3-13 presents, Guidehouse created target completes based on eTRACK+ participation data. The SWE reviewed and approved sample design memos[20] and survey instruments prior to fielding.

Note that survey completes are defined as a survey where the participant successfully completed the entire survey through to the end and excludes partial completes and respondents who were screened out of the survey due to ineligibility. Guidehouse removed "don't know" responses from analysis for most questions in the process survey analysis. Therefore, n values may vary between questions.

Table 3-13. Rebates and Marketplace Solar Sample Targets and Completes

Number Contacted	Target Completes	Actual Completes	Response Rate	Percentage of Target Achieved
121	20	46	38%	230%

Source: Guidehouse analysis

Guidehouse's survey email outreach approach included sending sampled customers an initial invitation email and up to two reminder emails. Guidehouse offered Solar customers who completed the survey a $15 e-gift card through the Tango platform.

Rebates and Marketplace Point of Purchase Pathway Spray Foam Measure

For the Point of Purchase pathway canned spray foam measure (referred to throughout Section 3.1.5 as Spray Foam) participant survey sample, Guidehouse defined the survey population

[20] Guidehouse, PECO PY16 Process and NTG Design Memo- FINAL, dated April 23, 2025.

based on customer activity data from eTRACK+, as described in Section 3.1.2. As Table 3-14 presents, Guidehouse created target completes based on eTRACK+ participation data. The SWE reviewed and approved sample design memos[21] and survey instruments prior to fielding.

As mentioned in Section 3.1.2, the eTRACK+ customer activity data did not include participant contact information for the Point of Purchase Pathway of the Rebates and Marketplace component. Guidehouse therefore collected customer data via an in-store intercept survey at the time of purchase for the canned spray foam online survey. This effort was a continuation of a gross impact survey effort in PY15, described in Section 3.1.2. Process questions were added to the survey in PY16.

Note that survey completes are defined as a survey where the participant successfully completed the entire survey through to the end and excludes partial completes and respondents who were screened out of the survey due to ineligibility. Guidehouse removed "don't know" responses from analysis for most questions in the process survey analysis. Therefore, n values may vary between questions.

Table 3-14. Rebates and Marketplace Spray Foam Sample Targets and Completes

Number Contacted	Target Completes	Actual Completes	Response Rate	Percentage of Target Achieved
110	94	17	15%	18%

Source: Guidehouse analysis

Guidehouse's survey email outreach approach included sending sampled customers an initial invitation email and up to two reminder emails. Guidehouse offered Spray Foam customers who completed each survey a $15 e-gift card through the Tango platform.

Rebates and Marketplace Point of Purchase Pathway Upstream Channel

For the retail store manager participant interview sample for the Point of Purchase pathway upstream channel (referred to throughout Section 3.1.5 as Upstream), Guidehouse defined the survey population based on customer activity data provided by the CSP, as described in Section 3.1.2. As Table 3-15 presents, Guidehouse created target completes based on this participation data. The SWE reviewed and approved sample design memos[22] and survey instruments prior to fielding. The interview effort yielded only two responses and are included here for informational purposes only.

Note that interview completes are defined as an interview where the participant successfully completed the entire interview through to the end. Guidehouse removed "don't know" responses from analysis for most questions in the process analysis. Therefore, n values may vary between questions.

Table 3-15. Rebates and Marketplace Upstream Sample Targets and Completes

Number Contacted	Target Completes	Actual Completes	Response Rate	Percentage of Target Achieved
39	39 (census)	2	5%	5%

[21] Guidehouse, PECO PY16 Process and NTG Design Memo- FINAL, dated April 23, 2025.
[22] Guidehouse, PECO PY16 Process and NTG Design Memo- FINAL, dated April 23, 2025.

Source: Guidehouse analysis

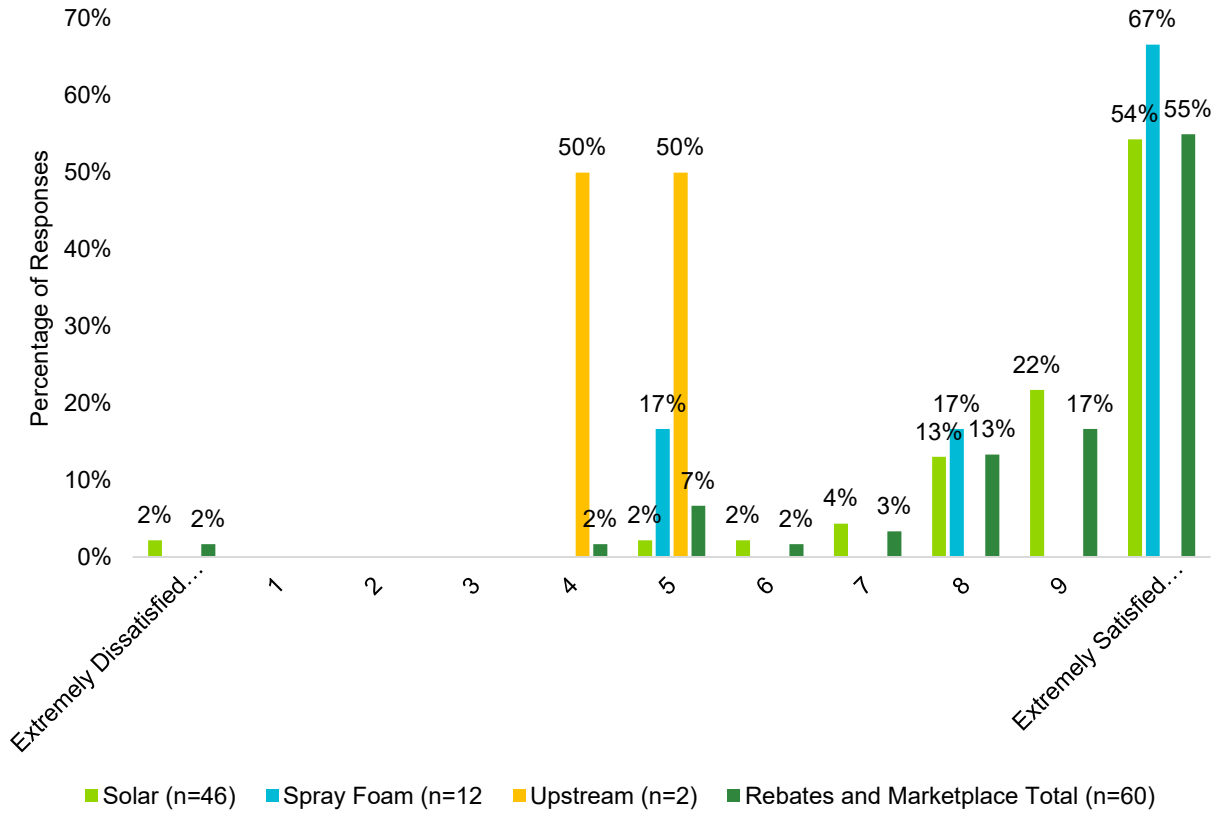
Guidehouse sent interview scheduling emails to retail store managers, including information about the interview and a link to schedule a time to speak with a Guidehouse representative. Due to low email response rates, Guidehouse also attempted up to three phone calls to schedule interviews with upstream retail store managers. Guidehouse offered upstream retail store managers who completed each interview a $100 e-gift card through the Tango platform.

3.1.5.2 Key Findings from Process Evaluation

Guidehouse presents key findings here for the Rebates and Marketplace component Downstream and Point of Purchase pathways evaluated as described in the previous section. The following figures describe the results separately for each of the Solar, Spray Foam, and Upstream surveys/interviews, and aggregates the three survey/interview results into a total Rebates and Marketplace component. Appendix E includes process evaluation sections for each component, though most components were not evaluated in PY16.

As Figure 3-2 shows, respondents are overall satisfied with PECO's Rebates and Marketplace component. Respondents provided an overall satisfaction score of 8.8 out of 10 for the Rebates and Marketplace component, using a scale where 0 is "extremely dissatisfied" and 10 is "extremely satisfied." Respondents provided a score of 9.0 out of 10 for Solar, 8.8 out of 10 for Spray Foam, and 4.5 out of 10 for Upstream. The one respondent who reported an overall satisfaction of 0 out of 10 for Solar reported a high bill with an inability to speak with customer support. Of the two Upstream respondents, one reported dissatisfaction with the amount of training provided to retail store staff, and the other reported dissatisfaction with the in-store signage.

Figure 3-2. Rebates and Marketplace Overall Satisfaction by Pathway

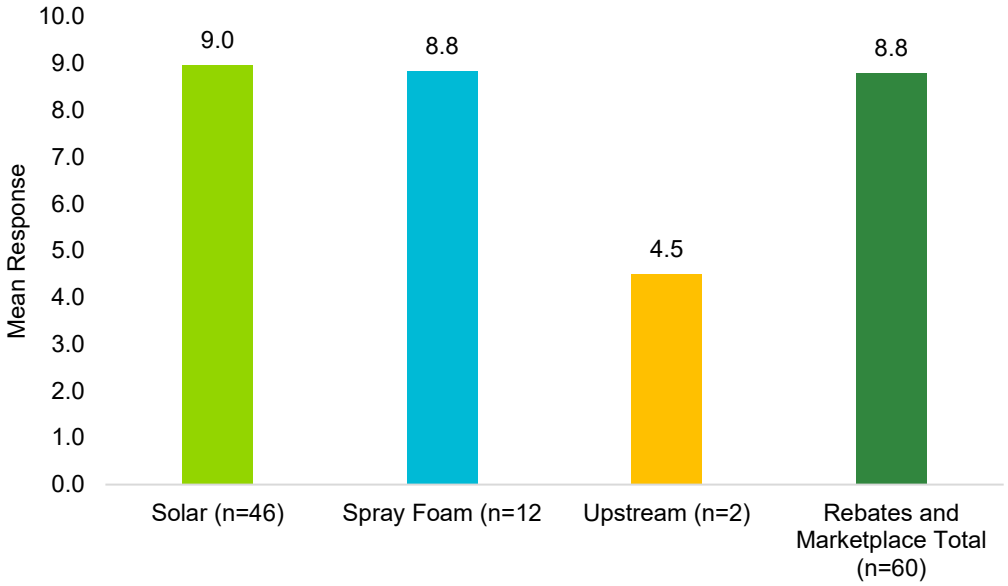


Respondents received the following question: "How would you rate your satisfaction with [Pathway Name] overall?" Guidehouse excluded "don't know" responses from analysis.

Source: Guidehouse analysis

Figure 3-3 shows the mean satisfaction score for the Rebates and Marketplace component by pathway.

Figure 3-3. Rebates and Marketplace Mean Satisfaction by Pathway



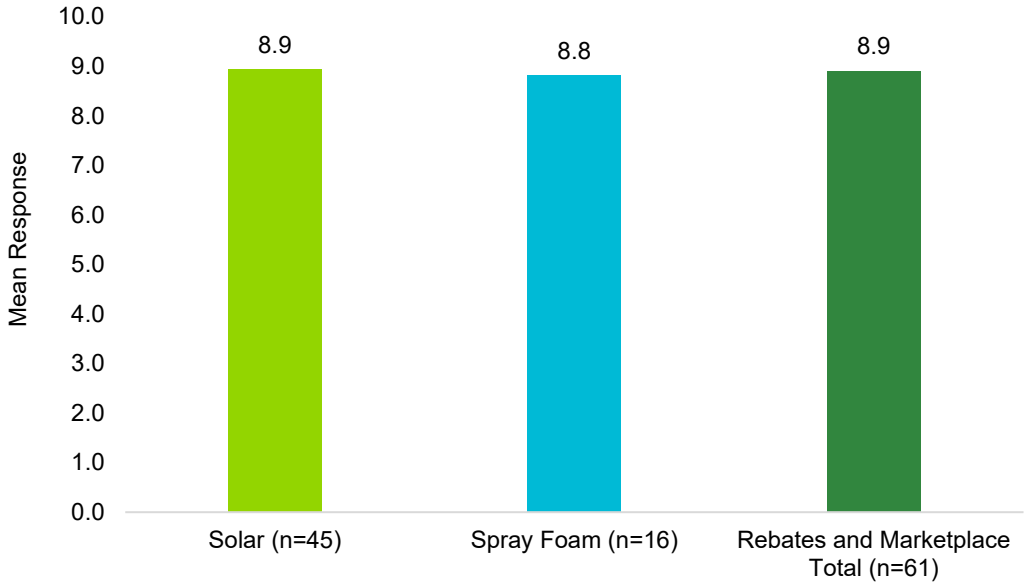
Respondents received the following question: "How would you rate your satisfaction with [Pathway Name] overall?" Guidehouse excluded "don't know" responses from analysis.

Source: Guidehouse analysis

Figure 3-4 shows the mean likelihood to recommend PECO's Residential EE Program. On average, Solar respondents reported a score of 9.0 out of 10 and Spray Foam respondents reported a score of 8.8 out of 10, using a scale where 0 is "not at all likely" and 10 is "extremely likely." The mean likelihood to recommend the Rebates and Marketplace component overall is 8.8 out of 10. Upstream retail store managers were not asked this question as the decision to participate in the program typically is made by a corporate office, so retail store managers are not likely to be recommending the program to others.

Customers who reported a likelihood to recommend the component as a 7 out of 10 or lower were also asked what changes to the component would make them more likely to recommend it to others. Solar respondents reported that providing a higher rebate amount and a dedicated customer service line for solar projects would increase their likelihood to recommend the component.

Figure 3-4. Rebates and Marketplace Mean Likelihood to Recommend by Pathway

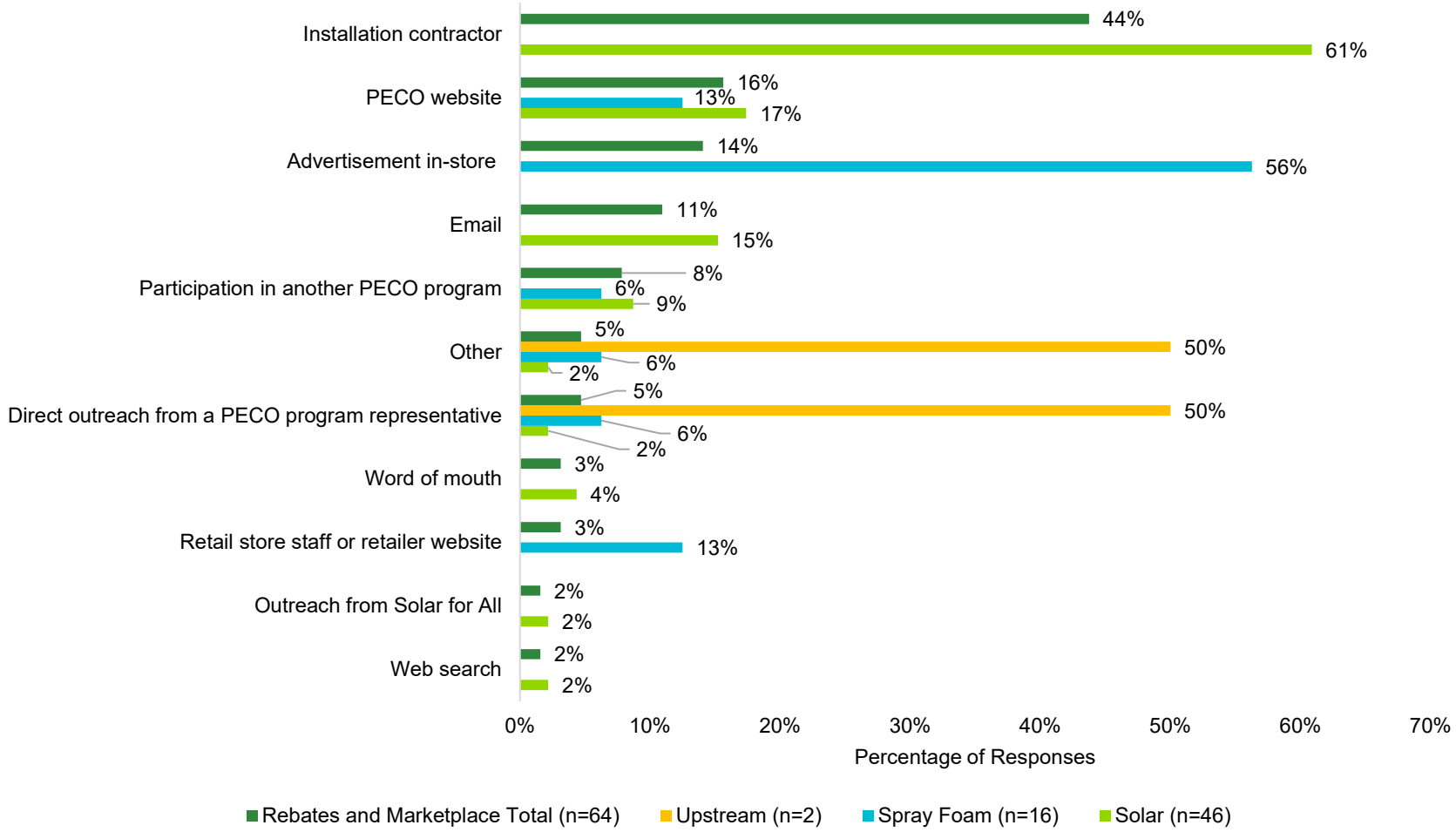


Respondents received the following question: "How likely are you to recommend [Pathway Name] to others?" Guidehouse excluded "don't know" responses from analysis.

Source: Guidehouse analysis

As Figure 3-5 shows, most Solar respondents (61%) learned about the component from their installation contractor. Through staff interviews, Guidehouse learned that PECO's Solar outreach strategy is evolving given that this is a new offering. PECO expects to be generating awareness earlier in the decision-making process for Solar moving forward. Most Spray Foam respondents (56%) learned about the component through an in-store advertisement, and Upstream respondents learned about the component from a PECO program representative (50%) or by conducting research after seeing in-store signage (50%). Despite most respondents (70%) indicating a likelihood to recommend the program as a 9 out of 10 or higher, few respondents (4% for Solar and 0% for Spray Foam and Upstream, as Figure 3-5 shows) heard about the program through word of mouth.

Figure 3-5. Sources of Rebates and Marketplace Awareness by Pathway



Respondents received the following question: "How did you learn about [Pathway Name]? Select all that apply." Guidehouse excluded "don't know" responses from analysis.

Source: Guidehouse analysis

Detailed findings by component and pathway are presented in Appendix E.

3.1.6 Program Finances and Cost-Effectiveness Reporting

Table 3-16 presents a detailed breakdown of program finances and cost-effectiveness. TRC benefits in Table 3-16 were calculated using gross verified impacts. NPV PY16 costs and benefits are expressed in 2024 dollars; Phase IV totals are in 2021 dollars.

Table 3-16. Summary of Program Finances – Gross Verified

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	IMCs	$34,418		$122,651	
2	Rebates to Participants and Trade Allies	$6,501		$20,896	
3	Upstream/Midstream Incentives	$1,412		$5,890	
4	Material Cost for Self-Install Programs (EE&C Kits)	$651		$2,743	
5	Direct Installation Program Materials and Labor	$0		$18	
6	Participant Costs (row 1 minus the sum of rows 2 through 5)	$25,854		$93,104	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$0	$0	$0	$0
8	Administration and Management	$7,055	$0	$24,438	$0
9	Marketing	$0	$0	$0	$0
10	Program Delivery	$0	$0	$0	$0
11	EDC Evaluation Costs	$0		$0	
12	SWE Audit Costs	$0		$0	
13	**Program Overhead Costs (sum of rows 7 through 12)**	**$7,055**		**$24,438**	
14	Total NPV TRC Costs (sum of rows 1 and 13)	$41,473		$147,089	
15	Total NPV Lifetime Electric Energy Benefits	$19,882		$68,243	
16	Total NPV Lifetime Electric Capacity Benefits	$19,018		$62,281	
17	Total NPV Lifetime O&M Benefits	$314		$24,823	
18	Total NPV Lifetime Fossil Fuel Impacts	$4,261		-$1,200	
19	Total NPV Lifetime Water Impacts	$3,110		$16,274	
20	**Total NPV TRC Benefits (sum of rows 15 through 19)**	**$46,584**		**$170,420**	
21	**TRC Benefit-Cost Ratio (row 20 divided by row 14)**	**1.12**		**1.16**	

* Rows 1-13 are presented in nominal dollars (PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025); P4TD = 2021 nominal dollars

Source: Guidehouse analysis

Table 3-17 presents program financials and cost-effectiveness on a net savings basis. Guidehouse applied NTGRs, which are summarized in Table 2-5.

The 2021 TRC Test Final Order stated that the NTGR should be applied to all benefits in the net TRC test, including but not limited to avoided energy and capacity costs, operations and maintenance (O&M), interactive effects, and secondary fossil fuel impacts. In addition, the NTGRs are applied to the IMCs, therefore the IMCs are different on a net savings basis compared with the gross savings basis.

Table 3-17. Summary of Program Finances – Net Verified

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	IMCs	$16,837		$79,808	
2	Rebates to Participants and Trade Allies	$6,501		$20,896	
3	Upstream/Midstream Incentives	$1,412		$5,890	
4	Material Cost for Self-Install Programs (EE&C Kits)	$651		$2,743	
5	Direct Installation Program Materials and Labor	$0		$18	
6	Participant Costs (row 1 minus the sum of rows 2 through 5)	$8,273		$50,262	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$0	$0	$0	$0
8	Administration and Management	$7,055	$0	$24,438	$0
9	Marketing	$0	$0	$0	$0
10	Program Delivery	$0	$0	$0	$0
11	EDC Evaluation Costs	$0		$0	
12	SWE Audit Costs	$0		$0	
13	**Program Overhead Costs (sum of rows 7 through 12)**	**$7,055**		**$24,438**	
14	Total NPV TRC (sum of rows 1 and 13)	$23,892		$104,246	
15	Total NPV Lifetime Electric Energy Benefits	$9,726		$45,198	
16	Total NPV Lifetime Electric Capacity Benefits	$9,304		$40,424	
17	Total NPV Lifetime O&M Benefits	$154		$17,055	
18	Total NPV Lifetime Fossil Fuel Impacts	$2,084		-$1,596	
19	Total NPV Lifetime Water Impacts	$1,521		$10,966	
20	**Total NPV TRC Benefits (sum of rows 15 through 19)**	**$22,789**		**$112,046**	
21	**TRC Benefit-Cost Ratio (row 20 divided by row 14)**	**0.95**		**1.07**	

* Rows 1-13 are presented in nominal dollars (PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025); P4TD = 2021 nominal dollars

Source: Guidehouse analysis

3.1.7 Status of Recommendations

The impact and process evaluation activities in PY16 led to the following findings and recommendations from Guidehouse to PECO, along with a summary of how PECO plans to address the recommendations in program delivery.

Table 3-18. Summary of Residential EE Evaluation Recommendations

Component	Evaluation Activity	Finding	Recommendation	EDC Status
In-Home Assessment	Impact	Deemed savings for Outlet Gaskets and weather stripping in kits are based on TRM default values but assume all homes have electric resistance heat and central air conditioning. Homes with gas heat, ASHPs, and homes without air conditioning all result in significant reductions to savings. Survey responses included a variety of heating and cooling types and an ISR of 0.39 for kit Outlet Gaskets, resulting in over an 80% reduction to energy savings and a realization rate of 0.17 for kit Outlet Gaskets. Non-kit Outlet Gaskets were also impacted, though to a lesser degree.	Guidehouse recommends the CSPs update deemed savings values based on the percentage of homes with cooling, gas, or electric heating fuel types, and heating and cooling equipment types. These breakdowns can be found in Appendix G of the 2018 Baseline Study for Phase IV. Based on the heating and cooling information contained in the 2018 Baseline Study, Guidehouse recommends the following deemed values for kits: • Outlet Gaskets: 5.77 kWh and 0.000069 kW per outlet gasket • Door weather stripping: 0.5907 kWh and 0.000007 kW per linear foot or 9.628 kWh and 0.000114 kW per door Guidehouse recommends the CSPs further derate these deemed savings with an ISR, such as the 0.39 this evaluation found for kit Outlet Gaskets.	Under Consideration
In-Home Assessment	Impact	Customers surveyed sometimes reported different heating and cooling types than reported in the tracking data, resulting in variances to savings and realization rates.	The In-Home Assessment component is composed of two components: kits and measures installed via an onsite visit. For kit measures, Guidehouse recommends the CSPs use “unknown" heating and cooling types and use deemed savings based on heating and cooling breakdowns based on Appendix G of the 2018 Baseline Study for Phase IV and the 2023 Baseline study for Phase V. Direct install measures require a contractor to be onsite. Guidehouse recommends that the contractor collect and document the actual heating and cooling types used in the participant home.	Under Consideration

Component	Evaluation Activity	Finding	Recommendation	EDC Status
Rebates and Marketplace	Impact	For HVAC installation measures, including High Efficiency Equipment measures, the CSP does not report baseline efficiency.	Guidehouse recommends the CSPs report all baseline efficiencies used to calculate savings.	Under Consideration
Rebates and Marketplace	Impact	Guidehouse identified that the reported savings for ENERGY STAR Air Purifiers with a measure completion date after 12/31/2023 but before 6/1/2024 do not use the updated Guidance Memo[23] with new federal standards and savings algorithms. Measures using the outdated guidance achieved a realization rate around 60%. This resulted in the overall realization rate for ENERGY STAR Air Purifiers to be around 90%.	Guidehouse recommends the CSPs follow the current SWE guidance memo for all ENERGY STAR Air Purifiers sold after 1/1/2024.	Implemented
Rebates and Marketplace	Impact	Four solar projects were duplicated in the tracking data. Guidehouse shared this finding and these projects with the CSP. The CSP noted that their internal systems identified the duplicates and did not pay duplicate incentives but savings for the duplicate projects were still claimed in eTRACK+.	Guidehouse recommends the CSPs consider implementing an automated duplication check, searching for the same address or account number to prevent duplicate entries.	Implemented
Rebates and Marketplace	Impact	Reported solar savings did not consistently use the recommended PVWatts methodology to estimate energy and demand savings. This measure offering was new in PY16 and some inconsistencies in reported savings were expected due to challenges harmonizing modeling assumptions from their proprietary tools and PVWatts. This caused high variability within the solar sample, with realization rates ranging from 0.44 to 1.96.	Guidehouse recommends PECO and the CSPs educate solar installers on PVWatts and how to use it, including the default values to use. PECO and the CSP have already started doing so. Guidehouse also recommends the CSPs develop an automated Excel tool to process 8,760 outputs from PVWatts and automatically calculate peak demand savings and then distribute this spreadsheet tool to installers so that they can rapidly produce energy and demand savings in alignment with the IMP for reporting purposes. If PVWatts data is not available on a project-by-project basis, the population average production is likely to be between 1,000 kWh and 1,400 kWh per kW installed and average summer peak demand savings between 0.3 kW and 0.4 kW per kW installed. If PVWatts estimates are unavailable, Guidehouse recommends	Under Consideration

[23] Revised TRM Section 2.4.12 ENERGY STAR Air Purifiers

Component	Evaluation Activity	Finding	Recommendation	EDC Status
			the CSPs estimate 1,100 kWh and 0.35 kW savings per installed kW.	
Rebates and Marketplace	Impact	For ductless heat pumps, the reported capacities for indoor units are drawn from the AHRI database. The AHRI database reports capacities for a total system in aggregate or for an outdoor unit. This is acceptable for 1:1 indoor:outdoor unit pairs. Systems with multiple indoor units paired to a single outdoor unit results in evaluated indoor unit capacities very different from reported capacities: • Project 3020970 installed three indoor units with cooling capacities of 9 kBTU/hr and heating capacities of 10 kBtu/hr, but reported three indoor units with cooling capacities of 22 kBTU/hr and heating capacities of 25 kBTU/hr. • Project 3020980 installed two indoor units with cooling capacities of 9 kBTU/hr and heating capacities of 10 kBtu/hr but reported two indoor units with cooling capacities of 22 kBTU/hr and heating capacities of 18 kBtu/hr.	Guidehouse recommends the CSPs use AHRI capacities for 1:1 indoor:outdoor system pairs, but when more than one indoor unit is paired with a single outdoor unit, Guidehouse recommends the CSPs use system heating and cooling capacities from the NEEP ccASHP database, and report these based on the indoor unit's capacity.	Implemented
Rebates and Marketplace	Impact	In PY15, Guidehouse began research to verify savings for spray foam. The research received a limited number of survey responses within the PY15 reporting timeframe, so Guidehouse continued the survey effort into PY16. This effort resulted in an updated savings estimate of 35.825 kWh and 0.0004215 kW per can. The CSP's claimed a variable amount of savings per can throughout PY16, claiming an average of 54.43 kWh and 0.00061 kW per can. This claim resulted in realization rates of 66% for energy and 69% for demand.	Guidehouse recommends the CSPs update their reported deemed savings to be 35.825 kWh and 0.0004215 kW per can.	Implemented

Component	Evaluation Activity	Finding	Recommendation	EDC Status
Rebates and Marketplace	Process	Respondents provided a high mean overall satisfaction for the solar offering (9.0 out of 10, n=46). Respondents provided the lowest mean satisfaction scores for the solar offering[24] for the assistance provided by PECO customer service (6.9, n=25), the documentation required to apply for a rebate (6.8 out of 10, n=12), the ease of applying for a rebate (6.5 out of 10, n=12). Some respondents noted frustration with the wait times or information provided by PECO customer service.	Guidehouse recommends PECO continue to shift the application process to contractors to reduce technical barriers, delays, and overall customer burden. PECO should consider having a dedicated or more streamlined call center for solar projects or providing more in-depth solar training to call center staff to improve their ability to respond to solar-related customer questions or concerns.	Under Consideration
Rebates and Marketplace	Process/ NTG	Nearly half of respondents (44%) first heard about the PECO solar offering after the installation of the solar energy system was complete. About a third (36%) heard about it while working with a contractor to install the solar energy system. Only 14% first heard about it before they started working with a contractor to install the solar energy system (n=36). The NTGR for the solar projects is 0.29 with free ridership at 0.72 because a majority of participants began or completed their project prior to learning about the incentive. Through staff interviews, Guidehouse learned that PECO's outreach strategy is evolving given that this offering is new. PECO expects to be generating awareness earlier in the decision-making process moving forward.	Due to the change in program outreach that significantly changes the timing of awareness generation, Guidehouse anticipates conducting another NTG and process evaluation in PY17. The PY17 evaluation will be used to calculate an updated NTG value and understand the new customer experience. Guidehouse does not have recommendations on this topic for PECO or the CSP at this time.	Implemented

[24] More detail on this finding can be found in Section E.1.3.

Component	Evaluation Activity	Finding	Recommendation	EDC Status
Appliance Recycling	Impact	The Dehumidifier Retirement measure was assigned to be around 70 unique GHMeasureID values ranging from R1412 to R1495. This field should be unique to each measure type, as it is used to bring in measure characteristics such as the IMC and gas/water benefits for the TRC evaluation.	Guidehouse recommends the CSPs standardize the Res A/R Dehumidifier Retirement GHMeasureID to R1412.	Implemented
Rebates and Marketplace	TRC Test	The Residential Program saw a significant year-over-year increase in demand-based benefits, growing from $9.9 million in PY15 to $18.9 million in PY16. Most of this increase was driven by Residential Solar measures within the Downstream program component pathway - these measures accounted for nearly a third of verified demand savings in the Residential Program in PY16.	Guidehouse recommends PECO continue to pursue Residential Solar customers to meet the Phase IV demand savings target.	Implemented
Rebates and Marketplace	TRC Test	Spray Foam remained a significant measure for the Residential Program in PY16, contributing 31% of the program's verified first-year kWh savings. This measure remains highly cost-effective under the TRC framework, largely due to the low customer incremental costs incurred.	PECO should anticipate a measurable drop in both first-year kWh savings and TRC cost-effectiveness for the Residential Program in PY17 if spray foam participation is reduced.	Under Consideration

Source: Guidehouse analysis

3.2 Income-Eligible EE Program

The Income-Eligible EE Program offers IE customers opportunities to save energy across all their electric end uses. The Income-Eligible EE Program serves customers with household incomes less than or equal to 150% of the FPL. The Residential EE Program serves all other customers, also referred to as market-rate. Some components (Multifamily and Appliance Recycling) allocate savings to both the Income-Eligible EE Program and the Residential EE Program.

CMC is the prime CSP for the program, managing additional CSPs to implement program components:

- **Appliance Recycling:** The Appliance Recycling component traditionally focused on responsibly recycling refrigerators, freezers, dehumidifiers, and window air conditioning units. The component serves both IE and market-rate customers. Historically, ARCA implemented the Appliance Recycling component. However, ARCA was unable to fulfill their obligations early in the phase, which resulted in the program being put on hold until an alternative implementation methodology could be adopted. In PY16, the program started to partner with eForce Recycling, which facilitates drop-off events within the greater Philadelphia area. These drop-off events collect only dehumidifiers and window air conditioners. The program continues to investigate ways to again offer the collection of refrigerators and freezers.
- **Single-Family:** The Single-Family component improves the energy efficiency of single-family homes for IE customers to help reduce their electric bills and make their homes more comfortable. CMC implements the Single-Family component. There are multiple pathways to receive program services. The Free Energy Checkup Program and Low-Income Usage Reduction Program (LIURP)[25] offer consistent services for IE households but are differentiated by funding sources. The program also mails energy efficient kits to anyone who has recently signed up for or been put on an IE payment program (i.e., customer assistance program). These kits include advanced power strips, a low-flow faucet aerator, and a low-flow showerhead.
- All measures for the Single-Family component are 100% subsidized. When appropriate, measure installation funding is coordinated with the Long-Term Savings component. The implementation and evaluation approaches are consistent for these two components.
- **Long-Term Savings:** The Long-Term Savings component is implemented as an overlay service through the Single-Family component to encourage the installation of long-term, comprehensive measures. All Long-Term Savings projects are Single-Family component participants, but not all Single-Family participants will be Long-Term Savings participants. As a result, both the Single-Family and Long-Term Savings components are evaluated and reported as a single component. CMC implements the Long-Term Savings component.
- The Long-Term Savings component measures include insulation, air sealing, duct sealing, heat pumps, air conditioners, thermostats, and residential heat pump water heaters and solar water heaters. All measures are 100% subsidized.

[25] LIURP funding is not part of the Act 129 program.

3.2.1 Participation and Reported Savings by Customer Segment

Table 3-19 presents the participation counts, reported energy and demand savings, and incentive payments for the Income-Eligible EE Program in PY16 by customer segment.

Table 3-19. Income-Eligible EE Program Participation and Reported Impacts

Parameter	Income-Eligible	Total
PY16 # Participants[1]	7,467	**7,467**
PYRTD MWh/yr	13,943	**13,943**
PYRTD MW/yr	1.60	**1.60**
PY16 Incentives ($1,000)	4,092	**4,092**

[1] Note: Participation totals do not include Single-Family Giveaway measures.

Source: Guidehouse analysis

3.2.2 Gross Impact Evaluation

Guidehouse conducted the gross impact evaluation for the Income-Eligible EE Program following the general approach outlined in its Evaluation Plan[26] for PY16. The Income-Eligible EE Program gross impact evaluation included a comprehensive tracking database analysis of all TRM-based and IMP-based measures to confirm that reported savings align with TRM and IMP standards. Guidehouse was able to review all measures within the Income-Eligible EE Program. Guidehouse adjusted the verified savings based on discrepancies identified in the tracking database analysis.

A discussion of the Multifamily Income-Eligible evaluation is in Section 3.1.2. Guidehouse conducted the Multifamily Residential EE Program and Income-Eligible Multifamily EE Program impact evaluations together. See additional details on methodology in Sections 3.1.2 and 3.1.5.1.

Additionally, for the Single-Family and Long-Term Savings components, in PY16, Guidehouse conducted both a customer survey and engineering desk review verification activities for a sample of 243 customer responses.

All samples were designed and implemented to meet the targets set in Guidehouse's sampling design memos.[27] Table 3-20 outlines the impact survey sample targets and completes. Survey completes are defined as a survey where the participant successfully completed the entire survey through to the end and excludes partial completes and respondents who were screened out of the survey due to ineligibility. Additional details of the impact evaluation completed in PY16 can be found in Appendix E. Details on the survey activities, approach, and incentives for the Income-Eligible Single-Family and Long-Term Savings survey can be found Appendix E.

Table 3-20. Income-Eligible Impact Sample Targets and Completes

Component	Stratum	Number Contacted	Target Completes	Actual Completes	Response Rate	Percentage of Target Achieved
	Kits	31,394	30	130	0.4%	433%

[26] Guidehouse, Phase IV Evaluation Plan, Energy Efficiency and Conservation Portfolio, revised November 18, 2024.
[27] Guidehouse, PECO PY16 Residential Impact Sample Design Memo FINAL, dated March 31, 2025.

Component	Stratum	Number Contacted	Target Completes	Actual Completes	Response Rate	Percentage of Target Achieved
Single-Family and Long-Term Savings	High Impact	258	18	19	7%	106%
	Medium Impact	755	20	55	7%	275%
	Low Impact	1471	20	39	3%	195%
	Total	**33,878**	**88**	**243**	**1%**	**276%**

Source: Guidehouse analysis

Table 3-21 shows gross impact results for energy and Table 3-22 shows gross impact results for demand.

Table 3-21. Income-Eligible EE Program Gross Impact Results for Energy

Component	PYRTD MWh/yr	Energy Realization Rate	Sample CV or Error Ratio	Relative Precision at 85% C.L.
Single-Family/ Long-Term Savings	13,759	1.19	1.24	0.08
Appliance Recycling	184	1.04	0.17	0.02
Program Total[1]	**13,943**	**1.19**	**1.23**	**0.09 [90% C.L.]**

1 The Multifamily Income-Eligible component is not included in this table; it is included with Residential EE Program savings due to how this is reported in the tracking database; savings are credited to the IE carveout.

Source: Guidehouse analysis

Table 3-22. Income-Eligible EE Program Gross Impact Results for Demand

Component	PYRTD MW/yr	Demand Realization Rate	Sample CV or Error Ratio	Relative Precision at 85% C.L.
Single-Family/ Long-Term Savings	1.54	1.17	1.24	0.08
Appliance Recycling	0.06	1.02	0.14	0.01
Program Total[1]	**1.60**	**1.16**	**1.20**	**0.09 [90% C.L.]**

[1] The Multifamily Income-Eligible component is not included in this table; it is included with Residential EE Program savings due to how this is reported in the tracking database; savings are credited to the IE carveout.

Source: Guidehouse analysis

The introduction to Section 3 describes the two-step evaluation method, which results in the ratios that Table 3-23 and Table 3-24 show. The tracking database analysis is conducted annually while the verification ratio may be historical based on the Evaluation Plan.[28] The TDR multiplied by the verification ratio represents the overall energy or demand realization rate.

Table 3-23.Income-Eligible Energy Ratios

Component	Energy TDR	Energy Verification Ratio	Energy Realization Rate
Single-Family/ Long-Term Savings	0.95	1.25	1.19
Appliance Recycling	1.01	1.02	1.04

[28] Guidehouse, Phase IV Evaluation Plan, Energy Efficiency and Conservation Portfolio, revised November 18, 2024.

Component	Energy TDR	Energy Verification Ratio	Energy Realization Rate
Income-Eligible Total	**0.95**	**1.25**	**1.19**

Source: Guidehouse analysis

Table 3-24.Income-Eligible Demand Ratios

Component	Demand TDR	Demand Verification Ratio	Demand Realization Rate
Single-Family/ Long-Term Savings	0.92	1.27	1.17
Appliance Recycling	1.01	1.01	1.02
Income-Eligible Total	**0.92**	**1.26**	**1.16**

Source: Guidehouse analysis

The following factors led to variation between the reported and verified savings, which led to the observed realization rates:

- **Tracking Database Analysis:** Guidehouse adjusted savings across a variety of measures, including low flow faucet aerators and ENERGY STAR air purifiers. The adjustment that had the largest impact on savings was a correction to the kit inputs for low flow faucet aerators. These updates resulted in an energy TDR of 0.95 and a demand TDR of 0.93 for the Income-Eligible EE Program. Appendix E contains further measure-level detail.
- **HVAC-related Measures:** For some HVAC-related measures, such as Central Air Conditioner & Heat Pump Maintenance and ENERGY STAR Certified Connected Thermostats, the tracking data reports a SEER of 14, EER of 14, and HSPF of 7.7. This data slightly underestimates cooling energy and peak demand savings and overestimates heating energy savings.
- **Low-Flow Showerheads and Faucet Aerators:** Income-eligible kits include a faucet aerator and a showerhead. The evaluated kit faucet aerator and showerhead savings were higher than reported savings because of higher-than-expected installation rates and because some were installed in homes with electric resistance water heat. Conversely, three direct install faucet aerators and showerheads were removed by customers, leading to lower ISRs, and four direct install faucet aerators and showerheads were installed in homes with gas water heat, leading to zero electrical savings. These evaluation results led to opposite impacts. Kit faucet aerators and kit showerheads achieved realization rates of 230% and 177%, respectively, for both energy and demand. Direct install faucet aerators and showerheads received realization rates of 43% and 53%, respectively.
- **Education Measures:** The CSP uses placeholder values of 1 kWh and 0 kW for tracked savings for Education measures. Guidehouse used survey research to update these savings values in PY16. Evaluated savings values vary by measure type.
- **Survey Analysis:** Guidehouse's impact evaluation surveyed 126 customers who were sent kit faucet aerators. Sixty-seven installed the aerator, 56 did not, and three were unsure, did not remember, or did not know. Of the 67 respondents who installed the aerator, 22 installed the aerator in the kitchen and 30 installed it in the bathroom. The 15 remaining installed aerators included unusual survey reports, including other non-bathroom non-kitchen locations, reports that the aerator had been installed but that the

customer did not know where, and reports that the single aerator was installed in both the kitchen and the bathroom.

3.2.3 Net Impact Evaluation

Guidehouse does not assess net impacts for the Income-Eligible EE Program as per guidance from the SWE's Evaluation Framework.[29]

3.2.3.1 HIM Research

Guidehouse did not evaluate HIMs for the Income-Eligible EE Program in PY16.

3.2.4 Verified Savings Estimates

In Table 3-25, the realization rates and NTGRs determined by Guidehouse are applied to the reported energy and demand savings estimates to calculate the verified savings estimates for the Income-Eligible EE Program in PY16.

Table 3-25. Income-Eligible EE Program PY16 and P4TD Savings Summary

Savings Type	Energy (MWh/yr)	Demand (MW/yr)
PYRTD	13,943	1.60
PYVTD Gross	16,542	1.85
PYVTD Net	16,542	1.85
RTD	73,413	7.73
VTD Gross	74,341	7.67
VTD Net	74,341	7.67

Source: Guidehouse analysis

3.2.5 Process Evaluation

As described in the Phase IV Evaluation Plan[30] approved by the SWE, Guidehouse did not conduct in-depth process evaluation activities for the Residential Income-Eligible Program in PY16. Instead, Guidehouse interviewed the PECO program managers and CSP staff to understand the goals of the program, identify significant implementation changes, and identify areas of strength and areas of improvement. Guidehouse will use findings from these interviews to inform evaluation research in future years.

3.2.6 Program Finances and Cost-Effectiveness Reporting

Table 3-26 presents a detailed breakdown of program finances and cost-effectiveness. TRC benefits in Table 3-26 were calculated using gross verified impacts. NPV PY16 costs and benefits are expressed in 2024 dollars; Phase IV totals are in 2021 dollars.

[29] Pennsylvania Statewide Evaluator, *Evaluation Framework for Pennsylvania*, https://www.puc.pa.gov/media/1584/swe-phaseiv_evaluation_framework071621.pdf.

[30] Guidehouse, Phase IV Evaluation Plan, Energy Efficiency and Conservation Portfolio, revised November 18, 2024.

Table 3-26. Summary of Program Finances – Gross Verified

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	IMCs	$3,940		$19,566	
2	Rebates to Participants and Trade Allies	$2,744		$19,934	
3	Upstream/Midstream Incentives	$0		$0	
4	Material Cost for Self-Install Programs (EE&C Kits)	$1,348		$6,422	
5	Direct Installation Program Materials and Labor	$0		$12	
6	Participant Costs (row 1 minus the sum of rows 2 through 5)	-$152		-$6,802	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$0	$0	$0	$0
8	Administration and Management	$1,377	$0	$7,250	$0
9	Marketing	$0	$0	$0	$0
10	Program Delivery	$0	$0	$0	$0
11	EDC Evaluation Costs	$0		$0	
12	SWE Audit Costs	$0		$0	
13	**Program Overhead Costs (sum of rows 7 through 12)**	**$1,377**		**$7,250**	
14	Total NPV TRC Costs (sum of rows 1 and 13)	$5,317		$26,817	
15	Total NPV Lifetime Electric Energy Benefits	$4,527		$23,561	
16	Total NPV Lifetime Electric Capacity Benefits	$2,906		$13,041	
17	Total NPV Lifetime O&M Benefits	$254		$3,466	
18	Total NPV Lifetime Fossil Fuel Impacts	$17,532		$16,535	
19	Total NPV Lifetime Water Impacts	$10,202		$60,981	
20	**Total NPV TRC Benefits (sum of rows 15 through 19)**	**$35,422**		**$117,583**	
21	**TRC Benefit-Cost Ratio (row 20 divided by row 14)**	**6.66**		**4.38**	

* Rows 1-13 are presented in nominal dollars (PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025); P4TD = 2021 nominal dollars.

Source: Guidehouse analysis

Program financials and cost-effectiveness on a net savings basis are the same values as in Table 3-26 because verified net savings equal the verified gross savings for the Income-Eligible EE Program.

3.2.7 Status of Recommendations

The impact and process evaluation activities in PY16 led to the following findings and recommendations from Guidehouse to PECO, along with a summary of how PECO plans to address the recommendations in program delivery.

Table 3-27. Summary of Income-Eligible EE Evaluation Recommendations

Component	Evaluation Activity	Finding	Recommendation	EDC Status
Single-Family Income-Eligible	Impact	The education measures in the Single-Family Income-Eligible component are reported with placeholder savings values of 1.0 kWh and 0.0 kW in the PY16 tracking data. Guidehouse applies deemed savings values to these measures, which results in an energy realization rate value for the education stratum of around 3600%.	Guidehouse recommends the CSP report the deemed value for these Single-Family Income-Eligible component education measures in the tracking data, allowing for more accurate reported savings.	Under Consideration
Single-Family Income-Eligible	Impact	For some non-replacement HVAC measures, such as Central Air Conditioner & Heat Pump Maintenance and ENERGY STAR Certified Connected Thermostats, the tracking data reports a SEER of 14, EER of 14, and HSPF of 7.7. This data slightly underestimates cooling energy and peak demand savings, and overestimates heating savings.	Guidehouse recommends the CSP follow the TRM guidance, which indicates using Table 2-8 and Early Replacement values. These values are a SEER of 13.5, EER of 11.4, and HSPF of 8.2 for ASHP and a SEER of 12.1 and EER of 10.6, for Central Air Conditioning.	Implemented
Single-Family Income-Eligible	Impact	Reported savings for over 38,000 kit faucet aerator measure lines use the Kitchen variables, assuming the aerator is installed in the kitchen. This assumption is based on installation guidance included in the kit, indicating that the aerators should be installed in the kitchen. After reviewing the installed aerators, Guidehouse found the participating aerators can be installed anywhere.	Guidehouse recommends the CSP use the "unknown" location deemed values for all kits and only use location-specific parameters for Direct Install aerators with a known installation location.	Under Consideration
Single-Family Income-Eligible	Impact	The Income-Eligible program tracking data does not include model numbers, AHRI identifiers, ENERGY STAR identifiers, or efficient EER values for ductless minisplit heat pumps. The TRM includes a default algorithm to calculate an approximated stand-in EER value, based on the SEER value, if the actual EER is missing. Given the lack of information, Guidehouse has used this approximation for evaluation purposes.	Guidehouse recommends the CSP build an automated check to flag any blank model numbers or AHRI IDs and to make at least one of these fields a required field.	Under Consideration
Single-Family Income-Eligible	Impact	Over 91% of Air Purifiers in the Income-Eligible program tracking data and almost all of the random sample have one model number in the tracking data: 3332111100. One measure line from the sample and 3% of the population had a different model number and efficiency: 3432111100. Ten measure lines from the sample and 6% of the population had a blank model	Guidehouse recommends the CSP build an automated check to flag any blank model numbers and to make this field required.	Implemented

Component	Evaluation Activity	Finding	Recommendation	EDC Status
		number. These 10 measure lines had a reported efficiency of more than 100x the baseline efficiency, more than 50x the most efficient Air Purifiers reported, and more than 40x the most efficient air purifiers listed on the ENERGY STAR website. This finding indicates an erroneous data entry. All of the sampled Air Purifiers with a blank model number had the same CADR as the dominant 3332111100. For evaluation purposes, Guidehouse used the ENERGY STAR ID number from the tracking data to look up the efficiency.		
Single-Family Income-Eligible	TRC Test	In the Income-Eligible Program, the total of the measure-level incentive cost values is significantly lower than the incentive spend totals indicated in the Portfolio Report. The Single-Family Income-Eligible component, for example, has $2.01 million in total measure-level incentives but $2.60 million in incentives in the Portfolio Report.	Guidehouse recommends PECO provide an additional breakout in the Portfolio Report for measure incentives and program incentives to enable alignment with tracking data values.	Under Consideration

Source: Guidehouse analysis

3.3 Residential HER Program

The objective of the Residential HER Program for market-rate customers is to encourage reduced home energy use through print (mail) and online (email) reports sent directly to customers that give insight into their household energy usage. These programs leverage social norming to drive persistent energy savings through smart energy practices.

Oracle implements the HER program as a randomized control trial (RCT). HER print and online content provides customers with usage summaries to compare their household energy use with the average energy use of similar households. In this way, these customers have a relative sense of where their energy use patterns fall. The reports also provide targeted recommendations or tips to customers, suggesting actions they can take to reduce consumption. The full content of HERs serves to encourage customers to reduce their consumption and enhance engagement and general satisfaction.

The reports are sent to targeted cohorts of customers on an opt-out basis. In Phase IV, cohort activity is on a rotating activity schedule, meaning that some report recipient cohorts will not receive HERs in certain years.[31] During PY16, approximately 508,000 households received HERs across nine active residential cohorts, with reports paused for two legacy residential cohorts.

3.3.1 Participation and Reported Savings by Customer Segment

Table 3-28 presents the participation counts, reported energy and demand savings, and incentive payments for the Residential HER Program in PY16 by customer segment. Participants are defined as HER recipients that have savings in at least one month during the program year.

Table 3-28. Residential HER Program Participation and Reported Impacts

Parameter	Residential (Non-IE)	Total
PY16 # Participants	508,266	**508,266**
PYRTD MWh/yr	28,911	**28,911**
PYRTD MW/yr	4.70	**4.70**
PY16 Incentives ($1,000)	-	**-**

Source: Guidehouse analysis

3.3.2 Gross Impact Evaluation

Guidehouse evaluated savings for the nine active residential HER cohorts in PY16. Using a lagged dependent variable (LDV) model, Guidehouse estimated monthly energy savings separately for each cohort. Modeled energy savings are reduced through a double-counting (uplift) analysis on other energy efficiency program participation and through the application of persistence from past program years, which is also done by cohort. This approach results in first-year incremental savings compliant with Phase IV requirements. For peak demand, Guidehouse used a simple difference model to estimate savings for each wave and applied both the modeled and first-year incremental energy savings to these demand savings to indirectly

[31] In Phase III, all wave cohorts remained active after launch, but Phase IV uses a varied wave activation schedule for each program year due to now claiming only first-year incremental savings. For PY16, two residential cohorts active in Phase III or previously active in Phase IV were not sent reports and thus do not claim savings.

account for uplift and persistence reductions. Refer to Appendix B for the full impact evaluation detail. Table 3-29 and Table 3-30 present evaluation results.

Table 3-29. Residential HER Program Gross Impact Results for Energy

	PYRTD MWh/yr	Energy Realization Rate	Sample CV or Error Ratio	Relative Precision at 85% C.L.
Program Total	**28,911**	**0.90**	**-**	**-**

Source: Guidehouse analysis

Table 3-30. Residential HER Program Gross Impact Results for Demand

	PYRTD MW/yr	Demand Realization Rate	Sample CV or Error Ratio	Relative Precision at 85% C.L.
Program Total	**4.70**	**1.64**	**-**	**-**

Source: Guidehouse analysis

The following factors led to variations between the reported and verified savings, which led to the observed realization rates:

- Guidehouse leveraged summer 2024 peak-hour metering data to conduct the peak demand analysis. Differences in data sources can drive discrepancies in reported and verified savings in either direction (e.g., using hourly data may provide a more accurate estimate of savings).
- All active residential HER recipients are in at least their fourth active year. After 3 years of exposure, measured energy savings are expected to increase modestly in subsequent years. However, the varied wave schedule in Phase IV may increase variability in savings as legacy waves are likely to experience fluctuations in savings after being untreated for one or more years.
- The peak demand analysis, which focuses on the summer months, is likely to deliver consistent demand savings estimates throughout the remainder of the phase, conditional on the cohorts treated in each year. Notably, one or more of the demand regression coefficients for four residential cohorts are statistically insignificant.

Refer to Appendix B for the full impact evaluation detail.

3.3.3 Net Impact Evaluation

Guidehouse does not assess net impacts for the Residential HER Program as per guidance from the SWE's Evaluation Framework.[32]

3.3.4 Verified Savings Estimates

In Table 3-31, the realization rates and NTGRs determined by Guidehouse are applied to the reported energy and demand savings estimates to calculate the verified savings estimates for the Residential HER Program in PY16.

[32] Pennsylvania Statewide Evaluator, *Evaluation Framework for Pennsylvania*, https://www.puc.pa.gov/media/1584/swe-phaseiv_evaluation_framework071621.pdf.

Table 3-31. Residential HER Program PY16 and P4TD Savings Summary

Savings Type	Energy (MWh/yr)	Demand (MW/yr)
PYRTD	28,911	4.70
PYVTD Gross	26,156	7.73
PYVTD Net	26,156	7.73
RTD	108,558	17.67
VTD Gross	105,303	24.51
VTD Net	105,303	24.51

Source: Guidehouse analysis

3.3.5 Process Evaluation

As described in the Phase IV Evaluation Plan[33] approved by the SWE, Guidehouse did not conduct in-depth process evaluation activities for the Residential HER Program in PY16. Instead, Guidehouse interviewed the PECO program managers and CSP staff to understand the goals of the program, identify significant implementation changes, and identify areas of strength and areas of improvement. Guidehouse will use findings from these interviews to inform evaluation research in future years.

3.3.6 Program Finances and Cost-Effectiveness Reporting

Table 3-32 presents a detailed breakdown of program finances and cost-effectiveness. TRC benefits in Table 3-32 were calculated using gross verified impacts. NPV PY16 costs and benefits are expressed in 2024 dollars; Phase IV totals are in 2021 dollars.

Table 3-32. Summary of Program Finances – Gross Verified

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	IMCs	$0		$0	
2	Rebates to Participants and Trade Allies	$0		$0	
3	Upstream/Midstream Incentives	$0		$0	
4	Material Cost for Self-Install Programs (EE&C Kits)	$0		$0	
5	Direct Installation Program Materials and Labor	$0		$0	
6	Participant Costs (row 1 minus the sum of rows 2 through 5)	$0		$0	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$0	$0	$0	$0
8	Administration and Management	$2,217	$0	$8,001	$0
9	Marketing	$0	$0	$0	$0
10	Program Delivery	$0	$0	$0	$0
11	EDC Evaluation Costs	$0		$0	
12	SWE Audit Costs	$0		$0	
13	**Program Overhead Costs (sum of rows 7 through 12)**	**$2,217**		**$8,001**	
14	**Total NPV TRC Costs (sum of rows 1 and 13)**	**$2,217**		**$8,001**	
15	Total NPV Lifetime Electric Energy Benefits	$3,138		$9,172	

[33] Guidehouse, Phase IV Evaluation Plan, Energy Efficiency and Conservation Portfolio, revised November 18, 2024.

Row	Cost Category*	PYTD ($1,000)	P4TD ($1,000)
16	Total NPV Lifetime Electric Capacity Benefits	$5,981	$14,798
17	Total NPV Lifetime O&M Benefits	$0	$0
18	Total NPV Lifetime Fossil Fuel Impacts	$0	$0
19	Total NPV Lifetime Water Impacts	$0	$0
20	**Total NPV TRC Benefits (sum of rows 15 through 19)**	**$9,119**	**$23,970**
21	**TRC Benefit-Cost Ratio (row 20 divided by row 14)**	**4.11**	**3.00**

* Rows 1-13 are presented in nominal dollars (PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025); P4TD = 2021 nominal dollars.

Source: Guidehouse analysis

Program financials and cost-effectiveness on a net savings basis are the same values as in Table 3-32 because verified net savings equal the verified gross savings for the Residential HER Program.

3.3.7 Status of Recommendations

Guidehouse makes no recommendations for the Residential HER program this year.

3.4 Income-Eligible HER Program

The Income-Eligible HER Program objective is to encourage reduced home energy use through print (mail) and online (email) reports sent directly to customers that give insight into their household energy usage. These programs leverage social norming to drive persistent energy savings through smart energy practices.

Oracle implements the Income-Eligible HER Program as an RCT. HER print and the online content provide customers with usage summaries to compare their household energy use with the average energy use of similar households. In this way, these customers have a relative sense of where their energy use patterns fall. The reports also provide targeted recommendations or tips to customers, suggesting actions they can take to reduce consumption.

Different from the Residential HER program, customers on IE rates receive messaging tailored toward low-cost and no-cost recommendations. The full content of HERs serves to encourage customers to reduce their consumption and enhance engagement and general satisfaction. The reports are sent to targeted cohorts of customers on an opt-out basis. During PY16, approximately 34,000 IE households received HERs for the two active IE cohorts.[34]

3.4.1 Participation and Reported Savings by Customer Segment

Table 3-34 presents the participation counts, reported energy and demand savings, and incentive payments for the Income-Eligible HER Program in PY16 by customer segment. Participants are defined as HER recipients that have savings in at least one month during the program year.

Table 3-33. Income-Eligible HER Program Participation and Reported Impacts

Parameter	Income-Eligible	Total
PY16 # Participants	34,756	**34,756**
PYRTD MWh/yr	1,465	**1,465**
PYRTD MW/yr	0.24	**0.24**
PY16 Incentives ($1,000)	-	**-**

Source: Guidehouse analysis

3.4.2 Gross Impact Evaluation

Guidehouse evaluated savings for two IE HER cohorts. The evaluation follows the same approach as the Residential HER Program, as described in Section 3.3.2. Refer to Appendix B for the full impact evaluation detail. Table 3-35 and Table 3-36 present evaluation results.

Table 3-34. Income-Eligible HER Program Gross Impact Results for Energy

	PYRTD MWh/yr	Energy Realization Rate	Sample C_V or Error Ratio	Relative Precision at 85% C.L.
Program Total	**1,465**	**0.55**	**-**	**-**

Source: Guidehouse analysis

[34] For PY15, one IE cohort was not sent reports until approximately halfway through the program year.

Table 3-35. Income-Eligible HER Program Gross Impact Results for Demand

	PYRTD MW/yr	Demand Realization Rate	Sample C_V or Error Ratio	Relative Precision at 85% C.L.
Program Total	**0.24**	**0.83**	**-**	**-**

Source: Guidehouse analysis

The following factors led to variation between the reported and verified savings and led to the observed realization rates:

- Guidehouse leveraged summer 2024 peak-hour metering data to conduct the peak demand analysis. Differences in data sources can drive discrepancies in reported and verified savings (e.g., using hourly data may provide a more accurate estimate of savings).
- Approximately 6% of the population of active HER recipients in the Income-Eligible Program are split across two waves, Wave 7 Income-Eligible and Wave 8 Low-Income. Wave 8 Low-Income is in its second year while Wave 7 Income-Eligible is in its fourth year of exposure. While measured savings typically trend upward in the first 3 years of exposure, savings for IE cohorts are highly variable and often statistically insignificant due to small group size and other potential influences on energy usage, such as income-based billing programs.
- Income-Eligible HER customers may differ from their Residential HER counterparts. This difference is likely to cause wider variations in verified versus reported savings based on methodology or cause the magnitude and statistical significance of savings estimates to develop differently over the course of Phase IV. Savings for the Wave 7 Income-Eligible cohort in PY16 were statistically insignificant for 9 months of the program year. Savings are statistically insignificant for all 12 months for the newest IE cohort, Wave 8.

Refer to Appendix B for the full impact evaluation detail.

3.4.3 Net Impact Evaluation

Guidehouse does not assess net impacts for the Income-Eligible HER Program as per guidance from the SWE's Evaluation Framework.[35]

3.4.4 Verified Savings Estimates

In Table 3-37, the realization rates and NTGRs determined by Guidehouse are applied to the reported energy and demand savings estimates to calculate the verified savings estimates for the Income-Eligible HER Program in PY16.

Table 3-36. Income-Eligible HER Program PY16 and P4TD Savings Summary

Savings Type	Energy (MWh/yr)	Demand (MW/yr)
PYRTD	1,465	0.24
PYVTD Gross	807	0.20
PYVTD Net	807	0.20
RTD	3,421	0.56

[35] Pennsylvania Statewide Evaluator, *Evaluation Framework for Pennsylvania*, https://www.puc.pa.gov/media/1584/swe-phaseiv_evaluation_framework071621.pdf.

Savings Type	Energy (MWh/yr)	Demand (MW/yr)
VTD Gross	2,473	0.12
VTD Net	2,473	0.12

Source: Guidehouse analysis

3.4.5 Process Evaluation

As described in the Phase IV Evaluation Plan[36] approved by the SWE, Guidehouse did not conduct in-depth process evaluation activities for the Income-Eligible HER Program in PY16. Instead, Guidehouse interviewed the PECO program managers and CSP staff to understand the goals of the program, identify significant implementation changes, and identify areas of strength and areas of improvement. Guidehouse will use findings from these interviews to inform evaluation research in future years.

3.4.6 Program Finances and Cost-Effectiveness Reporting

Table 3-38 presents a detailed breakdown of program finances and cost-effectiveness. TRC benefits in Table 3-38 were calculated using gross verified impacts. NPV PY16 costs and benefits are expressed in 2024 dollars; Phase IV totals are in 2021 dollars.

Table 3-37. Summary of Program Finances – Gross Verified

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	IMCs	$0		$0	
2	Rebates to Participants and Trade Allies	$0		$0	
3	Upstream/Midstream Incentives	$0		$0	
4	Material Cost for Self-Install Programs (EE&C Kits)	$0		$0	
5	Direct Installation Program Materials and Labor	$0		$0	
6	Participant Costs (row 1 minus the sum of rows 2 through 5)	$0		$0	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$0	$0	$0	$0
8	Administration and Management	$97	$0	$283	$0
9	Marketing	$0	$0	$0	$0
10	Program Delivery	$0	$0	$0	$0
11	EDC Evaluation Costs	$0		$0	
12	SWE Audit Costs	$0		$0	
13	**Program Overhead Costs (sum of rows 7 through 12)**	**$97**		**$283**	
14	Total NPV TRC Costs (sum of rows 1 and 13)	$97		$283	
15	Total NPV Lifetime Electric Energy Benefits	$97		$218	
16	Total NPV Lifetime Electric Capacity Benefits	$153		$247	
17	Total NPV Lifetime O&M Benefits	$0		$0	
18	Total NPV Lifetime Fossil Fuel Impacts	$0		$0	
19	Total NPV Lifetime Water Impacts	$0		$0	
20	**Total NPV TRC Benefits (sum of rows 15 through 19)**	**$249**		**$465**	
21	**TRC Benefit-Cost Ratio (row 20 divided by row 14)**	**2.57**		**1.64**	

[36] Guidehouse, Phase IV Evaluation Plan, Energy Efficiency and Conservation Portfolio, revised November 18, 2024.

* Rows 1-13 are presented in nominal dollars (PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025); P4TD = 2021 nominal dollars.

Source: Guidehouse analysis

Program financials and cost-effectiveness on a net savings basis are the same as the values in Table 3-38 because verified net savings equal the verified gross savings for the Income-Eligible HER Program.

3.4.7 Status of Recommendations

Guidehouse makes no recommendations for the IE HER program this year.

3.5 Non-Residential EE Program

The Non-Residential EE Program offers an array of opportunities to assist C&I customers in reducing their energy consumption and associated energy costs. The program encompasses a variety of energy efficiency components and measures to achieve this goal. Common measures within the Non-Residential EE Program include efficient lighting equipment, lighting controls, HVAC equipment, HVAC RCx, variable frequency drives (VFDs), refrigeration, and building automation systems (BASs), among others. DNV implements the Non-Residential EE Program, which is made up of four components:

- **Downstream Rebates:** The Downstream Rebates component, including combined heat and power (CHP), includes both custom measures and prescriptive measures described by the TRM.[37] Baselines may be established as existing equipment (in situ), code minimum efficiency, or by using custom comparisons for custom projects. Downstream Rebates projects typically involve working directly with customers or with their contractors on potential projects and filling out an application for program incentives.
- **Midstream Rebates "Instant Discounts":** [38] The Midstream Rebates component involves working directly with distributors to incentivize efficient equipment by reducing the sale price at the point of sale (POS) for customers. Midstream Rebates measures are all prescriptive, with baselines predefined by the TRM and IMP documents. The Midstream Rebates component also encompasses an LED aggregation pathway (which captures savings from manufacturer and national distributor direct-to-consumer transactions that did not go through the POS pathway). In Phase IV, most Midstream Rebates participation goes through the POS pathway. The Midstream component includes more than lighting, but non-lighting participation accounts for only approximately 0.01% of energy savings, less than 0.05% of Midstream Rebates measure lines, and less than 0.002% of units incentivized through the Midstream Rebates program.
- **Small Business Direct Install:** The Small Business Direct Install component offers rebates to small businesses for the direct installation of energy efficiency measures to improve overall energy performance. Typical measure offerings include efficient lighting and lighting controls, refrigeration lighting, door gaskets, and efficient motors on refrigerators and freezers.
- **New Construction:** New Construction is the smallest component in terms of savings and number of participants, targeting customers at the time of building design, before construction or major renovations. Implementing ECMs at the time of construction or renovation is often the most time-efficient and cost-effective pathway to building energy efficiency. New Construction participants are typically either constructing new buildings, constructing new additions onto existing buildings, or performing renovations of existing buildings significant enough that the new modified building must be compared with

[37] Pennsylvania Public Utility Commission, *Technical Reference Manual,* https://www.puc.pa.gov/filing-resources/issues-laws-regulations/act-129/technical-reference-manual/.

[38] Midstream is industry standard nomenclature used to describe this type of project in which incentives are provided at the distributor level and reflects the historical name for PECO's Midstream Rebates component. The name of PECO's Midstream Rebates component was changed in Phase IV to Instant Discounts. These two terms, Midstream Rebates and Instant Discounts, are used interchangeably throughout this report.

modern energy efficiency codes. Baselines for New Construction projects are established by city, county, and state energy efficiency codes.

3.5.1 Participation and Reported Savings by Customer Segment

Table 3-40 presents the participation counts, reported energy and demand savings, and incentive payments for the Non-Residential EE Program in PY16 by customer segment.

Table 3-38. Non-Residential EE Program Participation and Reported Impacts

Parameter	Small C&I (Non-GNI)	Large C&I (Non-GNI)	Small C&I (GNI)	Large C&I (GNI)	Municipal Lighting	Total[1]
PY16 # Participants	4,219	940	452	265	19	**5,895**
PYRTD MWh/yr	106,618	75,709	15,327	20,443	12,618	**230,715**
PYRTD MW/yr	24.21	14.12	3.20	3.80	0.00	**45.33**
PY16 Incentives ($1,000)	15,683	9,420	2,975	2,905	2,938	**33,921**

[1] For the Non-Residential Program, 746 MWh and 0.01 MW of reported savings are unverified in PY16. These unverified savings are included in reported savings values and excluded from verified savings values.

Source: Guidehouse analysis

3.5.2 Gross Impact Evaluation

Guidehouse conducted the gross impact evaluation for the Non-Residential EE Program following the general approach outlined in its Evaluation Plan[39] for PY16. In PY16, the Non-Residential EE Program gross impact evaluation included both a tracking database analysis of all prescriptive measures and project-specific M&V activities for a sample of projects from the Downstream Rebates, Midstream Rebates, and Small Business Direct Install components.

Guidehouse also reviewed all RCx projects within the Downstream Rebates component to confirm savings calculations, methods, and the availability of post-measure data. Of the 18 total RCx projects, 13 of which used IPMVP Option C regression modeling, Guidehouse found two PY16 projects that lacked 12 months of post-measure data. These two projects were extracted and isolated as unverified savings until PY17 in line with a PY15 guidance memo issued by the SWE.[40] These projects will be considered as part of the PY17 population and subject to sampling as part of Guidehouse's evaluation of the Downstream Rebates component in PY17. Four projects with unverified savings in PY15 were included in the PY16 population and one of these projects was sampled in the PY16 evaluation.

While unverified savings are included as part of reported savings in this report and excluded from verified savings, TDR and realization rates are shown relative to reported savings excluding unverified savings.

The tracking database analysis included a review of prescriptive TRM- and IMP-based measures to confirm data completeness, reported savings algorithm assumptions aligned with TRM and IMP standards, and all values fell within expected ranges. The output is the adjusted

[39] Guidehouse, Phase IV Evaluation Plan, Energy Efficiency and Conservation Portfolio, revised November 18, 2024.

[40] In August 2023, the SWE issued a guidance memo requiring all projects using IPMVP Option C, trend data, billing data, or AMI data, from pathways that typically would follow IPMVP Option C, to have at least 12 months of post-measure data. If 12 months of post-measure data would not be available for evaluation, those measures must be passed on as "unverified savings" until the following program year and evaluation.

database savings. The TDR is calculated by dividing the adjusted database savings by the reported savings.

Guidehouse conducted project-specific evaluation of the sampled projects, which included one or more of the following: engineering desk reviews, phone verifications, onsite verifications, and onsite metering.

- **Downstream Rebates:** Guidehouse conducted project-specific verification activities for a sample of 45 projects from the Downstream Rebates component in PY16.
- **Midstream Rebates:** Guidehouse conducted project-specific verification activities for a sample of 54 projects from the Midstream Rebates component in PY16.
- **Small Business Direct Install:** Guidehouse conducted project-specific verification activities for a sample of 15 projects from the Small Business Direct Install component in PY16.
- **New Construction:** Guidehouse applied a combination of tracking database analysis results and PY15 verification ratio to the PY16 reported savings.

All samples were designed and implemented to meet the targets set in Guidehouse's sample design memo.[41] Table 3-41 outlines the PY16 impact evaluation targets and completions. Additional detail of the impact evaluation completed in PY16 can be found in Appendix G.

Table 3-39. Non-Residential Project Count by Evaluation Method

Component	Verification Level	Evaluation Target	Number of Projects Evaluated[1]
Downstream Rebates	Tracking Database Analysis	944	944
	Engineering Desk Review Only		12
	Phone Verification		12
	Onsite Verification		21
	Total Sampled Projects		**45**
Midstream Rebates	Tracking Database Analysis	6,971	6,971
	Engineering Desk Review Only		30
	Phone Verification		19
	Onsite Verification		5
	Total Sampled Projects		**54**
Small Business	Tracking Database Analysis	526	526
	Engineering Desk Review Only		10
	Phone Verification		4
	Onsite Verification		1
	Total Sampled Projects		**15**

[1] Guidehouse's Evaluation Plan indicates that all evaluated projects will receive a phone verification. Sites that cannot be reached or that refuse a phone verification are converted to an engineering desk review. For projects with high uncertainty, high complexity, or other challenges where project files are not adequate to accurately estimate savings with confidence, or where a phone verification may be inadequate, Guidehouse adds an onsite verification to collect additional information for enhanced rigor. Desk reviews and onsites are not planned before sampling and therefore do not have target quantities.

[41] Guidehouse, PECO PY16 NonResidential Impact Sample Design Memo FINAL, dated December 30, 2024.

Source: Guidehouse analysis

Table 3-42 and Table 3-43 present the PY16 evaluation realization rates and statistical relative precision for energy and demand, respectively.

Table 3-40. Non-Residential EE Program Gross Impact Results for Energy

Component	PYRTD MWh/yr	Energy Realization Rate	Sample CV or Error Ratio	Relative Precision at 85% C.L.
Downstream Rebates[1]	97,435	0.94	0.26	0.06
Midstream Rebates	113,915	1.00	0.25	0.05
Small Business Direct Install	10,478	0.95	0.13	0.05
New Construction	8,887	1.13	0.09	0.09
Program Total	**230,715**	**0.98**	**0.25**	**0.04 [90% C.L.]**

[1] For the Non-Residential Downstream Rebates component, 746 MWh of reported savings were unverified in PY16. These unverified savings are included in reported savings values and excluded from verified savings values and accompanying realization rates.
Note: Guidehouse conducted tracking database analysis for all components and primary data collection and analysis for the Downstream Rebates, Midstream Rebates, and Small Business Direct Install components in PY16. Guidehouse applied the verification ratio from PY15 to the PY16 adjusted database savings for the New Construction component.

Source: Guidehouse analysis

Table 3-41. Non-Residential EE Program Gross Impact Results for Demand

Component	PYRTD MW/yr	Demand Realization Rate	Sample CV or Error Ratio	Relative Precision at 85% C.L.
Downstream Rebates[1]	15.7	0.90	0.79	0.17
Midstream Rebates	25.5	0.99	0.26	0.05
Small Business Direct Install	2.73	0.94	0.24	0.10
New Construction	1.34	1.13	0.12	0.11
Program Total	**45.3**	**0.96**	**0.47**	**0.07 [90% C.L.]**

[1] For the Non-Residential Downstream Rebates component, 0.01 MW of reported savings are unverified in PY16. These unverified savings are included in reported savings values and excluded from verified savings values and accompanying realization rates.
Note: Guidehouse conducted tracking database analysis for all components and primary data collection and analysis for the Downstream Rebates, Midstream Rebates, and Small Business Direct Install components in PY16. Guidehouse applied the verification ratio from PY15 to the PY16 adjusted database savings for the New Construction component.

Source: Guidehouse analysis

The introduction to Section 3 describes the two-step evaluation method that results in the ratios that Table 3-44 and Table 3-45 show. The tracking database analysis is conducted annually while the verification ratio may be historical based on the evaluation plan.[42] The TDR and the verification ratio together represent the overall energy or demand realization rate. Unverified savings are subtracted from reported savings before the tracking database review step and therefore the TDR and realization rates shown are relative to reported savings excluding unverified savings. A TDR close to 1 indicates that PECO and their CSPs are accurately reporting savings in accordance with the TRM and reducing the likelihood of systemic data errors.

[42] Guidehouse, Phase IV Evaluation Plan, Energy Efficiency and Conservation Portfolio, revised November 18, 2024.

Table 3-42. Non-Residential Energy Ratios

Component	Energy TDR	Energy Verification Ratio	Energy Realization Rate
Downstream Rebates	1.00	0.93	0.94
Midstream Rebates	0.99	1.02	1.00
Small Business Direct Install	1.00	0.96	0.95
New Construction[1]	1.08	1.05	1.13
Non-Residential Total	**1.00**	**0.98**	**0.98**

[1] The New Construction verification ratio is from the PY15 analysis.
Source: Guidehouse analysis

Table 3-43. Non-Residential Demand Ratios

Component	Demand TDR	Demand Verification Ratio	Demand Realization Rate
Downstream Rebates	1.00	0.90	0.90
Midstream Rebates	0.99	1.00	0.99
Small Business Direct Install	1.00	0.93	0.94
New Construction[1]	1.09	1.04	1.13
Non-Residential Total	**1.00**	**0.96**	**0.96**

[1] The New Construction verification ratio is from the PY15 analysis.
Source: Guidehouse analysis

The following sections detail the factors that led to variation between the reported and verified savings and the resultant realization rates.

3.5.2.1 Downstream Rebates

As illustrated by the ratios in Table 3-44 and Table 3-45, the Downstream Rebates realization rates were predominantly driven by the site-specific verification activities rather than the tracking database analysis. The site-specific verification activities resulted in updating TRM-deemed parameters to site-specific values. Twenty-six of the 45 sampled Downstream Rebates projects were lighting projects. Guidehouse made changes to lighting control types, HVAC types, and HOU for lighting measures based on site-specific data collected from customer interviews and trend data. Updates to input parameters affected 10 of the 26 lighting projects. Updates to control type were the most influential change for eight of these 10 projects, with seven decreasing energy savings and one increasing energy savings relative to the ex ante savings estimates. Two lighting projects were partially completed and received cuts to the energy and demand savings relative to the number of fixtures installed.

Nine of the 45 sampled Downstream Rebates projects were solar projects. For all sampled solar projects, Guidehouse adjusted the demand savings using an 8760 output from PVWatts rather than estimating demand savings using energy to demand factors (ETDFs). This update in approach caused an increase in demand savings. Guidehouse also used project-specific DC/AC ratios and inverter efficiencies rather than default values when the information was available. Finally, Guidehouse capped the demand savings for one solar project to the site's 2024 usage because the installed array was oversized. At the component level, these updates decreased both energy and demand savings.

Guidehouse's tracking data analysis identified several discrepancies with minimal overall impact on component-level realization rates. For High-Efficiency Evaporator Fan Motors for Walk-In or Reach-In Refrigerated Cases, the TRM provides a methodology to calculate motor input

wattage from motor horsepower. The reported savings did not follow this algorithm, instead reporting horsepower and input wattages that did not agree. Updating the analysis to use the reported horsepower caused a fivefold increase in the energy and demand realization rates for the 11 instances of this measure. For Evaporator Fan Controllers the reported calculation assumes an ECM efficiency as the baseline, but based on the tracking data, a shaded pole motor efficiency baseline should be used. The realization rate for this single project is 230% after making this adjustment. For water cooled chillers, reported savings calculations used IPLV instead of full load to calculate demand savings. Correcting this issue decreased the demand savings for two projects.

3.5.2.2 Midstream Rebates

The Midstream Rebates component is built to streamline and simplify participation for customers. As such, minimal information is collected at the POS for the purchased energy efficient equipment, such as light bulbs and fixtures. Because limited information is collected at the POS, reported equipment HOU are assumed and deemed based on the building type identified through an address lookup. During evaluation, Guidehouse updates the assumed or deemed HOU with actual HOU confirmed on an individual site-specific basis, which can lead to variability in project savings at the individual site level, including an increase or decrease in savings estimates. There were 54 projects in the Midstream Rebates component sample. For energy savings, updated HOU were the most significant change for eight projects,[43] updated heating or cooling types were the most significant change for five projects, and updated lighting control types caused the most significant change for three projects.[35] For demand savings, updated CFs caused the most significant change to 15 projects, updated heating or cooling types to five projects, and updated lighting control types caused the most significant change to three projects.

Guidehouse's tracking data analysis identified 61 midstream lighting measure lines that included fixtures that were ineligible for savings as of June 1, 2023. The savings associated with reflector lamps (R, ER, BR) >= 2.25 inches (57 mm) in diameter; all ER30, BR30, ER40, and BR40 lamps; all PAR, MR, and MRX lamps; ceiling-mounted fixtures that replace those lamps; and downlights were dropped to zero for those projects. Guidehouse found no other significant discrepancies in the tracking database analysis. Table 3-44 and Table 3-45 show the overall impacts of the changes to the Midstream Rebates component.

3.5.2.3 Small Business Direct Install

Guidehouse made changes to HOU and CF for lighting measures based on site-specific data collected from customer interviews and project documentation for seven of the 15 projects in the component. Five projects had decreased energy and demand savings and two projects had increased energy and demand savings because of these changes.

Guidehouse's tracking database analysis identified minor discrepancies that had minimal impact on component-level savings and realization rates. The overall impacts of the changes to the Small Business Direct Install component are found in Table 3-44 and Table 3-45.

[43] Three projects overlap between the 15 projects that had HOU as the most influential factor and the five projects that had control type changes as the most influential factor; these three projects had HOU and control type changes as very influential factors.

3.5.2.4 New Construction

Guidehouse's tracking database analysis identified discrepancies that had an impact on component-level savings and realization rates. The tracking database analysis revealed that 13 projects were using lighting power density (LPD) values from the 2015 version of the International Energy Conservation Code (IECC) when 2018 values should have been used. Adjusting the LPD and recalculating the baseline wattage for these projects increased the energy and demand savings for the program. For the PY16 analysis, Guidehouse applied strata-level verification ratios from PY15, resulting in an energy and demand realization rate of 1.13.

3.5.3 Net Impact Evaluation

As described in the Phase IV Evaluation Plan[44] for PY16 and in Table 3-2, Guidehouse conducted NTG research for the Non-Residential Downstream Rebates component, the Non-Residential Small Business Direct Install component, and the Non-Residential Midstream Rebates component. Table 3-47 summarizes the component-level NTGR results for the Non-Residential Program evaluated in PY16.

3.5.3.1 Methodology

Guidehouse followed the SWE's Evaluation Framework[45] for conducting NTG research and analysis for the Non-Residential EE Program. The SWE guidance included detail on gathering feedback from participants in the evaluated Non-Residential components of the program using self-reported surveys. These surveys were part of the process evaluation survey efforts detailed in Section 3.5.5 and approved by the SWE prior to fielding.

The following describes the general methodology for estimating the Non-Residential EE Program NTGR including definitions of free ridership and spillover and how they are used to calculate the final NTGR. See Appendix G.1.2, Appendix G.2.2, and Appendix G.3.2 for further detail on the methodology and algorithms used to estimate component-level NTGRs in PY16:

- **Free Ridership:** The self-reported free ridership survey battery is brief to avoid customer burden and includes two metrics of assessing free ridership: 1) the intention to carry out the energy efficient project without program funds and 2) the influence of the program in the decision to carry out the energy efficient project at the time it was conducted. When scored, each metric results in a value ranging from 0 to 0.5, and a combined total free ridership score from 0 to 1.0.
- **Spillover:** The self-reported spillover battery collects data on additional efficiency improvement projects conducted at participating non-residential facilities that did not receive a program incentive but were conducted at least in part because of the program. Survey questions gather high-level information on the type of projects conducted including type and number of units installed to allow for estimates of energy savings. Guidehouse divides the total spillover savings by the total gross savings for the sample to arrive at the spillover result.

[44] Guidehouse, Phase IV Evaluation Plan, Energy Efficiency and Conservation Portfolio, revised November 18, 2024.
[45] Pennsylvania Statewide Evaluator, *Evaluation Framework for Pennsylvania*, https://www.puc.pa.gov/media/1584/swe-phaseiv_evaluation_framework071621.pdf.

Guidehouse estimated the final NTGR score using Equation 3-2.

Equation 3-2. NTGR Equation

$$NTGR = 1 - Free\ Ridership + Spillover$$

Where:

$Free\ Ridership$	Quantifies the percentage of savings (reduction in energy consumption or demand) from participants who would have implemented the measure in the absence of the program or component
$Spillover$	Quantifies the percentage reduction in energy consumption or demand (that is, additional savings) caused by the presence of the utility program; spillover savings happen when customers invest in additional energy efficient measures or activities without receiving a financial incentive from the program or component

The following bullets summarize the methods used to estimate the NTG for each Non-Residential EE Program component. Appendix E provides details on the NTG methods and algorithms used for the NTG research.

- **Downstream Rebates – Solar:** For the program known to customers as the PECO Ways to Save Program, in alignment with the process evaluation survey activity detailed in Section 3.5.5, Guidehouse completed online surveys with non-residential customers receiving a PECO rebate for energy efficient equipment through the Downstream pathway. The survey asked participants to rate the amount of influence (on a 0-10 influence scale) the program had on their decision to purchase and install the equipment through the program. The survey also asked about the intentions of each participant if the program had not been available.
- **Small Business Direct Install:** For the program known to customers as the PECO Small Business Solutions program, Guidehouse completed online surveys with non-residential customers who received a rebate for the installation of energy efficient equipment through the Small Business Direct Install component. The survey asked participants to rate the amount of influence (on a 0-10 influence scale) the program had on their decision to install their energy efficient equipment. The survey also asked about the intentions of each participant if the discount had not been available.
- **Midstream Rebates:** For the program known to customers and distributors as the PECO Instant Discounts program, Guidehouse completed online surveys with participating distributors. The survey asked distributors to rate the amount of influence (on a 0-10 influence scale) the program had on actions taken by their business to increase the sales of high efficiency equipment. The survey also asked distributors to rate their likelihood of taking action to increase the sales of high efficiency equipment in absence of the program. Additionally, distributors were asked questions to determine the percentage of program-eligible equipment that would have been sold in absence of the program.

3.5.3.2 NTG Results

Guidehouse conducted surveys with customers in PECO's Downstream Rebates and Small Business Direct Install components, as well as distributors in the Midstream Rebates component.

Table 3-44. Non-Residential Program NTG Survey Sample Targets and Completes

Component	Number Contacted	Target Completes	Actual Completes	Response Rate	Percentage Achieved
Downstream Rebates	462	42	21	5%	50%
Midstream Rebates	34	34 (census)	4[1]	12%	12%
Small Business Direct Install	310	28	19	6%	68%

[1] One respondent with zero savings in the Midstream Rebates component was excluded from analysis

Source: Guidehouse analysis

Table 3-45. Non-Residential EE Program Net Impact Evaluation Results

Component	PYVTD (MWh)	Free Ridership	Spillover	NTGR	Relative Precision (@ 85% CL)
Downstream Rebates	93,757	0.288	0.009	0.722	0.24
Midstream Rebates	114,246	0.328	-	0.672	1.17
Small Business Direct Install	9,990	0.075	0.003	0.928	0.22

Source: Guidehouse analysis

3.5.3.3 HIM Research

As described in the Phase IV Evaluation Plan[46] for PY16, Guidehouse used the Non-Residential Downstream NTG survey to collect feedback on the HIMs and estimated NTG for the program in PY16. Table 3-48 includes the NTGR and relative precision estimates for these HIMs.

Table 3-46. Non-Residential EE Program HIM Results

HIM	Percentage of Program Savings	Free Ridership	Spillover	NTGR
Lighting Improvements (Downstream)[1]	73%	0.20	0.09	0.89
Custom Solar (Downstream)	9%	0.52	0.00	0.48

[1] The NTG results for the Lighting Improvements HIM come from the sampled survey participants and do not reflect the rolled up results for Lighting Improvements across the entire Non-Residential Downstream component population.

Source: Guidehouse analysis

3.5.4 Verified Savings Estimates

In Table 3-49, realization rates and NTGRs determined by Guidehouse are applied to the reported energy and demand savings estimates to calculate the verified net savings estimates for the Non-Residential EE Program in PY16.

[46] Guidehouse, Phase IV Evaluation Plan, Energy Efficiency and Conservation Portfolio, revised November 18, 2024.

Table 3-47. Non-Residential EE Program PY16 and P4TD Savings Summary

Savings Type	Energy (MWh/yr)	Demand (MW/yr)
PYRTD	230,715	45.32
PYVTD Gross[1]	228,042	43.54
PYVTD Net[1]	156,764	30.06
RTD	859,506	167.76
VTD Gross	862,875	166.75
VTD Net	590,336	114.91

[1] For the Non-Residential Downstream Rebates component, 746 MWh and 0.01 MW of reported savings are unverified in PY16. These unverified savings are included in reported savings values and excluded from verified savings values. In PY15, 3,192 MWh and 0.01 MW of reported savings were unverified. These unverified savings are excluded from reported savings values and included in verified savings values for PY16.

Source: Guidehouse analysis

3.5.5 Process Evaluation

The PY16 process evaluation of the Non-Residential EE Program included PECO program manager and CSP staff interviews and a survey for participants of the Downstream Rebates Solar component. This section summarizes the evaluation methods, data collection techniques, sample design, and key results related to the survey.

3.5.5.1 Methodology

Guidehouse interviewed the PECO program managers and CSP staff to understand the goals of the program in PY16, identify significant implementation changes, and identify areas of strength and areas for improvement. Guidehouse also conducted a survey of Downstream Rebates Solar participants, as Table 3-50 outlines. The survey assessed customer satisfaction, likeliness to recommend the program to others (also known as net promoter score), and program awareness for customers who installed solar measures through the component. The survey was fielded in conjunction with the NTG survey to reduce burden on the participant base. The survey was similar to the PY14 evaluation for the Downstream Rebates component, which collected data from non-solar participants.

Guidehouse also conducted a survey of Midstream Rebates distributors that included NTG evaluation for all distributors and process evaluation for non-lighting distributors only. However, no surveys were completed by non-lighting distributors. As indicated in the Phase IV Evaluation Plan,[47] Guidehouse anticipated a low response from non-lighting distributors and plans to continue this research and share results in PY17.

Table 3-48. Non-Residential EE Program Process Activities by Component

Component	PM/CSP Interview	Survey	Survey Recipient
Downstream Rebates	✓	✓	Solar Participants
Midstream Rebates	✓	✓	Non-Lighting Distributors
Small Business Direct Install	✓	-	NA
New Construction	✓	-	NA

Source: Guidehouse analysis

[47] Guidehouse, Phase IV Evaluation Plan, Energy Efficiency and Conservation Portfolio, revised November 18, 2024.

Guidehouse fielded the Downstream Rebates Solar survey to sampled participants via an online survey. Guidehouse defined the survey population based on customer activity data from eTRACK+. The SWE reviewed and approved sample design memos[48] and survey instruments prior to fielding. Guidehouse removed "don't know" responses from analysis for most questions. Therefore, n values may vary between questions.

Table 3-49. Non-Residential Sample Targets and Completes

Component	Stratum	Number Contacted	Target Completes	Actual Completes	Response Rate	Percentage Achieved
Downstream Rebates	Solar	31	6	5	16%	83%

Source: Guidehouse analysis

Guidehouse anticipated that the Downstream Rebates component may not meet its target completes and took extra steps to bolster response rates and survey completes. These steps were taken in addition to the standard email invitation and up to two email reminders were sent to all sampled survey participants. Actions included the following:

- **Incentive offered:** Guidehouse offered a $100 e-gift card through the Tango platform.
- **PECO email:** In PY16, Guidehouse provided PECO an email template and a list of customers (name and email only). Prior to the initial survey invitation from Guidehouse, PECO sent an email to customers surveyed encouraging them to complete the survey.

3.5.5.2 Key Findings from Process Evaluation

Guidehouse presents key findings here for the Downstream Rebates component. Appendix G includes process evaluation sections for each component, though most components were not evaluated in PY16.

As Figure 3-6 shows, respondents were overall satisfied with PECO's Non-Residential EE Program Downstream Rebates component. Two out of five respondents listed their satisfaction as a 10 out of 10, using a scale where 0 is "extremely dissatisfied" and 10 is "extremely satisfied."

[48] Guidehouse, PECO PY16 Process and NTG Design Memo- FINAL, dated April 23, 2025.

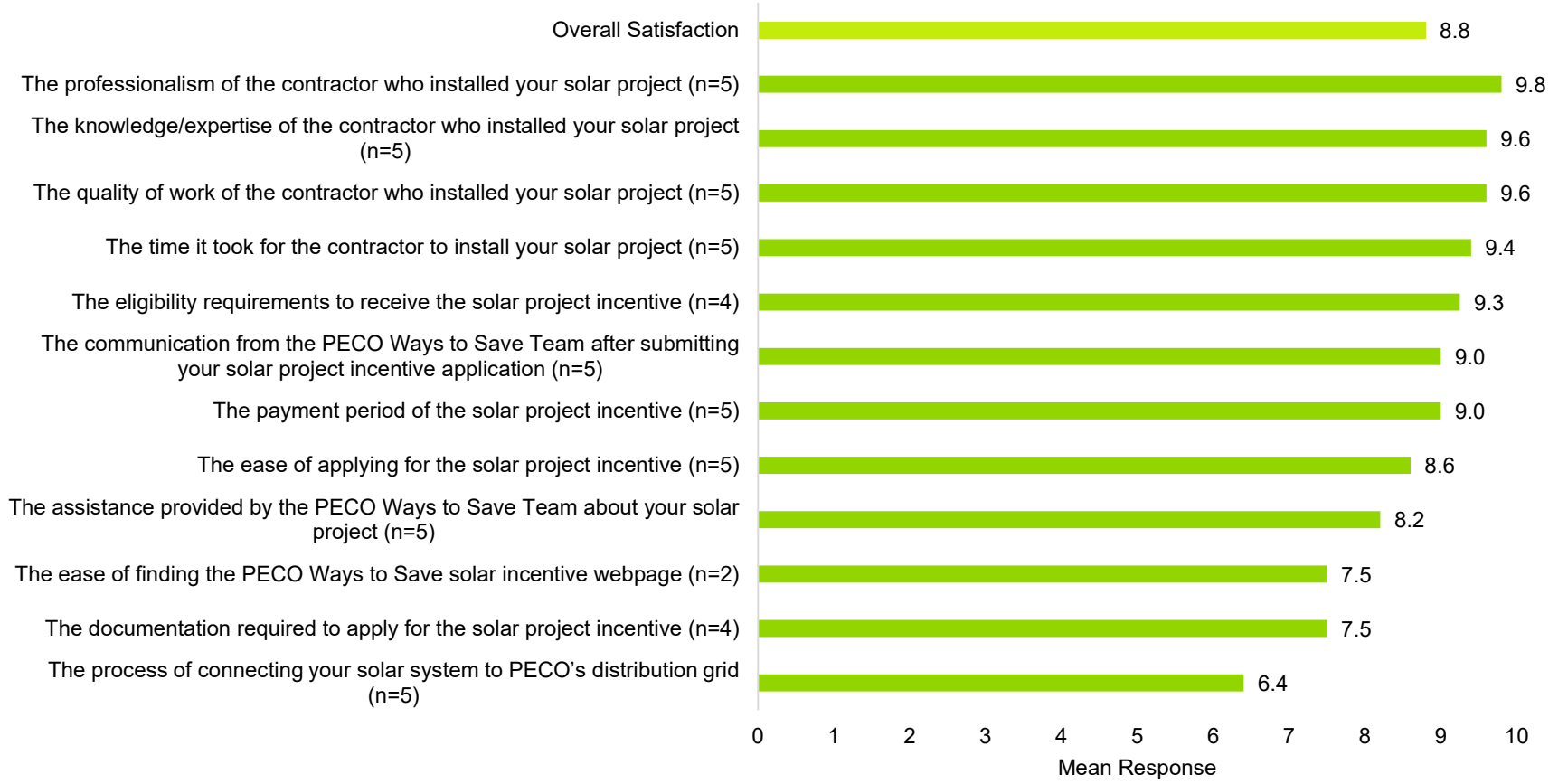
Figure 3-6. Non-Residential Downstream Rebates Component Overall Satisfaction (n=5)

Respondents received the following question: "How would you rate your satisfaction with the PECO Ways to Save program overall?"

Source: Guidehouse analysis

The mean satisfaction score for the Non-Residential Downstream Rebates component reflects high levels of satisfaction, as Figure 3-7 shows. The mean satisfaction for the component overall is 8.8 out of 10, using a scale where 0 is "extremely dissatisfied" and 10 is "extremely satisfied." Respondents reported the highest satisfaction with aspects related to their contractors: the professionalism of the contractor(s) that installed their solar equipment (9.8 out of 10, n=5); the knowledge/expertise of the contractor who installed their solar equipment (9.6, n=5); and the quality of the work of the contractor who installed their solar equipment (9.6, n=5). Respondents reported the lowest satisfaction with the process of connecting their solar system to PECO's distribution grid (6.4, n=5), the documentation required to apply for the solar project incentive (7.5, n=4), and the ease of finding the PECO Ways to Save solar incentive webpage (7.5, n=2).

Figure 3-7. Non-Residential Downstream Rebates Component Satisfaction (n=5)



Respondents received the following question: "How would you rate your satisfaction with the following aspects of the PECO Ways to Save program?" Guidehouse excluded "don't know" responses from analysis.

Source: Guidehouse analysis

The mean likelihood to recommend PECO's Non-Residential Downstream Rebates component is very high at 9.6 out of 10, as Figure 3-8 shows, with all but one score being a 10 out of 10, using a scale where 0 is "not at all likely" and 10 is "extremely likely." When asked if they had recommended the program to others, two respondents indicated that they had.

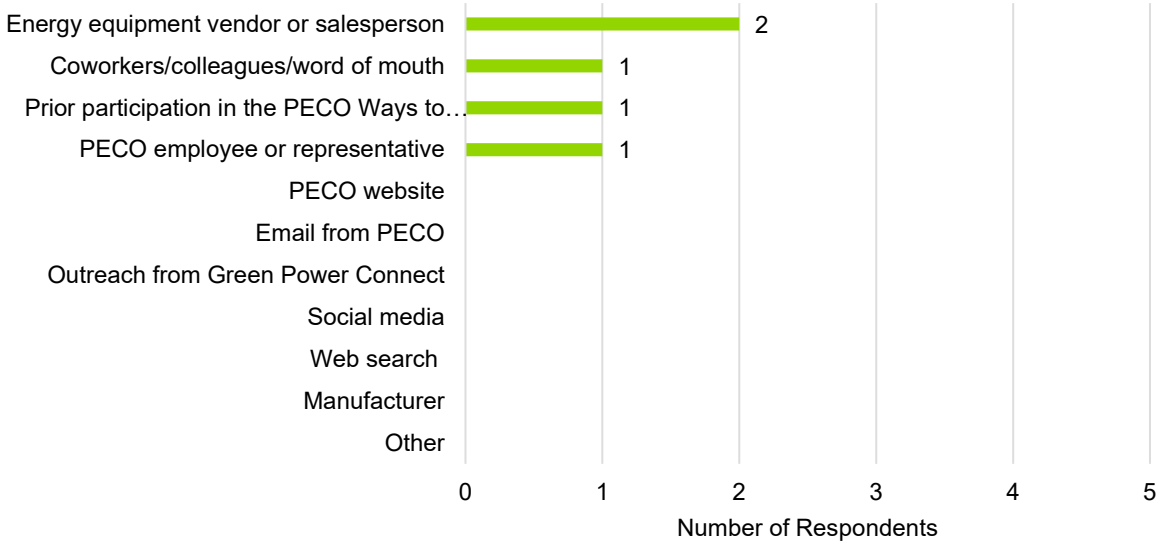
Figure 3-8. Non-Residential Downstream Rebates Component Likelihood to Recommend (n=5)

Respondents received the following question: "How likely are you to recommend the PECO Ways to Save Program to others?"

Source: Guidehouse analysis

Figure 3-9 indicates that there is not one single way that respondents learn about the Non-Residential Downstream Rebates component. The most common information source is energy equipment vendors or salespeople (two respondents), word of mouth (one respondent), prior program participation (one respondent), and PECO employees or representatives (one respondent).

Figure 3-9. Sources of Non-Residential Downstream Rebates Component Awareness (n=5)



Respondents received the following question: "How did you learn about PECO Ways to Save program?"
Source: Guidehouse analysis

Detailed findings are presented by component in Appendix G.

3.5.6 Program Finances and Cost-Effectiveness Reporting

Table 3-52 presents a detailed breakdown of program finances and cost-effectiveness. TRC benefits in Table 3-52 were calculated using gross verified impacts. NPV PY16 costs and benefits are expressed in 2024 dollars; Phase IV totals are in 2021 dollars.

Table 3-50. Summary of Program Finances – Gross Verified

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	**IMCs**	$81,128		$352,947	
2	Rebates to Participants and Trade Allies	$14,875		$49,176	
3	Upstream/Midstream Incentives	$15,679		$70,398	
4	Material Cost for Self-Install Programs (EE&C Kits)	$0		$0	
5	Direct Installation Program Materials and Labor	$3,367		$18,994	
6	Participant Costs (row 1 minus the sum of rows 2 through 5)	$47,207		$214,379	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$0	$0	$0	$0
8	Administration and Management	$11,627	$0	$45,895	$0
9	Marketing	$0	$0	$0	$0
10	Program Delivery	$0	$0	$0	$0
11	EDC Evaluation Costs	$0		$0	
12	SWE Audit Costs	$0		$0	
13	**Program Overhead Costs (sum of rows 7 through 12)**	**$11,627**		**$45,895**	

Row	Cost Category*	PYTD ($1,000)	P4TD ($1,000)
14	**Total NPV TRC Costs (sum of rows 1 and 13)**	**$92,755**	**$398,841**
15	Total NPV Lifetime Electric Energy Benefits	$61,441	$237,287
16	Total NPV Lifetime Electric Capacity Benefits	$55,061	$204,547
17	Total NPV Lifetime O&M Benefits	$9,309	$41,935
18	Total NPV Lifetime Fossil Fuel Impacts	-$6,195	-$32,074
19	Total NPV Lifetime Water Impacts	$0	$0
20	**Total NPV TRC Benefits (sum of rows 15 through 19)**	**$119,616**	**$451,695**
21	**TRC Benefit-Cost Ratio (row 20 divided by row 14)**	**1.29**	**1.13**

* Rows 1-13 are presented in nominal dollars (PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025); P4TD = 2021 nominal dollars.

Source: Guidehouse analysis

Table 3-53 presents program financials and cost-effectiveness on a net savings basis. Guidehouse conducted primary NTGR data collection and analysis for the Non-Residential Downstream Rebates component in PY16. For the other program components, Guidehouse applied NTGRs from the most recent analysis year. Table 2-5 summarizes the NTGRs.

The 2021 TRC Test Final Order stated that the NTGR should be applied to all benefits in the net TRC test, including but not limited to avoided energy and capacity costs, O&M, interactive effects, and secondary fossil fuel impacts. In addition, the NTGRs are applied to the IMCs, therefore the IMCs are different on a net savings basis compared with the gross savings basis.

Table 3-51. Summary of Program Finances – Net Verified

Row	Cost Category*	PYTD ($1,000)		P4TD ($1,000)	
1	**IMCs**	$56,386		$241,498	
2	Rebates to Participants and Trade Allies	$14,875		$49,176	
3	Upstream/Midstream Incentives	$15,679		$70,398	
4	Material Cost for Self-Install Programs (EE&C Kits)	$0		$0	
5	Direct Installation Program Materials and Labor	$3,367		$18,994	
6	Participant Costs (row 1 minus the sum of rows 2 through 5)	$22,465		$102,929	
		EDC	**CSP**	**EDC**	**CSP**
7	Program Design	$0	$0	$0	$0
8	Administration and Management	$11,627	$0	$45,895	$0
9	Marketing	$0	$0	$0	$0
10	Program Delivery	$0	$0	$0	$0
11	EDC Evaluation Costs	$0		$0	
12	SWE Audit Costs	$0		$0	
13	**Program Overhead Costs (sum of rows 7 through 12)**	**$11,627**		**$45,895**	
14	**Total NPV TRC Costs (sum of rows 1 and 13)**	**$68,013**		**$287,392**	
15	Total NPV Lifetime Electric Energy Benefits	$42,703		$162,485	
16	Total NPV Lifetime Electric Capacity Benefits	$38,269		$140,654	
17	Total NPV Lifetime O&M Benefits	$6,470		$28,968	
18	Total NPV Lifetime Fossil Fuel Impacts	-$4,306		-$21,726	
19	Total NPV Lifetime Water Impacts	$0		$0	

Row	Cost Category*	PYTD ($1,000)	P4TD ($1,000)
20	**Total NPV TRC Benefits (sum of rows 15 through 19)**	**$83,136**	**$310,381**
21	**TRC Benefit-Cost Ratio (row 20 divided by row 14)**	**1.22**	**1.08**

* Rows 1-13 are presented in nominal dollars (PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025); P4TD = 2021 nominal dollars.

Source: Guidehouse analysis

3.5.7 Status of Recommendations

The impact and process evaluation activities in PY16 led to the following findings and recommendations from Guidehouse to PECO, along with a summary of how PECO plans to address the recommendations in program delivery.

Table 3-52. Summary of Non-Residential EE Evaluation Recommendations

Component	Evaluation Activity	Finding	Recommendation	EDC Status
Downstream	Impact	For two lighting projects, PRJ-36143-2024 [58% realization rate] and PRJ-35453-2024 [3% realization rate], the ex ante calculations included the installation of higher fixture quantities than those confirmed during site visits. Guidehouse used confirmed site visit quantities to calculate ex post savings. PRJ-36143: Project was supposed to have 256 2x4 fixture replaced but only 64 were found onsite. Guidehouse used the adjusted number to calculate savings for that measure line. PRJ-35453: Project was supposed to have 684 fixtures installed through the downstream program. However, in the site visit, Guidehouse found that only 30 fixtures were installed because the site was planning to use internal resources to complete the installation but was short staffed. This finding was later confirmed by the CSP. The project received a 3% realization rate for both energy and demand because it was partially completed.	1. Guidehouse recommends PECO and the CSP review application materials to identify where this requirement can be better emphasized and made clearer to participants. PECO and the CSP can also ask/remind Trade Allies to emphasize this requirement and set clear expectations with customers that projects must be completed before the final application is submitted. 2. For lighting projects where installations occur in multiple areas, PECO should consider creating a template to calculate savings on an area by area or room by room basis. Doing so will aid future audits and verifications to know exactly where projects occur, especially for frequent participants.	Implemented
Downstream	Impact	The ex ante analysis applied a uniform default DC/AC ratio of 1.2 for all solar projects. Guidehouse based evaluated savings on verified inverter and module specifications and project-specific ratios. Also, reported savings used PVWatts and the TRM's default inverter efficiency for all projects. Guidehouse's evaluation used actual inverter efficiency, taken directly from product spec sheets.	To improve the accuracy of ex ante savings estimates for solar PV projects, Guidehouse recommends that the CSP incorporate the following into calculations: • Apply project-specific DC/AC ratios derived from verified equipment specifications rather than using a uniform default. • Use manufacturer-reported values from spec sheets for inverter efficiencies.	In Progress
Downstream	Impact	In all sampled solar PV projects, the ex ante analysis used the ETDF method from the TRM to estimate demand savings. The TRM provided guidance to utilize the 8,760-hour simulation approach, when possible, which is the approach used by Guidehouse. Additionally, inconsistencies in ETDF interpolation (e.g., picking higher azimuth instead of lower) and the ETDF assumption that all panels have a 20° tilt angle, led to inaccurate demand savings estimates.	When calculating demand savings for solar PV projects, Guidehouse recommends the CSP utilize the 8,760 method in PVWatts to estimate solar production during peak periods. If this method is not possible, the ETDF tables in the TRM should be used. If used, the CSP and evaluators should ensure interpolation between azimuth values is done appropriately to use the most accurate values based on site conditions.	In Progress
Downstream	Impact	For High-Efficiency Evaporator Fan Motors for Walk-In or Reach-In Refrigerated Cases, the ex ante horsepower and kW	Guidehouse recommends the CSP use consistent values across columns that report	In Progress

Component	Evaluation Activity	Finding	Recommendation	EDC Status
		do not correspond to the same power. Using the horsepower nameplate values leads to variability in realization rates. The overall energy realization rate was 490% across the 11 measures in the sample as a result of this finding.	the same efficiency metric in different units and remove values that are not used in calculations.	
Downstream	Impact	The CSP's reported savings calculations for electric chillers use IPLV instead of full load to calculate demand savings for water cooled chillers. The Phase IV TRM's measure 3.2.2, Table 3-31, and the corresponding footnote 19 note: "The 'full load' efficiency from the appropriate Path A or B should be used to calculate the Peak Demand Savings as it is expected that the chillers would be under full load during the peak demand periods." Correcting this issue decreased the demand savings for two projects (PRJ-35284-2024 and PRJ-05268-2023). The demand realization rates for these two projects were 37% and 63%, respectively.	Guidehouse recommends the CSP use full load efficiency when calculating peak demand savings.	Under Consideration
Downstream	Impact	For the TRM measure control for Evaporator Fan Controllers (Section 3.5.3), the ex ante calculation assumes an ECM efficiency as the baseline. However, based on the tracking data, it appears a shaded pole baseline should be used. The realization rate for this single project is 230% after making this adjustment.	Guidehouse recommends the CSP align the baseline efficiency with the baseline motor type claimed in the tracking data.	In Progress
Midstream	Impact	There were 61 midstream lighting measure lines that included fixtures that are ineligible for savings as of June 1, 2023. The savings associated with reflector lamps (R, ER, BR) >= 2.25 inches (57 mm) in diameter; all ER30, BR30, ER40, and BR40 lamps; all PAR, MR, and MRX lamps; ceiling-mounted fixtures that replace those lamps; and downlights were zeroed out for those projects.	Guidehouse recommends the CSP adopt the updated SWE Codes and Standards guidance when calculating reported savings around measure 3.1.7, which required compliance as of June 1, 2023.	Implemented
New Construction	Impact	The tracking database analysis revealed that 13 new construction projects were using LPD values from the 2015 version of the IECC when 2018 values should have been used.	Guidehouse recommends the CSP update calculations to use the 2018 IECC reference for LPD values.	Under Consideration
Downstream	Process/ NTG	Free ridership for the solar stratum is 0.52 with no spillover, resulting in an NTGR of 0.48 for the solar stratum. Through staff interviews, Guidehouse learned that PECO's outreach strategy is evolving given that this offering is new. PECO expects to generate awareness earlier in the decision-making process moving forward.	Due to the change in program outreach that will likely impact the timing of awareness, Guidehouse anticipates conducting another NTG and process evaluation in PY17. The PY17 evaluation will be used to calculate an updated NTG value and understand the new customer experience. Guidehouse does not	In Progress

Component	Evaluation Activity	Finding	Recommendation	EDC Status
			have recommendations on this topic for PECO or the CSP at this time.	
Downstream	Process	Respondents provided a high mean overall satisfaction score for the offering (8.8 out of 10, n=5). Respondents provided the lowest mean satisfaction scores for the ease of finding the PECO Ways to Save solar incentive webpage (7.5 out of 10, n=2), the documentation required to apply for the solar project incentive (7.5 out of 10, n=4), and the process of connecting the solar system to PECO's distribution grid (6.4 out of 10. n=5).	To ease the customer participation burden, Guidehouse recommends PECO continue to streamline the application process and reduce the required documentation. As the offering develops, PECO could compile documentation with frequently asked questions and common issues and resolutions related to the interconnection process to share with participants.	In Progress
Downstream	Process	All five respondents reported they were very likely (8 out of 10 or higher) to recommend the solar component to others; two out of five respondents indicated they have recommended the component to another business already.	Guidehouse recommends PECO consider incentivizing these referrals or providing customers with solar-specific materials either to advertise in their business that they are eco-friendly or share with other businesses.	Under Consideration

Source: Guidehouse analysis

4. Portfolio Finances and Cost Recovery

This section provides an overview of the expenditures associated with PECO's portfolio and the recovery of those costs from ratepayers.

4.1 Program Financials

Table 4-1 shows program-specific and portfolio total finances for PY16. The columns in Table 4-1 are adapted from the Direct Program Cost categories in the Commission's EE&C Plan template[49] for Phase IV. Non-incentives include EDC Materials, Labor, and Administration costs (including costs associated with an EDC's employees) as well as implementation conservation service provider (ICSP) Materials, Labor, and Administration costs (including both the program implementation contractor and the costs of any other outside vendors and EDC employees to support program delivery). The dollar figures in Table 4-1 and Table 4-2 are based on EDC tracking of expenditures with no adjustments to account for inflation.[50]

Table 4-1. PY16 Program and Portfolio Total Finances ($1,000)

Program	Incentives	Non-Incentives	Total Cost
Residential	$8,564	$7,055	$15,619
Income-Eligible	$4,092	$1,377	$5,469
Residential HER	$0	$2,217	$2,217
Income-Eligible HER	$0	$97	$97
Non-Residential	$33,921	$11,627	$45,548
Common Portfolio Costs[1]			**$10,406**
Portfolio Total	**$46,576**	**$22,374**	**$79,356**
SWE Costs[2]	**-**	**-**	**-**
Portfolio Total	**$46,576**	**$22,374**	**$79,356**

[1] Portfolio Common Costs include administrative, marketing, evaluation, and other shared expenses.
[2] Statewide Evaluation costs are outside of the 2% spending cap.
Source: PECO, CSP tracking data

Table 4-2. P4TD Program and Portfolio Total Finances ($1,000)

Program	Incentives	Non-Incentives	Total Cost
Residential	$29,131	$24,438	$53,569
Income-Eligible	$24,840	$7,250	$32,090
Residential HER	$0	$8,001	$8,001
Income-Eligible HER	$0	$284	$284
Non-Residential	$138,718	$45,894	$184,612
Common Portfolio Costs[1]			**$42,346**
Portfolio Total	**$192,689**	**$85,867**	**$320,902**
SWE Costs[2]	**-**	**-**	**-**
Portfolio Total	**$192,689**	**$85,867**	**$320,902**

[1] Portfolio Common Costs include administrative, marketing, evaluation, and other shared expenses.

[49] Pennsylvania Public Utility Commission, *State of Pennsylvania Act 129 Energy Efficiency Conservation Plan Template*, September 9, 2020, https://www.puc.pa.gov/pcdocs/1676672.docx.

[50] The cost recovery of program expenses through riders happens promptly so that costs are being recovered from ratepayers in the same dollars that they are incurred.

[2] Statewide Evaluation costs are outside of the 2% spending cap.
Source: PECO, CSP tracking data

4.2 Cost Recovery

Act 129 allows Pennsylvania EDCs to recover EE&C Plan costs through a cost-recovery mechanism. PECO's cost-recovery charges are organized separately by four customer sectors to verify that the electric rate classes that finance the programs are the rate classes that receive the direct energy conservation benefits. Cost recovery is governed by tariffed rate class, so it is necessarily tied to the way customers are metered and charged for electric service. Note the differences between Table 4-3 and Section 2.3. For example, the IE customer segment is a subset of PECO's residential tariff(s) and therefore not listed in Table 4-3.

Table 4-3. EE&C Plan Expenditures by Cost-Recovery Category

Cost-Recovery Sector	Rate Classes Included[1]	PY16 Spending	P4TD Spending
Residential	R, RH, and CAP	$26,850	$111,025
Small C&I	GS	$27,933	$121,673
Large C&I	PD, HT, and EP	$21,587	$84,377
Municipal	SLE, AL, and TLCL	$2,986	$3,829
Portfolio Total	**All**	**$79,356**	**$320,902**

[1] See current rate class definitions at https://www.peco.com/MyAccount/MyBillUsage/Pages/CurrentElectric.aspx.
Source: PECO

For Phase IV of Act 129, PECO nominated a portion of peak demand reduction acquired via EE&C programs into the PJM FCM. Proceeds from resources that clear in the FCM flow back to the rate class that generated the savings to offset cost recovery. Table 4-4 shows the proceeds received in PY16 and P4TD net of CSP fees and other administrative costs.

Table 4-4. FCM Proceeds from Recognized Peak Demand Reductions ($1,000)

Cost-Recovery Sector	Rate Classes Included[1]	PY16 Proceeds	P4TD PJM Proceeds
Residential	R, RH, and CAP	$331	$606
Small C&I	GS	$345	$502
Large C&I	PD, HT, and EP	$281	$438
Municipal	SLE, AL, and TLCL	$1	$2
Portfolio Total	**All**	**$959**	**$1,549**

[1] See current rate class definitions at https://www.peco.com/MyAccount/MyBillUsage/Pages/CurrentElectric.aspx.
Source: PECO

At the portfolio level, PY16 cost recovery requirements were lowered by 1.2% due to the FCM proceeds received from recognition of 75.4 MW for the 2024-2025 delivery year. P4TD cost recovery requirements have been lowered by 0.5% due to the FCM proceeds received, including recognition of 50.1 MW for the 2023-2024 delivery year. PECO expects to receive an additional $3.02 million of proceeds for the 2025/2026 delivery year. Beginning in the 2026/2027 delivery year, peak demand reduction from energy efficiency is no longer an eligible resource, so Phase V cost recovery will be unaffected by proceeds from Phase IV peak demand reductions.

Appendix A. Site Inspection Summary

Guidehouse's impact evaluation team completed site inspections for 17 unique sites to collect and verify site-specific operation parameters and to verify equipment installation as reported. Due to some projects including multiple phases, this process encompassed site visits for 24 individual projects. EcoMetric performed all onsite visits. Table A-1 shows the findings.

Table A-1. PY16 Non-Residential Site Visit Summary

Component	Update from Onsite	Type of Project	Onsite Tasks	Summary of Findings, Updates, and Impacts
Downstream	No	Lighting + Controls	Verify fixture type(s), quantities, model numbers, wattages, controls configuration, and HOU.	The overall fixture configuration differed slightly from the provided project documentation but by a small enough margin that Guidehouse is confident that savings will fall within 5% of claimed. Sub-metered information was not available to verify due to the facility's placement on a campus-wide metering system.
Downstream	No	Street Lighting	Verify fixture types(s), quantities, and operation for a sample of installed fixtures.	Guidehouse verified the installation of a sample of fixtures selected across six street lighting projects. Guidehouse also accessed the project's lighting management dashboard and adjusted savings down for lights that had malfunctioning controllers.
Downstream	No	Solar	Confirm PV array configuration, capacity, operation, and converter specifications.	The array configuration and performance details were confirmed via site visit. However, some adjustments were made to verified savings calculations to correct inconsistencies between installed array and initial estimates.
Downstream	Yes	Lighting	Verify fixture type(s), quantities, model numbers, wattages, and HOU.	The site visit revealed a difference in HOU between the tracking data and the facility operation. These adjustments are reflected in the verified savings and realization rate.
Downstream	Yes	Lighting + Controls	Verify fixture type(s), quantities, model numbers, wattages, controls configuration, and HOU.	The project invoices indicated 264 installed 2x4 LED fixtures. However, the site visit revealed that only 64 were installed, leading to a large savings reduction. Additionally, it was discovered that occupancy sensors were installed on two fixture types, modestly increasing savings.
Downstream	Yes	Lighting	Verify building HVAC type(s), fixture type(s), quantities, model numbers, wattages, and HOU.	The project invoices indicated 47 installed 2x4 LED fixtures. However, the site visit revealed that only 30 were installed, leading to a savings reduction. Building heating fuel was also verified during the site visit.
Midstream	Yes	Lighting	Verify building HVAC type(s), fixture type(s), quantities, model numbers, wattages, and HOU.	Fixture types and quantities were verified at the site visit, but it was discovered that the facility was not air conditioned. This led to a savings adjustment from the tracking data. Hours of use were also adjusted based on site-specific data.

Component	Update from Onsite	Type of Project	Onsite Tasks	Summary of Findings, Updates, and Impacts
Midstream	Yes	Lighting	Verify building HVAC type(s), fixture type(s), quantities, model numbers, wattages, and HOU.	Installed fixtures were verified via photos taken during the site visit. Based on this confirmation, the baseline was adjusted in accordance with TRM and IMP guidelines. The site visit also confirmed that both pre- and post-retrofit fixtures were controlled via light switches. The site visit further confirmed the presence of a daycare facility within the warehouse space, which houses 20 light fixtures. The daycare HVAC configuration was confirmed. Additionally, the ex ante analysis assumed the warehouse was comfort cooled with unknown heating type. However, the site visit confirmed that the warehouse is unconditioned.
Midstream	No	Lighting	Verify building HVAC type(s), fixture type(s), quantities, model numbers, wattages, and HOU.	The project included the installation of 193 2x4 LED fixtures. While onsite the engineer verified 292 2x4 fixtures. The site contact provided a photometric plan that confirmed the observations. Guidehouse reviewed the population data to investigate if this sampled project was a phase of a total lighting retrofit, but the data did not support this hypothesis. This project was discussed internally and ultimately no additional savings were awarded for the excess fixtures.
Downstream	Yes	RCx	Verification of system characteristics, quantities, and operational specifics.	Fan speeds and motor loading were adjusted via site visit data. Additionally, AHU3 HOU were corrected, as they were accidentally inverted in the ex ante calculations.
Downstream	Yes	Lighting + Controls	Verify building HVAC type(s), fixture type(s), quantities, model numbers, wattages, and HOU.	Site contact confirmed via onsite interview that the existing system configuration included occupancy sensors, leading to a reduction in savings.
Downstream	No	Compressed Air	Confirm compressor types, capacities, configuration, HOU, and dryer details.	Minor calculation adjustments impacted the realization rate, but the system configuration observed onsite was as described.
Midstream	No	Lighting - Interior + Exterior	Verify building HVAC type(s), fixture type(s), quantities, model numbers, wattages, and HOU.	No adjustments were made as a result of the site visit. Small calculation adjustments stemmed from a wattage alignment with DLC values.
Small Business Direct Install	Yes	Lighting - Interior + Exterior	Verify building HVAC type(s), fixture type(s), quantities, model numbers, wattages, and HOU.	HOU and heating system fuel were updated based on site visit information.
Downstream	Yes	RCx	Verification of system characteristics, quantities, and operational specifics.	Site visit confirmed that the VFDs for one measure were never installed, eliminating savings for that equipment. Observed fan speeds and flow rates showed lower part-

Component	Update from Onsite	Type of Project	Onsite Tasks	Summary of Findings, Updates, and Impacts
				load operation for some systems than indicated in ex ante calculations, further reducing savings. Additionally, HOU were also adjusted for some systems based on site BAS observations and interviews.
Downstream	Yes	Motors + VFDs	Confirmation of VFD installation and operation.	While no direct adjustments from site observations, the site engineer was able to obtain trend data from the onsite contact to amend the ex ante savings calculations

Source: Guidehouse analysis

Appendix B. HER Impact Evaluation Detail

This appendix details the full HER programs' impact evaluation. All cohorts are included together, regardless of residential or IE status. According to the Phase IV plan, the HER programs are planned to account for 8% of total portfolio energy savings and 9% of total portfolio demand savings. Oracle implements the HER programs.

B.1 Billing Data Management

Guidehouse used monthly billing data from Oracle to perform the energy savings analysis. Guidehouse applied the following preliminary data management steps on the billing data prior to conducting the energy regression analysis:

- Remove exact duplicate bills from the data as provided, by account.
- Drop all bills for accounts that went inactive prior to the latter of (a) the start of the current program year (June 1, 2024) and (b) the launch month of an account's wave.
- Normalize consecutive estimated reads by account, per Section 6.1.4 of the Phase IV Evaluation Framework.[51]
- Convert usage billing data to monthly calendarized observations, per Section 6.1.4 of the Phase IV Evaluation Framework.
- Remove monthly observations outside of each wave's 12-month pre-period and current post-period.
- Remove outlier data, per Section 6.1.4.1 of the Phase IV Evaluation Framework,[52] defined as monthly observations outside median monthly usage by wave plus or minus 10 times that median usage.

B.2 Impact Regression Results

Guidehouse followed the impact evaluation methodology outlined in Section 6.1.5 of the Phase IV Evaluation Framework.[53] Guidehouse estimated energy savings using a monthly LDV model. For details on model selection, refer to Section 6.1.5 of the Phase IV Evaluation Framework.

Table B-1 summarizes the regression outputs and statistics by wave, including the absolute precision for percentage savings estimates. The Phase IV Evaluation Framework Section 6.1.1.1 requires that the solution-level verification achieve an absolute precision of ±0.5% at the 95% confidence level (two-tailed), but individual cohorts may have a wider margin of error.[54] The precisions in Table B-2 reflect the error of the individual regression analysis estimates using a two-tailed 95% confidence level.

[51] Pennsylvania Statewide Evaluator, "Section 6.1.4 Data Management," *Evaluation Framework for Pennsylvania*, https://www.puc.pa.gov/media/1584/swe-phaseiv_evaluation_framework071621.pdf.

[52] Pennsylvania Statewide Evaluator, "Section 6.1.4.1 Outlier Detection and Removal," *Evaluation Framework for Pennsylvania*, https://www.puc.pa.gov/media/1584/swe-phaseiv_evaluation_framework071621.pdf.

[53] Pennsylvania Statewide Evaluator, "Section 6.1.5 Model Specification," *Evaluation Framework for Pennsylvania*, https://www.puc.pa.gov/media/1584/swe-phaseiv_evaluation_framework071621.pdf.

[47] Pennsylvania Statewide Evaluator, *Evaluation Framework for Pennsylvania*, https://www.puc.pa.gov/media/1584/swe-phaseiv_evaluation_framework071621.pdf.

Table B-1. HER Energy Regression Details (kWh/day)

HER Wave		Jun 2024	Jul 2024	Aug 2024	Sep 2024	Oct 2024	Nov 2024	Dec 2024	Jan 2025	Feb 2025	Mar 2025	Apr 2025	May 2025
Wave 1	ATE	-0.345	-0.459	-0.325	-0.277	-0.389	-0.709	-1.169	-1.487	-1.243	-0.763	-0.390	-0.132
	Std. Err.	0.180	0.188	0.173	0.148	0.137	0.178	0.263	0.321	0.287	0.203	0.156	0.151
Wave 2	ATE	-0.824	-0.907	-0.883	-0.775	-0.672	-0.765	-1.203	-1.515	-1.395	-1.012	-0.918	-0.895
	Std. Err.	0.295	0.314	0.279	0.236	0.200	0.232	0.333	0.396	0.359	0.263	0.222	0.240
Wave 4	ATE	-0.507	-0.581	-0.410	-0.268	-0.212	-0.277	-0.347	-0.326	-0.230	-0.256	-0.318	-0.344
	Std. Err.	0.148	0.165	0.142	0.114	0.091	0.109	0.157	0.178	0.159	0.119	0.099	0.103
Wave 5 Dual Fuel	ATE	-0.080	-0.166	-0.309	-0.128	-0.051	0.046	0.031	0.027	0.113	-0.075	-0.039	-0.126
	Std. Err.	0.287	0.315	0.276	0.226	0.188	0.199	0.250	0.278	0.262	0.222	0.191	0.209
Wave 6 Dual Fuel	ATE	-0.486	-0.941	-1.038	-0.968	-0.852	-0.808	-0.767	-0.676	-0.735	-0.496	-0.528	-0.621
	Std. Err.	0.469	0.542	0.489	0.414	0.336	0.361	0.447	0.509	0.468	0.372	0.349	0.382
Wave 6 Electric Only	ATE	-0.582	-0.779	-0.816	-0.697	-0.414	-0.607	-0.913	-1.099	-1.179	-0.945	-0.697	-0.409
	Std. Err.	0.261	0.300	0.270	0.235	0.204	0.258	0.370	0.442	0.401	0.288	0.221	0.214
Wave 7 Dual Fuel	ATE	-0.257	-0.331	-0.325	-0.266	-0.187	-0.149	-0.112	-0.094	-0.142	-0.118	-0.183	-0.321
	Std. Err.	0.087	0.096	0.083	0.068	0.056	0.059	0.075	0.085	0.079	0.063	0.059	0.064
Wave 7 Has Email	ATE	-0.517	-0.525	-0.424	-0.334	-0.189	-0.254	-0.350	-0.398	-0.359	-0.320	-0.278	-0.269
	Std. Err.	0.107	0.121	0.105	0.084	0.070	0.088	0.126	0.147	0.134	0.099	0.078	0.079
Wave 7 Income Eligible	ATE	-0.212	-0.137	-0.218	-0.139	-0.111	-0.065	-0.159	-0.341	-0.292	-0.280	-0.357	-0.362
	Std. Err.	0.153	0.177	0.176	0.156	0.105	0.145	0.210	0.241	0.223	0.166	0.121	0.106
Wave 7 No Email	ATE	-0.316	-0.368	-0.306	-0.224	-0.112	-0.134	-0.084	-0.021	-0.162	-0.157	-0.124	-0.207
	Std. Err.	0.088	0.102	0.086	0.068	0.059	0.080	0.116	0.133	0.123	0.089	0.069	0.064
Wave 8 Low Income	ATE	-0.151	-0.198	0.005	0.139	0.008	-0.099	-0.036	-0.117	0.034	-0.037	-0.083	-0.145
	Std. Err.	0.116	0.144	0.150	0.138	0.092	0.129	0.184	0.217	0.204	0.150	0.107	0.094

Note: ATE is average treatment effect as the change in kWh/day.

Source: Guidehouse analysis of monthly billing data

Table B-2. HER Percentage Energy Savings

HER Wave		Jun 2024	Jul 2024	Aug 2024	Sep 2024	Oct 2024	Nov 2024	Dec 2024	Jan 2025	Feb 2025	Mar 2025	Apr 2025	May 2025
Wave 1	% Savings	0.96%	1.14%	0.96%	1.00%	1.40%	1.71%	1.84%	1.92%	1.85%	1.70%	1.20%	0.49%
	Abs. Prec.	0.99%	0.92%	1.00%	1.05%	0.97%	0.84%	0.81%	0.81%	0.84%	0.88%	0.93%	1.10%
Wave 2	% Savings	1.23%	1.21%	1.40%	1.57%	1.57%	1.42%	1.60%	1.76%	1.84%	1.82%	1.98%	1.97%
	Abs. Prec.	0.86%	0.82%	0.87%	0.94%	0.92%	0.84%	0.87%	0.90%	0.93%	0.93%	0.94%	1.03%
Wave 4	% Savings	1.27%	1.25%	1.09%	0.97%	0.96%	1.13%	1.13%	1.00%	0.78%	1.06%	1.43%	1.47%
	Abs. Prec.	0.73%	0.69%	0.74%	0.81%	0.81%	0.87%	1.00%	1.06%	1.05%	0.96%	0.87%	0.86%
Wave 5 Dual Fuel	% Savings	0.19%	0.34%	0.79%	0.45%	0.23%	-0.20%	-0.11%	-0.09%	-0.43%	0.34%	0.18%	0.53%
	Abs. Prec.	1.36%	1.27%	1.39%	1.56%	1.70%	1.70%	1.78%	1.90%	1.97%	1.97%	1.76%	1.72%
Wave 6 Dual Fuel	% Savings	0.79%	1.33%	1.76%	2.16%	2.47%	2.23%	1.77%	1.48%	1.76%	1.43%	1.56%	1.62%
	Abs. Prec.	1.49%	1.51%	1.63%	1.81%	1.91%	1.95%	2.02%	2.18%	2.20%	2.10%	2.02%	1.95%
Wave 6 Electric Only	% Savings	1.21%	1.43%	1.75%	1.85%	1.26%	1.42%	1.51%	1.57%	1.87%	2.06%	1.90%	1.21%
	Abs. Prec.	1.06%	1.08%	1.14%	1.22%	1.22%	1.19%	1.20%	1.24%	1.25%	1.23%	1.18%	1.25%
Wave 7 Dual Fuel	% Savings	0.83%	0.90%	1.11%	1.24%	1.14%	0.86%	0.55%	0.44%	0.72%	0.70%	1.13%	1.77%
	Abs. Prec.	0.55%	0.51%	0.55%	0.62%	0.66%	0.67%	0.72%	0.77%	0.79%	0.74%	0.72%	0.69%
Wave 7 Has Email	% Savings	1.95%	1.68%	1.67%	1.76%	1.22%	1.41%	1.51%	1.56%	1.54%	1.74%	1.72%	1.66%
	Abs. Prec.	0.79%	0.76%	0.81%	0.87%	0.89%	0.95%	1.06%	1.13%	1.13%	1.05%	0.95%	0.95%
Wave 7 Income -Eligible	% Savings	0.80%	0.43%	0.81%	0.67%	0.69%	0.35%	0.66%	1.28%	1.19%	1.42%	2.11%	2.22%
	Abs. Prec.	1.12%	1.09%	1.28%	1.47%	1.27%	1.50%	1.70%	1.78%	1.78%	1.64%	1.40%	1.28%
Wave 7 No Email	% Savings	1.35%	1.31%	1.35%	1.35%	0.81%	0.81%	0.40%	0.09%	0.76%	0.93%	0.86%	1.47%
	Abs. Prec.	0.74%	0.71%	0.74%	0.81%	0.84%	0.95%	1.07%	1.13%	1.13%	1.04%	0.94%	0.89%
Wave 8 Low Income	% Savings	0.53%	0.59%	-0.02%	-0.61%	-0.04%	0.45%	0.12%	0.36%	-0.11%	0.16%	0.43%	0.81%
	Abs. Prec.	0.80%	0.85%	1.02%	1.20%	1.01%	1.15%	1.23%	1.30%	1.33%	1.25%	1.09%	1.04%

Source: Guidehouse analysis of monthly billing data

B.3 Recipient Household Counts

Monthly impacts for the HER Program depend on the total number of active recipients with consumption data during each month. Recipients accrue savings for the full month, for each active month they have consumption data. Additionally, customers that opt out of receiving reports still accrue savings for as long as they remain active to retain the validity of the RCT design and savings.[55] Guidehouse multiplied the total number of active recipients by the number of days in the month, by the treatment estimates for each month, and by cohort. Table B-3 shows the number of active recipients that accrued savings in each month by cohort and across the entire program.

Table B-3. HER Active Recipient Households

Month	Wave 1	Wave 2	Wave 4	Wave 5 Dual Fuel	Wave 6 Dual Fuel	Wave 6 Electric Only	Wave 7 Dual Fuel	Wave 7 Has Email	Wave 7 Income-Eligible	Wave 7 No Email	Wave 8 Low Income	Program Total
Jun 2024	18,821	25,180	134,809	11,157	3,940	11,147	81,467	153,305	14,969	66,261	19,527	**540,583**
Jul 2024	18,750	25,095	134,291	11,096	3,928	11,068	80,925	151,842	14,834	65,843	19,294	**536,966**
Aug 2024	18,663	24,997	133,731	11,054	3,907	10,982	80,384	150,428	14,708	65,333	19,057	**533,244**
Sep 2024	18,599	24,900	133,166	11,011	3,886	10,907	79,909	148,967	14,537	64,810	18,804	**529,496**
Oct 2024	18,540	24,812	132,741	10,977	3,875	10,836	79,533	147,864	14,401	64,342	18,541	**526,462**
Nov 2024	18,487	24,751	132,362	10,958	3,863	10,775	79,215	146,901	14,293	63,951	18,380	**523,936**
Dec 2024	18,427	24,690	131,896	10,922	3,849	10,718	78,857	145,755	14,177	63,464	18,181	**520,936**
Jan 2025	18,360	24,630	131,530	10,885	3,837	10,646	78,472	144,554	14,066	63,012	17,965	**517,957**
Feb 2025	18,314	24,550	131,128	10,857	3,819	10,577	78,149	143,877	13,928	62,732	17,732	**515,663**

[55] Pennsylvania Statewide Evaluator, "Section 6.1.1.2 Opt-Outs and Account Closures," *Evaluation Framework for Pennsylvania*, https://www.puc.pa.gov/media/1584/swe-phaseiv_evaluation_framework071621.pdf.

Month	Wave 1	Wave 2	Wave 4	Wave 5 Dual Fuel	Wave 6 Dual Fuel	Wave 6 Electric Only	Wave 7 Dual Fuel	Wave 7 Has Email	Wave 7 Income-Eligible	Wave 7 No Email	Wave 8 Low Income	Program Total
Mar 2025	18,264	24,489	130,800	10,829	3,807	10,534	77,849	143,262	13,842	62,536	17,592	**513,804**
Apr 2025	18,198	24,421	130,368	10,789	3,792	10,461	77,506	142,275	13,696	62,164	17,365	**511,035**
May 2025	18,121	24,312	129,781	10,744	3,762	10,373	77,008	141,123	13,538	61,710	17,129	**507,601**

Source: Guidehouse analysis of monthly billing data

B.4 Dual Participation Analysis

To the extent that the HER Program increases participation in other solutions, some savings from the regression analysis could be double-counted if appropriate adjustments are not made. Double-counting can be avoided for programs that track participation at the customer level by estimating the increase in program participation among HER recipients. This approach is also known as dual participation savings or uplift savings.

To generate estimates of dual participation, Guidehouse followed the Phase IV Evaluation Framework Section 6.1.8 for both downstream and upstream program accounting.[56] The assumption is that exposure to the HER messaging motivates participants to take advantage of other programs' offerings promoted through HER materials. This exposure creates a situation where households in the treatment groups are likely to participate in other programs at a higher rate than households in the control groups. The methodology calls for program-specific uplift calculations. To that end, Guidehouse estimated aggregate uplift across the Residential EE Program's components.

Guidehouse's dual participation analysis also accounts for upstream savings, which functions differently than for downstream programs. Because upstream participation is not tracked at the customer level, the approach for specific homes is not feasible. Therefore, Guidehouse used an assumed percentage reduction factor for each recipient cohort to account for upstream dual participation. The assumed percent reduction factors increase overtime from a low of 0.75% for the first year and to a high of 3% for the fourth year and beyond. This factor determines total upstream reduction based on the estimate of energy savings less downstream double-counted savings. PECO stopped offering upstream lighting in June 2023 so adjustment factors are not applied waves launched thereafter, like wave 8 which was launched in June of 2024. Table B-4 shows percentage upstream reduction values for each wave.

Table B-4. HER Default Upstream Reduction Factors

Year of Wave Activity	Default Upstream Reduction Factor	HER Waves Included
1	0.75%	-
2	1.50%	Wave 7D, Wave 7HE, Wave 7NE, Wave 7IE
3	2.25%	-
4 and beyond	3.00%	Wave 1, Wave 2, Wave 4, Wave 5D, Wave 6D, Wave 6E

Source: Phase IV Evaluation Framework Section 6.1.8.2

Table B-5 summarizes the dual participation savings associated with both downstream and upstream programs across each of the HER recipient cohorts.

Table B-5. HER Double-Counting Savings Adjustments

HER Wave	Downstream Adjustment (MWh)	Upstream Adjustment (MWh)	Total Adjustment (MWh)
Wave 1	776	105	882
Wave 2	1,575	218	1,793

[56] Pennsylvania Statewide Evaluator, "Section 6.1.8 Dual Participation Analysis," *Evaluation Framework for Pennsylvania*, https://www.puc.pa.gov/media/1584/swe-phaseiv_evaluation_framework071621.pdf.

HER Wave	Downstream Adjustment (MWh)	Upstream Adjustment (MWh)	Total Adjustment (MWh)
Wave 4	397	482	879
Wave 5 – Dual Fuel	113	4	118
Wave 6 – Dual Fuel	92	29	121
Wave 6 – Electric Only	461	75	536
Wave 7 – Dual Fuel	682	80	762
Wave 7 – Has Email	81	282	363
Wave 7 – IE	0	17	17
Wave 7 – No Email	396	59	455
Wave 8 – Low Income	0	0	0

Source: Guidehouse analysis of PECO program tracking data

B.5 Persistence and First-Year Savings

In compliance with Phase IV incremental annual accounting requirements and per Section 6.1.9 of the Phase IV Evaluation Framework,[57] Guidehouse performed a persistence analysis to estimate first-year savings for all cohorts in their third or later year of activity.

The calculations for persistence reductions follow the algorithms in the 2021 Pennsylvania Technical Reference Manual (PA TRM), Volume 2, Section 2.7.3.[58] Guidehouse used the default decay rate of 31.3% to calculate monthly persistence based on ATE from prior program years and proportionate to estimated savings net of uplift from the current program year. Table B-6 contains the monthly persistence reductions for all active cohorts.

[57] Pennsylvania Statewide Evaluator, "Section 6.1.9 Incremental Annual Accounting and Measure Life," *Evaluation Framework for Pennsylvania*, https://www.puc.pa.gov/media/1584/swe-phaseiv_evaluation_framework071621.pdf.

[58] Pennsylvania Public Utility Commission, *Technical Reference Manual,* https://www.puc.pa.gov/filing-resources/issues-laws-regulations/act-129/technical-reference-manual/.

Table B-6. HER Persistence (MWh)

Month	Wave 1	Wave 2	Wave 4	Wave 5 Dual Fuel	Wave 6 Dual Fuel	Wave 6 Electric Only	Wave 7 Dual Fuel	Wave 7 Has Email	Wave 7 IE	Wave 7 No Email	Wave 8 Low Income	Program Total
Jun 2024	63	317	1,297	2	32	117	356	858	59	324	0	3,426
Jul 2024	98	362	1,540	8	69	162	475	888	39	390	0	4,032
Aug 2024	60	350	1,079	18	77	169	462	715	61	318	0	3,309
Sep 2024	44	287	669	6	69	138	360	537	37	218	0	2,365
Oct 2024	74	246	545	2	62	81	252	315	31	105	0	1,714
Nov 2024	160	275	691	-5	56	118	187	407	17	123	0	2,030
Dec 2024	295	490	885	-4	55	185	139	573	43	72	0	2,735
Jan 2025	385	633	834	-4	48	222	111	649	92	4	0	2,975
Feb 2025	287	517	530	-8	47	216	163	526	70	137	0	2,485
Mar 2025	184	387	655	4	33	190	143	518	74	145	0	2,334
Apr 2025	80	333	785	2	32	136	227	432	90	108	0	2,225
May 2025	-2	315	886	8	38	-157	330	428	94	203	0	2,143

Source: Guidehouse analysis of monthly billing data and ATE net-of-uplift from prior program years

To calculate first-year savings values, Guidehouse subtracted the persistence reductions from total savings net-of-uplift for the current program year. Table B-7 contains final first-year savings calculations by month for all active cohorts.

Table B-7. HER First-Year Savings (MWh)

Month	Wave 1	Wave 2	Wave 4	Wave 5 Dual Fuel	Wave 6 Dual Fuel	Wave 6 Electric Only	Wave 7 Dual Fuel	Wave 7 Has Email	Wave 7 IE	Wave 7 No Email	Wave 8 Low Income	Program Total
Jun 2024	62	177	648	8	16	64	227	1,465	35	262	89	3,053
Jul 2024	96	202	770	31	35	89	303	1,516	23	316	118	3,498
Aug 2024	59	195	539	70	39	92	294	1,222	37	257	-3	2,801
Sep 2024	43	160	334	22	34	76	230	918	22	176	-78	1,936
Oct 2024	72	138	273	6	31	45	161	538	18	85	-5	1,362
Nov 2024	155	154	345	-19	28	65	119	695	10	100	55	1,707
Dec 2024	287	274	442	-16	28	101	89	979	26	58	20	2,289
Jan 2025	374	354	417	-14	24	121	71	1,109	55	4	65	2,579
Feb 2025	279	289	265	-30	24	118	104	898	42	111	-17	2,082
Mar 2025	179	216	327	16	17	104	91	884	44	118	20	2,016
Apr 2025	78	186	392	7	16	74	145	738	54	87	43	1,820
May 2025	-2	176	443	32	19	-86	210	731	56	164	77	1,820

Source: Guidehouse analysis

B.6 Demand Savings

Guidehouse conducted an analysis to estimate average peak demand savings for the HER Program. To this end, Guidehouse developed a methodology in accordance with the Phase IV Evaluation Framework Section 6.1.6.[59] The methodology is bipartite, composed of a regression model that estimates hourly kW savings and a proportional conversion factor that accounts for uplift and persistence, by month.

Guidehouse used a simple difference regression model leveraging hourly interval data for peak hours to estimate gross average kW savings by month. Peak hours are defined as 2 p.m. to 6 p.m. on non-holiday weekdays during June through August of 2024. Guidehouse applied the following preliminary data management steps on the hourly metering data prior to carrying out the demand regression analysis:

- Limit the data to only observations within the definition of peak hours for PY16.
- Drop meter reads that occur after an account's inactive date.
- Remove customers with multiple service points if applicable.
- Remove exact duplicate meter reads by account.
- Remove estimated reads when an actual read is available for the same interval.
- Drop meter reads that occur after an account's inactive date.
- Remove outlier reads, defined as observations greater than or less than four standard deviations from the mean peak hourly usage (done separately for each cohort).
- Drop zero usage meter reads; missing reads are shown as zero usage and if kept can incorrectly reduce average hourly kW.
- Average the peak hourly reads to create a mean daily kW value by account and read date.
- Remove averaged account-date observations that incorporate less than three of the four possible peak hourly meter reads.
- Table B-8 contains the resulting kW regression estimates with clustered standard errors by month for all cohorts.

Table B-8. HER Demand Regression Details (kW)

HER Wave		Jun 2024	Jul 2024	Aug 2024
Wave 1	Est.	-0.03826	-0.03380	-0.03166
	Std. Err.	0.01519	0.01583	0.01409
Wave 2	Est.	-0.04323	-0.03560	-0.02912
	Std. Err.	0.02579	0.02701	0.02399
Wave 4	Est.	-0.04206	-0.04185	-0.03710
	Std. Err.	0.01200	0.01265	0.01097
Wave 5 Dual Fuel	Est.	-0.01326	-0.01304	-0.00459

[59] Pennsylvania Statewide Evaluator, "Section 6.1.6 Peak Demand Impacts," *Evaluation Framework for Pennsylvania*, https://www.puc.pa.gov/media/1584/swe-phaseiv_evaluation_framework071621.pdf.

HER Wave		Jun 2024	Jul 2024	Aug 2024
	Std. Err.	0.02374	0.02439	0.02163
Wave 6 Dual Fuel	Est.	-0.04744	-0.05969	-0.03911
	Std. Err.	0.04723	0.04914	0.04342
Wave 6 Electric Only	Est.	-0.03675	-0.02555	-0.03274
	Std. Err.	0.02448	0.02564	0.02278
Wave 7 Dual Fuel	Est.	-0.01708	-0.01780	-0.01795
	Std. Err.	0.00927	0.00976	0.00855
Wave 7 Has Email	Est.	-0.04339	-0.04218	-0.03659
	Std. Err.	0.01266	0.01348	0.01155
Wave 7 Income-Eligible	Est.	-0.02137	-0.01643	-0.01809
	Std. Err.	0.01191	0.01302	0.01140
Wave 7 No Email	Est.	-0.01594	-0.01697	-0.01368
	Std. Err.	0.00842	0.00931	0.00789
Wave 8 Low Income	Est.	0.00273	-0.01019	-0.00473
	Std. Err.	0.01099	0.01203	0.01057

Source: Guidehouse analysis of hourly metering data

To account for uplift and persistence, Guidehouse applied the ratio of the first-year savings ATE to the modeled ATE from the impact analysis for proportional parity in reductions for both the energy and demand savings. Each modified monthly kW value is multiplied by the total number of recipient households in that month (refer to Table B-3 for counts). The resulting monthly total demand savings are weighted together using total peak days for active households to create a single demand savings value by cohort.

B.7 Summary

Table B-9 contains the final values from the impact and demand analyses by cohort. Final MWh savings combine modeled energy savings, double-counted savings reductions, and persistence savings reductions. Final demand savings incorporate modeled demand savings and a ratio between gross and first-year energy savings, weighted by month.

Table B-9. HER Program Impacts Summary

Cohort	Modeled Savings (MWh)	Uplift Reduction (MWh)	Net-of-Uplift Savings (MWh)	Persistence Reduction (MWh)	First-Year Savings (MWh)	Demand Savings (MW)
Wave 1	4,292	882	3,410	1,729	1,681	0.213
Wave 2	8,827	1,793	7,035	4,514	2,521	0.256
Wave 4	16,471	879	15,592	10,397	5,195	1.716
Wave 5 – Dual Fuel	260	118	143	30	113	0.052
Wave 6 – Dual Fuel	1,048	121	927	617	310	0.057
Wave 6 – Electric Only	2,977	536	2,440	1,577	863	0.115

Cohort	Modeled Savings (MWh)	Uplift Reduction (MWh)	Net-of-Uplift Savings (MWh)	Persistence Reduction (MWh)	First-Year Savings (MWh)	Demand Savings (MW)
Wave 7 – Dual Fuel	6,011	762	5,248	3,206	2,042	0.518
Wave 7 – Has Email	18,903	363	18,540	6,846	11,694	3.803
Wave 7 – IE	1,147	17	1,130	708	422	0.101
Wave 7 – No Email	4,340	455	3,885	2,148	1,737	0.426
Wave 8 – Low Income	385	0	385	0	385	0.081

Source: Guidehouse analysis

Appendix C. PY16 and P4TD Summary by Customer Segment and IE Carveout

Table C-1 presents a summary of the programs, components, and customer segments that contribute to the IE carveout in PY16 and P4TD.

Table C-1. Summary of Income-Eligible Carveout Energy Savings (MWh/Yr)

Component	Customer Segment	PYVTD Gross (MWh/yr)	VTD Gross (MWh/yr)
Multifamily Income-Eligible	Multifamily Income-Eligible	2,169	12,196
Residential Total		**2,169**	**12,196**
Income-Eligible Single-Family/Long-Term Savings	Income-Eligible	16,351	71,481
Income-Eligible Appliance Recycling	Income-Eligible	191	2,860
Income-Eligible Total		**16,542**	**74,341**
Income-Eligible HER	Income-Eligible	**807**	**2,473**
Portfolio Total		**19,518**	**89,011**

Source: Guidehouse analysis

Appendix D. Summary of Program-Level Impacts, Cost-Effectiveness, and HIM NTG

D.1 Program- and Component-Level Impacts Summary

Table D-1 presents a summary of energy impacts by program and component through PY16.

Table D-1. Incremental Annual Energy Savings by Program and Component (MWh/Yr)

Program and Component	PYRTD (MWh/yr)	PYVTD Gross (MWh/yr)	PYVTD Net (MWh/yr)	RTD (MWh/yr)	VTD Gross (MWh/yr)	VTD Net (MWh/yr)
Rebates and Marketplace	40,888	33,313	12,180	129,974	113,796	67,074
Appliance Recycling	1,007	989	508	19,647	20,994	11,117
In-Home Assessment	7,611	6,543	5,349	23,279	21,507	19,154
New Construction	5,571	5,567	3,062	13,503	13,542	8,224
Multifamily	1,719	1,503	1,232	8,201	6,654	5,870
Multifamily Income-Eligible	2,680	2,169	2,169	14,008	12,196	12,196
Residential Total	**59,476**	**50,084**	**24,501**	**208,613**	**188,688**	**123,636**
Income-Eligible Single-Family	13,759	16,351	16,351	70,636	71,481	71,481
Income-Eligible Appliance Recycling	184	191	191	2,777	2,860	2,860
Income-Eligible Total	**13,943**	**16,542**	**16,542**	**73,413**	**74,341**	**74,341**
Residential HER	**28,911**	**26,156**	**26,156**	**108,558**	**105,303**	**105,303**
Income-Eligible HER	**1,465**	**807**	**807**	**3,421**	**2,473**	**2,473**
Downstream Rebates	97,435	93,757	67,682	371,039	355,817	245,505
Midstream Rebates	113,915	114,246	76,784	408,304	427,213	292,731
Small Business Direct Install	10,478	9,990	9,271	46,435	44,834	40,492
New Construction	8,887	10,049	3,025	33,728	35,011	11,608
Non-Residential Total	**230,715**	**228,042**	**156,764**	**859,506**	**862,875**	**590,336**
Portfolio Total	**334,509**	**321,631**	**224,769**	**1,253,512**	**1,233,680**	**896,090**

Note: For the Non-Residential Downstream Rebates component, 746 MWh of reported savings are unverified in PY16. These unverified savings are included in reported savings values and excluded from verified savings values.

Source: Guidehouse analysis

Table D-2 presents a summary of the peak demand impacts by energy efficiency program and component through the current reporting period.

Table D-2. Peak Demand Savings by Energy Efficiency Program and Component (MW/Yr)

Program and Component	PYRTD (MW/yr)	PYVTD Gross (MW/yr)	PYVTD Net (MW/yr)	RTD (MW/yr)	VTD Gross (MW/yr)	VTD Net (MW/yr)
Rebates and Marketplace	4.93	5.59	2.25	17.93	18.84	11.21
Appliance Recycling	0.38	0.38	0.17	4.26	4.47	2.26
In-Home Assessment	0.59	0.73	0.61	2.09	2.12	1.89
New Construction	1.35	1.57	0.86	4.04	3.11	1.93

Program and Component	PYRTD (MW/yr)	PYVTD Gross (MW/yr)	PYVTD Net (MW/yr)	RTD (MW/yr)	VTD Gross (MW/yr)	VTD Net (MW/yr)
Multifamily	0.22	0.19	0.16	1.15	0.94	0.83
Multifamily Income-Eligible	0.36	0.31	0.31	1.67	1.44	1.44
Residential Total	**7.83**	**8.77**	**4.36**	**31.15**	**30.92**	**19.56**
Income-Eligible Single-Family	1.54	1.79	1.79	7.05	6.97	6.97
Income-Eligible Appliance Recycling	0.06	0.06	0.06	0.68	0.70	0.70
Income-Eligible Total	**1.60**	**1.85**	**1.85**	**7.73**	**7.67**	**7.67**
Residential HER	**4.70**	**7.73**	**7.73**	**17.67**	**24.51**	**24.51**
Income-Eligible HER	**0.24**	**0.20**	**0.20**	**0.56**	**0.12**	**0.12**
Downstream Rebates	15.74	14.21	10.25	63.86	59.60	41.40
Midstream Rebates	25.51	25.26	16.97	87.55	91.11	62.41
Small Business Direct Install	2.73	2.55	2.37	10.69	10.02	9.10
New Construction	1.34	1.52	0.46	5.66	6.03	2.00
Non-Residential Total	**45.32**	**43.54**	**30.06**	**167.76**	**166.75**	**114.91**
Portfolio Total	**59.69**	**62.09**	**44.20**	**224.87**	**229.98**	**166.78**

Note: For the Non-Residential Downstream Rebates component, 0.01 MW of reported savings are unverified in PY16. These unverified savings are included in reported savings values and excluded from verified savings values.

Source: Guidehouse analysis

D.2 Program-Level Cost-Effectiveness Summary

Table D-3 shows the TRC ratios by program and for the portfolio. The benefits in Table D-3 were calculated using gross verified impacts. Costs and benefits are expressed in 2024 dollars.

Table D-3. PY16 Gross TRC Ratios by Program ($1,000)[1]

Program	TRC NPV Benefits	TRC NPV Costs	TRC Ratio	TRC Net Benefits (Benefits – Costs)
Residential	$46,534	$41,473	1.12	$5,061
Income-Eligible	$35,363	$5,317	6.65	$30,046
HER	$8,987	$2,217	4.05	$6,770
Income-Eligible HER	$227	$97	2.33	$130
Residential Subtotal	**$91,111**	**$49,104**	**1.86**	**$42,007**
Non-Residential Subtotal	**$119,616**	**$92,755**	**1.29**	**$26,861**
Common Portfolio Costs	-	**$10,406**	-	
Portfolio Total	**$210,727**	**$152,265**	**1.38**	**$58,462**

[1] Costs and benefits are expressed as follows: PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025

Source: PECO and CSP tracking data

Table D-4 presents PY16 cost-effectiveness using net verified savings to calculate benefits.

Table D-4. PY16 Net TRC Ratios by Program ($1,000)[1]

Program	TRC NPV Benefits	TRC NPV Costs	TRC Ratio	TRC Net Benefits (Benefits – Costs)
Residential	$22,708	$23,851	0.95	-$1,143
Income-Eligible	$35,363	$5,317	6.65	$30,046
HER	$8,987	$2,217	4.05	$6,770
Income-Eligible HER	$227	$97	2.33	$130
Residential Subtotal	**$67,285**	**$31,482**	**2.14**	**$35,803**
Non-Residential Subtotal	**$83,136**	**$68,013**	**1.22**	**$15,123**
Common Portfolio Costs	**-**	**$10,406**	**-**	
Portfolio Total	**$150,421**	**$109,900**	**1.37**	**$40,520**

[1] Costs and benefits are expressed as follows: PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025

Source: PECO and CSP tracking data

Table D-5 summarizes cost-effectiveness by program for Phase IV of Act 129. Cost and benefits are expressed in nominal dollars.

Table D-5. P4TD Gross TRC Ratios by Program ($1,000)[1]

Program	TRC NPV Benefits	TRC NPV Costs	TRC Ratio	TRC Net Benefits (Benefits – Costs)
Residential	$170,369	$147,089	1.16	$23,280
Income-Eligible	$117,525	$26,817	4.38	$90,708
HER	$23,838	$8,001	2.98	$15,836
Income-Eligible HER	$442	$284	1.56	$158
Residential Subtotal	**$312,174**	**$182,191**	**1.71**	**$129,983**
Non-Residential Subtotal	**$451,694**	**$398,842**	**1.13**	**$52,853**
Common Portfolio Costs	**-**	**$42,346**	**-**	
Portfolio Total	**$763,868**	**$623,378**	**1.23**	**$140,490**

[1] Costs and benefits are expressed as follows: PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025

Source: PECO and CSP tracking data

Table D-6 presents P4TD cost-effectiveness results using net verified savings to calculate benefits. Costs and benefits are expressed in nominal dollars.

Table D-6. P4TD Net TRC Ratios by Program ($1,000)[1]

Program	TRC NPV Benefits	TRC NPV Costs	TRC Ratio	TRC Net Benefits (Benefits – Costs)
Residential	$112,047	$104,246	1.07	$7,801
Income-Eligible	$117,583	$26,817	4.38	$90,767
HER	$23,970	$8,001	2.98	$15,968
Income-Eligible HER	$465	$284	1.61	$181
Residential Subtotal	**$254,064**	**$139,348**	**1.82**	**$114,717**
Non-Residential Subtotal	**$309,371**	**$286,776**	**1.08**	**$22,595**
Common Portfolio Costs	**-**	**$42,346**	**-**	

Program	TRC NPV Benefits	TRC NPV Costs	TRC Ratio	TRC Net Benefits (Benefits – Costs)
Portfolio Total	**$563,435**	**$468,469**	**1.20**	**$94,966**

[1] Costs and benefits are expressed as follows PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025

Source: PECO and CSP tracking data

D.3 HIM NTG Research

Findings from NTG research are not used to adjust compliance savings in Pennsylvania. Instead, NTG research provides directional information for program planning purposes and market trends across various sectors and energy efficient equipment types. Table D-7 presents NTG findings for the HIMs studied in PY16 to understand how this equipment is impacting the non-residential market.[60]

Table D-7. HIM NTG

HIM	Free Ridership	Spillover	NTGR
Solar – Non-Residential Downstream	0.52	0.00	0.48
Lighting Improvements – Non-Residential Downstream	0.20	0.09	0.89

Source: Guidehouse analysis

D.4 Program-Level Comparison of Performance to the Approved EE&C Plan

Table D-8 presents PY16 expenditures, by program, compared with the budget estimates set forth in the EE&C Plan[61] for PY16. All the dollars in Table D-8 are presented in 2024 nominal dollars.

Table D-8. Comparison of PY16 Expenditures with Phase IV EE&C Plan ($1,000)

Program	PY16 Budget from EE&C Plan	PY16 Actual Expenditures	Ratio (Actual/Plan)
Residential	$16,160	$15,619	0.97
Income-Eligible	$8,570	$5,469	0.64
Residential HER	$1,890	$2,217	1.17
Income-Eligible HER	$120	$97	0.81
Non-Residential	$61,910	$45,548	0.74
Portfolio Total	**$88,650**	**$68,950**	**0.78**

Sources: Guidehouse analysis, PECO EE&C Plan

[60] The Phase IV Evaluation Framework provides guidance to EDCs to oversample measure categories (technologies) of high importance, called HIMs, to help program planners make decisions concerning those measures. The SWE suggests that for each program year, each EDC identifies three to five HIMs for study based on energy impact, level of uncertainty, prospective value, funding, or other parameters. The intent is to prioritize measure-level NTGRs for HIMs, but the EDCs are encouraged to also provide program-level NTG information – that is, to oversample HIMs, but they may also include non-HIMs in the research, as appropriate, https://www.puc.pa.gov/media/1584/swe-phaseiv_evaluation_framework071621.pdf.

[61] PECO, *PECO Program Years 13 to 17 Act 129* 2024, https://www.puc.pa.gov/pcdocs/1834379.pdf.

Table D-9 presents P4TD expenditures, by program, compared with the budget estimates set forth in the EE&C Plan through PY16. Phase IV dollar totals in Table D-9 are presented in nominal dollars.

Table D-9. Comparison of P4TD Expenditures to Phase IV EE&C Plan ($1,000)

Program	Phase IV Budget from EE&C Plan through PY16	P4TD Actual Expenditures	Ratio (Actual/Plan)
Residential	$61,080	$53,569	0.88
Income-Eligible	$33,890	$32,090	0.95
Residential HER	$7,840	$8,001	1.02
Income-Eligible HER	$400	$283	0.71
Non-Residential	$211,690	$184,613	0.87
Portfolio Total	**$314,900**	**$278,557**	**0.88**

Sources: Guidehouse analysis, PECO EE&C Plan

Table D-10 compares PY16 verified gross program savings with the energy savings projections set forth in the EE&C Plan.

Table D-10. Comparison of PY16 Actual Program Savings with EE&C Plan Projections

Program	EE&C Plan Projections for PY16 (MWh)	PY16 VTD Gross MWh Savings	Ratio (Actual/Plan)
Residential	50,284	50,084	1.00
Income-Eligible	17,285	16,542	0.96
Residential HER	22,012	26,156	1.19
Income-Eligible HER	1,413	807	0.57
Non-Residential	269,974	228,042	0.84
Portfolio Total	**360,968**	**321,631**	**0.89**

Note: For the Non-Residential Downstream Rebates component, 746 MWh of reported savings are unverified in PY16. These unverified savings are included in reported savings values and excluded from verified savings values.

Sources: Guidehouse analysis, PECO EE&C Plan

Table D-11 compares P4TD verified gross program savings with the energy savings projections set forth in the EE&C Plan.

Table D-11. Comparison of P4TD Actual Program Savings with EE&C Plan Projections

Program	EE&C Plan Projections through PY16 (MWh)	VTD Gross MWh Savings	Ratio (Actual/Plan)
Residential	188,285	188,688	1.00
Income-Eligible	68,160	74,341	1.09
Residential HER	91,200	105,303	1.15
Income-Eligible HER	4,702	2,473	0.53
Non-Residential	945,572	862,875	0.91
Portfolio Total	**1,297,916**	**1,233,680**	**0.95**

Note: For the Non-Residential Downstream Rebates component, 746 MWh of reported savings are unverified in PY16. These unverified savings are included in reported savings values and excluded from verified savings values.

Sources: Guidehouse analysis, PECO EE&C Plan

Appendix E. Residential and Income-Eligible EE Programs

This appendix details the evaluation methods and activities Guidehouse deployed in PY16 for select residential and IE energy efficiency program components (listed below). Refer to Sections 3.1 and 3.2 for key evaluation findings, results, and conclusions for these components:

- Rebates and Marketplace (Market-Rate)
- Appliance Recycling (Market-Rate and IE)
- In-Home Assessment (Market-Rate)
- New Construction (Market-Rate)
- Multifamily (Market-Rate and IE)
- Single-Family (IE)
- Long-Term Savings (IE)

E.1 Rebates and Marketplace (Market-Rate)

The Rebates and Marketplace component includes customer rebates for lighting, HVAC, appliances, and energy-saving devices. There are multiple delivery pathways to receive product rebates: Downstream, Marketplace, and Point of Purchase. According to the Phase IV EE&C plan,[62] this component will account for 54% of Residential EE Program energy savings, 44% of Residential EE Program demand savings, 8% of total portfolio energy savings, and 6% of portfolio demand savings. CLEAResult implements the Phase IV Rebates and Marketplace component.

E.1.1 Gross Impact Evaluation

E.1.1.1 Methodology

Guidehouse conducted two activities to verify savings for this component: a tracking database analysis for all measures outlined in the PA TRM[63] and latest IMPs using a combination of TRM default values and EDC-provided data, and online surveys to verify installation characteristics of measures. As part of the tracking database analysis, Guidehouse verified algorithms used to estimate reported gross savings at the measure level and recalculated gross energy and demand savings estimates to confirm whether the tracking database was accurate as reported. Guidehouse used a programmatic approach in this step based solely on inputs provided in the tracking database and the relevant TRM and IMP sections. Non-TRM measures were passed through this process with no adjustment and adjusted database savings for these measures equaled the reported savings.[64] Table E-1 illustrates the factors that led to variation between the reported and adjusted database savings and impacted the observed realization rates reported in Section 3.1.2.

[62] PECO, *PECO Program Years 13 to 17 Act 129 – Phase IV Energy Efficiency and Conservation Plan*, filed June 19, 2024, https://www.puc.pa.gov/pcdocs/1834379.pdf.

[63] Pennsylvania Public Utility Commission, *Technical Reference Manual,* https://www.puc.pa.gov/filing-resources/issues-laws-regulations/act-129/technical-reference-manual/.

[64] Guidehouse, Phase IV Evaluation Plan, Energy Efficiency and Conservation Portfolio, revised November 18, 2024.

Table E-1. Detailed Findings for Rebates and Marketplace

Measure	Percentage of Residential Energy Savings[1]	Tracking Database Energy Ratio	Tracking Database Demand Ratio	Reason for Adjustment
Ductless Heat Pumps	4.0%	0.86	0.95	Reported savings do not reflect values provided in the tracking data and deemed TRM values. Verified savings use the provided values and the realization rates show misalignment.
ECM Circulation Fans	2.3%	1.05	1.06	Reported reduced energy demand factor is 0.11 rather than TRM constant 0.116.
Heat Pump Water Heater	1.1%	0.70	0.70	Reported units between 50 and 120 gallons use a UEF baseline of 0.92. TRM errata issued for PY15 provides updated equations to calculate UEF base for these larger measures.

[1] Percentage of Residential Energy Savings is the percentage of total Residential Program energy savings that each of these measures represents.

Source: Guidehouse analysis

E.1.1.2 Sampling

Guidehouse conducted online surveys of sampled spray foam and solar customers, and a census of ductless heat pump customers, in PY16, as described in Section 3.1.2. The surveys included specific questions the customer could answer based on common knowledge of the equipment they purchased. Savings were recalculated based on the customer responses in the surveys. Guidehouse used surveys to evaluate savings for solar and ductless heat pump measures from the Downstream pathway, and spray foam measures from the Point of Purchase delivery pathway. Findings from the survey are detailed in Section 3.1.2.

Guidehouse anticipated that some component surveys may not meet their target completes and took extra steps to bolster response rates and survey completes. These steps were taken in addition to the standard email invitation and up to two email reminders sent to all sampled survey participants. Actions included the following:

- **Incentive offered:** Guidehouse offered an e-gift card through the Tango platform and later increased the incentive to further encourage participation.
- **Additional sample:** Guidehouse contacted additional randomly selected customers, beyond the initial random sample, including a census of ductless heat pump customers.
- **Additional reminders:** Guidehouse sent additional reminders, beyond the typical two reminders, to all sampled customers.

Despite these actions, the survey effort did not meet response targets for two of the three targeted measure types, including ductless heat pumps and spray foam. For the ductless heat pump measures, Guidehouse did not sample. Instead, Guidehouse contacted everyone who participated with a ductless heat pump through the downstream pathway. The small population size and a low response rate combined led to Guidehouse not meeting sample targets for the ductless heat pump measure, despite the additional steps.

Table E-2. Rebates and Marketplace Sample Project Count

Delivery Pathway	Stratum	Target Count	Achieved Count
Downstream	Ductless Heat Pumps	24	12
	Solar	26	46
	Total	50	58
Point of Purchase	Spray Foam[1]	80	26

[1] Spray Foam Target Completes, Actual Completes, Number Contacted, and Response Rate are based on combined survey responses from PY15 and PY16.

Source: Guidehouse analysis

E.1.2 Net Impact Evaluation

Guidehouse conducted NTG research for the Downstream and Point of Purchase delivery pathways of the Rebates and Marketplace component in PY16. Guidehouse sent online surveys to PECO customers who participated in the Downstream pathway by receiving a rebate for a solar project (referred to throughout Section E.1.2 as Solar) and customers who received an instant incentive on canned spray foam through PECO's Point of Purchase pathway (referred to throughout Section E.1.2 as Spray Foam) in PY16. Guidehouse also conducted phone interviews for retail store managers who participated in the Point of Purchase pathway, though the two responses were not statistically significant and were excluded from results. Guidehouse received 43 valid NTG survey completes from Solar participants and 17 valid NTG survey completes from Spray Foam participants.[65] See Section 3.1.2 for information on the PY16 surveying effort.

E.1.2.1 Estimating Free Ridership

The SWE's Phase IV Evaluation Framework for residential downstream-type programs includes two metrics for estimating free ridership: intention and influence. This direction comes directly from the Energy Trust of Oregon (ETO) Common Methods for conducting NTG research. The Rebates and Marketplace component offers equipment upgrades through downstream rebates, an online marketplace, and instant in-store discounts (point of purchase). Guidehouse asked intention and influence questions specific to both Downstream and Point of Purchase delivery pathways.

Downstream Delivery Pathway

Intention

Intention is assessed through a few brief questions used to determine how the upgrade or equipment replacement likely would have differed if the respondent had not received the program assistance. The initial question asked the respondent to identify from a limited set of options that best describe what most likely would have occurred without the program.

The survey response options gathering feedback on intention in the PY16 Rebates and Marketplace component Downstream delivery pathway for solar projects included:

[65] NTG survey completes differ slightly from the Process survey complete counts below due to one Point of Purchase (Spray Foam) respondent answering the NTG battery of questions but dropping out of the survey prior to completing all process questions.

- Without the program, would not have installed the solar project
- Without the program, would have postponed the installation of the solar project
- Without the program, would have installed the solar project without a rebate from the offering
- Without the program, would have reduced the size or scope of the solar project

The first and second outcomes (not installed the solar project or postponed installation) indicate zero free ridership and thus results in an intention score of 0.00. The other outcomes require follow-up questions and are scored according to the Downstream algorithm that Figure E-1 shows.

In PY14, Guidehouse received approval from the SWE to remove the Don't Know (DK) option from the intention question battery for all PECO NTG research. This change aligned with other portfolios Guidehouse evaluates across the country. The nature of the counterfactual question is rooted in the unknown (i.e., asking about a situation that did not occur) and the DK option allows survey participants a chance to avoid considering an answer. Removing the DK option requires participants to think about their intentions for conducting their energy efficiency upgrades.

Scoring of Intention Assessment in Residential Programs

Table E-3 summarizes the possible response combinations to the questions described above and the intention score assigned to each unique combination.

Table E-3. Intention Scoring for Rebates and Marketplace - Downstream

Measure		Response	Intention Score
Solar	FR1. Please select the option below that best describes what you would have done if you had not participated in the PECO Residential Solar Rebates offering in the last year.	Without the program, would not have installed the solar project	0.00
		Without the program, would have postponed the installation of the solar project	0.00
		Without the program, would have installed the solar project without a rebate from the offering	See FR4
		Without the program, would have reduced the size or scope of the solar project	See FR3
	FR3. How much would you have reduced the size or scope of the project?	Small amount (1% - 33%)	0.375
		Moderate amount (34% - 66%)	0.25
		Large amount (67% - 99%)	0.125
		Don't know	0.25
	FR4. Does this mean you would have paid the entire cost of the solar installation without the PECO rebate?	Yes	0.50
		Don't know	0.375
		No	0.25

Source: Guidehouse analysis

Influence

Program influence may be assessed by asking the respondent how much influence—from 0 (not at all influential) to 10 (extremely influential)—various program elements had on the decision to do the project the way it was done.

The number of elements included will vary depending on program design, with staff interviews typically informing the list. The more typical elements programs use to influence customer decision making include information; incentives or rebates; interaction with program staff (technical assistance); interaction with program proxies, such as members of a trade ally network; building audits or assessments; and financing.

The program's influence score is equal to the maximum influence rating for any program element rather than, for example, the mean influence rating. The rationale is that if any given program element had a great influence on the respondent's decision, the program itself had a great influence, even if other elements had less influence.

Table E-4. Influence Ratings for Rebates and Marketplace - Downstream

Measure	Influence Element	Not at all Influential					Extremely Influential	Don't know
Solar	PECO marketing material promoting solar projects	0	1-2	3-4	5-6	7-8	9-10	NA
	PECO's rebate for the solar project	0	1-2	3-4	5-6	7-8	9-10	NA

Source: SWE Framework

High program influence and free ridership have an inverse relationship—the greater the program influence, the lower the free ridership, as Table E-5 shows.

Table E-5. Influence Scoring for Rebates and Marketplace - Downstream

Program Influence Rating	Influence Score
0 – not at all influential	0.50
1-2	0.44
3-4	0.38
5-6	0.25
7-8	0.13
9-10 – extremely influential	0.00
Don't know	0.25

Note: Guidehouse received approval from the SWE to shift from a 1-5 scale in Phase III to a 0-10 scale in Phase IV to align with the process evaluation best practices.

Source: SWE Framework

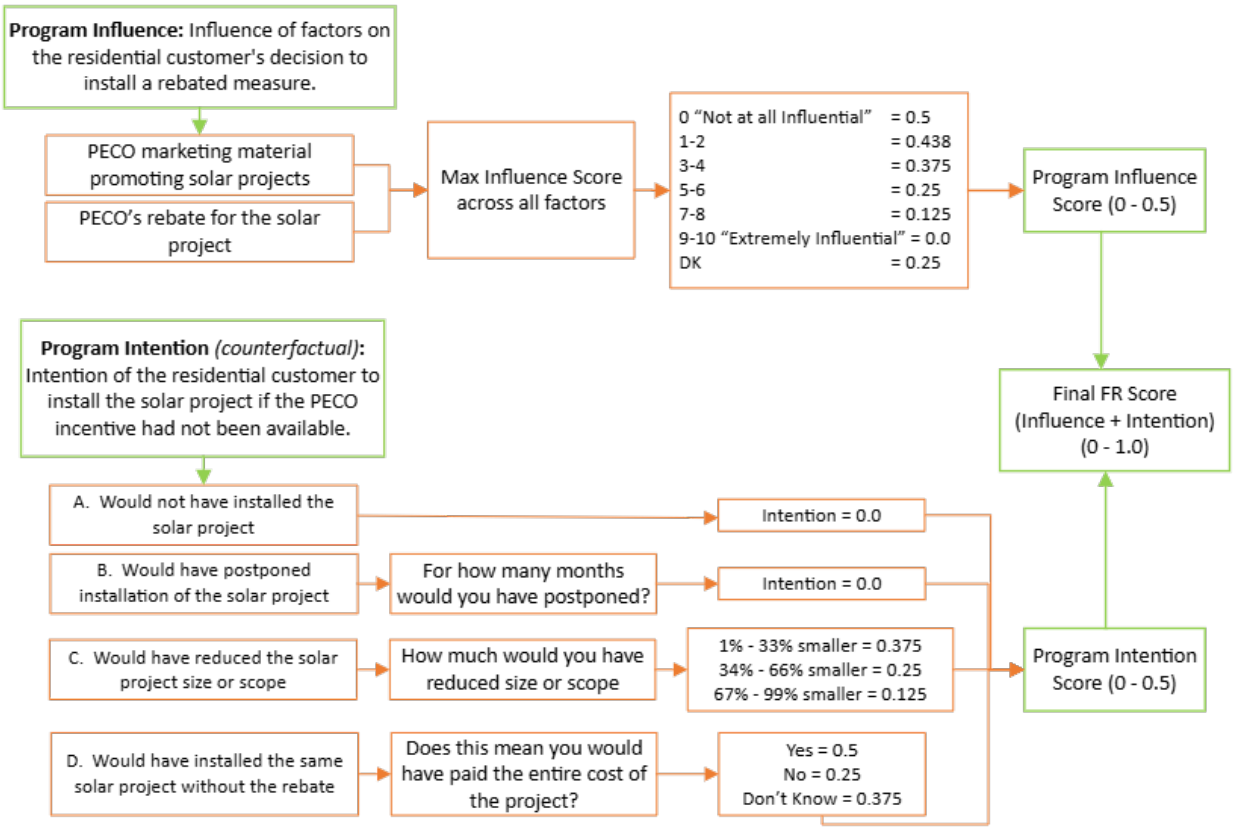
Total Free Ridership Score

Total free ridership is the sum of the intention and influence components, resulting in a score ranging from 0.00 to 1.00.

Free Ridership Algorithm

The following diagrams detail the algorithms used to estimate free ridership using self-reported survey responses for the Downstream delivery pathway.

Figure E-1. Free Ridership Algorithm – Downstream Pathway Solar Measure



Source: Guidehouse analysis

Point of Purchase Delivery Pathway Spray Foam Measure

Intention

Intention is assessed through a few brief questions used to determine how the upgrade or equipment replacement likely would have differed if the respondent had not received the program assistance. The initial question asks the respondent to identify from a limited set of options that best describe what most likely would have occurred without the program.

The response options gathering feedback on intention in the PY16 Rebates and Marketplace component, Point of Purchase delivery pathway for spray foam purchases included:

- Without the program, would not have bought the spray foam at all
- Without the program, would have bought fewer cans of spray foam
- Without the program, would have bought the same number of cans at the exact same time
- Without the program, would have bought a different brand of spray foam without the discount

The first outcome (not purchased the canned spray foam) indicates zero free ridership and thus results in an intention score of 0.00. The last two outcomes (would have bought the same

number of cans at the exact same time and would have bought a different brand of spray foam without the discount) indicates total free ridership, or an intention score of 0.50. The other options indicate partial free ridership and are scored according to the Point of Purchase algorithm as Figure E-2 shows.

In PY14, Guidehouse received approval from the SWE to remove the DK option from the intention question battery for all PECO NTG research. This change aligned with other portfolios Guidehouse evaluates across the country. The nature of the counterfactual question is rooted in the unknown (i.e., asking about a situation that did not occur) and the DK option allows survey participants a chance to avoid considering an answer. Removing the DK option requires participants to think about their intentions for conducting their energy efficiency upgrades.

Scoring of Intention Assessment in Residential Programs

Table E-6 summarizes the possible response combinations to the questions described above and the intention score assigned to each unique combination.

Table E-6. Intention Scoring for Rebates and Marketplace - Point of Purchase

Measure		Response	Intention Score
Spray Foam	FR7. Which of the following statements most closely describes what you would have done if the PECO instant discount was not offered for the canned spray foam:	Without the program, would not have bought the spray foam at all	0.00
		Without the program, would have bought fewer cans of spray foam	0.25
		Without the program, would have bought the same number of cans at the exact same time	0.50
		Without the program, would have bought a different brand of spray foam without the discount	0.50

Source: Guidehouse analysis

Influence

Program influence may be assessed by asking the respondent how much influence—from 0 (not at all influential) to 10 (extremely influential)—various program elements had on the decision to do the project the way it was done.

The number of elements included will vary depending on program design, with staff interviews typically informing the list. The more typical elements programs use to influence customer decision making include information; incentives or rebates; interaction with program staff (technical assistance); interaction with program proxies, such as members of a trade ally network; building audits or assessments; and financing.

The program's influence score is equal to the maximum influence rating for any program element rather than, for example, the mean influence rating. The rationale is that if any given program element had a great influence on the respondent's decision, the program itself had a great influence, even if other elements had less influence.

Table E-7. Influence Ratings for Rebates and Marketplace - Point of Purchase

Measure	Influence Element	Not at all Influential					Extremely Influential	Don't know
Spray Foam	The instant discount offered by PECO	0	1-2	3-4	5-6	7-8	9-10	NA
	PECO marketing email or bill insert	0	1-2	3-4	5-6	7-8	9-10	NA
	PECO advertising (online or television)	0	1-2	3-4	5-6	7-8	9-10	NA
	Retail salesperson recommendation	0	1-2	3-4	5-6	7-8	9-10	NA
	Retail store sign or other in-store marketing material	0	1-2	3-4	5-6	7-8	9-10	NA

Source: SWE Framework

High program influence and free ridership have an inverse relationship—the greater the program influence, the lower the free ridership, as Table E-8 shows.

Table E-8. Influence Scoring for Rebates and Marketplace - Point of Purchase

Program Influence Rating	Influence Score
0 – not at all influential	0.50
1-2	0.44
3-4	0.38
5-6	0.25
7-8	0.13
9-10 – extremely influential	0.00
Don't know	0.25

Note: Guidehouse received approval from the SWE to shift from a 1-5 scale in Phase III to a 0-10 scale in Phase IV to align with the process evaluation best practices.

Source: SWE Framework

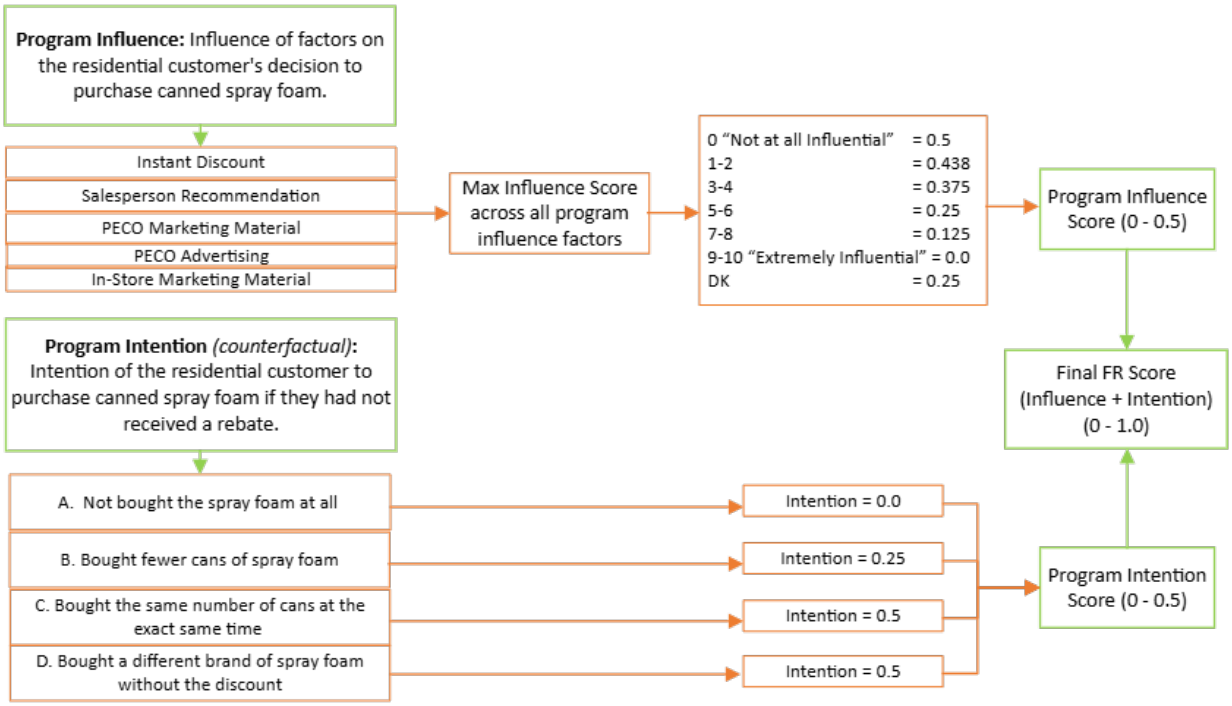
Total Free Ridership Score

Total free ridership is the sum of the intention and influence components, resulting in a score ranging from 0 to 1.00.

Free Ridership Algorithm

Figure E-2 details the algorithms used to estimate free ridership using self-reported survey responses for the Point of Purchase delivery pathway.

Figure E-2. Free Ridership Algorithm – Point of Purchase Pathway Spray Foam Measure



Source: Guidehouse analysis

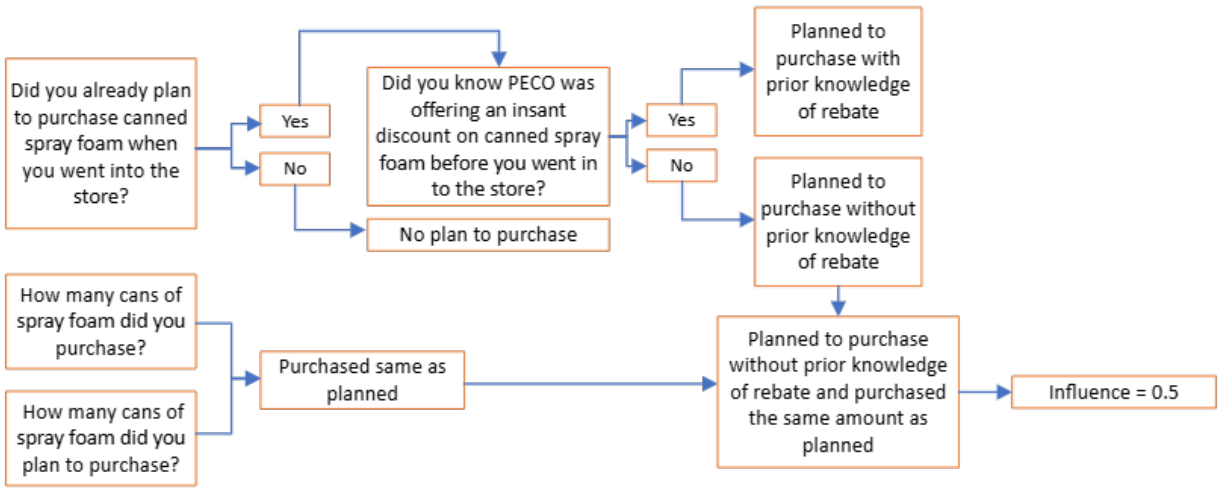
Free Ridership Consistency Check

Guidehouse also added consistency checks to confirm that the reported intention did not conflict with additional information that the respondent provided. Consistency check questions included:

- Were you aware you received an instant discount from PECO for the canned spray foam you purchased?
- Did you already plan to purchase canned spray foam when you went into the store?
- Did you know PECO was offering an instant discount on canned spray foam before you went into the store?
- How many cans of spray foam did you plan to purchase when you went into the store? How many cans of spray foam did you purchase?
    - If respondent purchased additional cans, why did you decide to purchase the additional cans of spray foam?

Consistency check questions informed the overall influence score using the algorithm outlined in Figure E-3. Based on this algorithm, if the respondent reported that they planned to purchase the canned spray foam without prior knowledge of the rebate and purchased the same amount of cans as planned, their influence score was overridden and reported as a 0.5. Otherwise, influence scores were based on the algorithm outlined in Figure E-2.

Figure E-3. Consistency Checks for Rebates and Marketplace Point of Purchase Pathway Spray Foam Measure



Source: Guidehouse analysis

Point of Purchase Delivery Pathway Upstream Channel

Guidehouse followed the SWE's Phase IV Evaluation Framework for Upstream programs by asking retail store managers in the Point of Purchase pathway about the impacts of the program on stocking and selling practices of qualifying energy efficient equipment. NTG questions covered the influence of the program on upselling, marketing, and promoting qualifying equipment. The questions also asked about the counterfactual scenario or what sales of qualifying equipment might have been in the absence of the program. Guidehouse interviewed two retail store managers, which did not provide statistically significant results and are therefore excluded from final results.

Intention

Guidance from both the Evaluation Framework and the Illinois Technical Reference Manual (IL TRM) recommends using the combination of two metrics to estimate free ridership: 1) the Intention of the customer to purchase the same energy efficient equipment in absence of the program (also known as the Counterfactual); and 2) the Influence the program had on the decision to purchase the energy efficient equipment.

For retailers and other Trade Allies, the question is less about purchasing energy efficient equipment and more about stocking and selling practices undertaken by the retail store based on their participation in the PECO program. For example, Guidehouse determined the intention of retailers to stock program-eligible equipment if the program did not exist, as well as the influence the program had on these stocking practices.

Guidehouse estimated the intention score by first establishing a baseline of what stocking and upselling practices were in place for program-qualifying equipment, prior to participating in PECO's program. Guidehouse then asked how these practices changed after participating in the program, as well as what may not have changed if the program did not exist.

For each of the energy efficient technologies (including room air conditioners, air purifiers, canned spray foam, dehumidifiers, and advanced power strips) offered through the PECO program, Guidehouse asked the following questions to establish retailer intention.

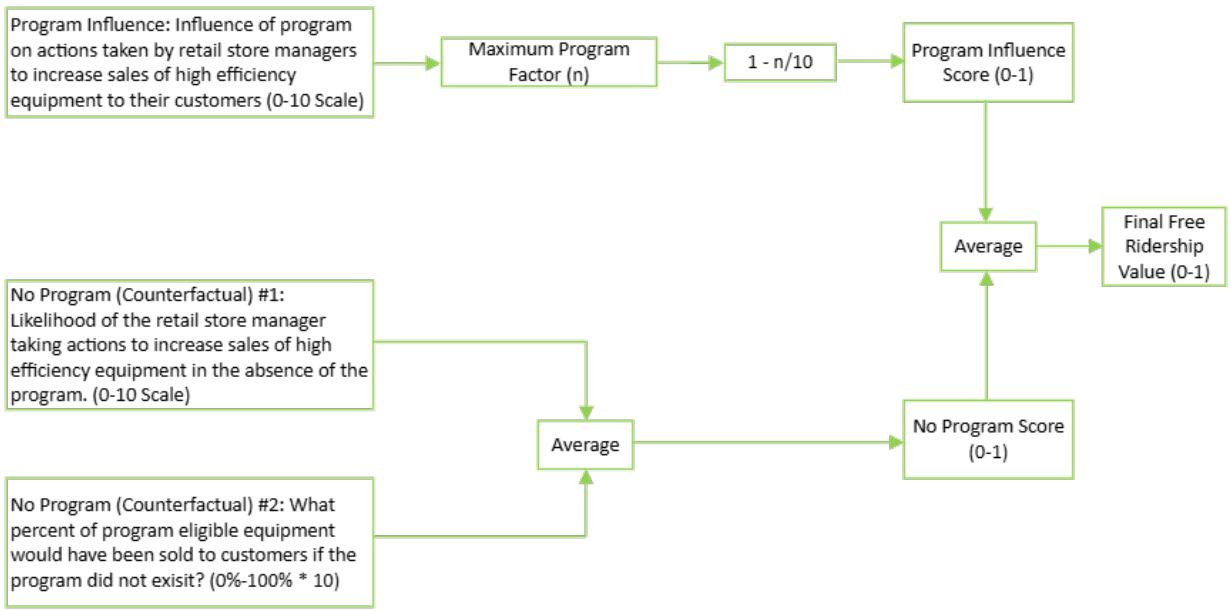
- Did you stock and sell this equipment prior to your participation in the program?
  - [If Not] Did you begin stocking and selling this equipment because of your participation in the program?
- Since participating in the program, have sales of this equipment increased or decreased and by what approximate percentage?
- In your opinion, how would sales have changed (increased or decreased) if the program had not been available?
- Since participating in the program, has your establishment:
- Increased stocking of program-qualifying equipment?
- Increased upselling of program-qualifying equipment?
- Increased marketing of program-qualifying equipment?
- Discussed the benefits of purchasing program-qualifying equipment?

Guidehouse scored the responses to these questions using the algorithm in Figure E-2.

Free Ridership Algorithm

Guidehouse created the following algorithm flowchart based on the SWE's Evaluation Framework and the IL TRM. Figure E-4 defines the algorithm for estimating free ridership using retailer feedback.

Figure E-4. Retailer Free Ridership Algorithm



Source: Guidehouse analysis

E.1.2.2 Estimating Participant Spillover

The participant spillover battery of questions assesses, for each participant, the number and description of non-incentivized energy-efficient equipment installed since program participation, and the program's influence on the participant's decision to install those technologies. This section summarizes the spillover approach for the Residential Rebates and Marketplace component in PY16.

Assessment of Program Influence on Residential Measures

The participant surveys asked respondents about the level of influence the Rebates and Marketplace component had on their decision to install the additional equipment. Guidehouse only asked the influence question once to cover all the additional energy efficient equipment installed, and assigned a value that determines what proportion of the measure's savings are attributed to the program:

- A rating of 8, 9, or 10 = 1.0 (full savings attributed to the program)
- A rating of 3, 4, 5, 6, or 7 = 0.5 (half of the savings attributed to the program)
- A rating of 0, 1, or 2 = 0 (no savings attributed to the program)

Solar survey respondents reported installing efficient windows, heating or cooling equipment, insulation, and sealing air leaks in doors, none of which received a program rebate. Spray foam respondents did not report any spillover activities influenced by the program.

Assessment of Energy Savings for Residential Spillover

Where applicable, the savings for each additional measure installed were calculated per the TRM for a rebated measure installed through the program. For partially deemed measures, the SWE and Guidehouse developed conservative working assumptions for any required inputs (e.g., square footage of home, R-value improvement, replaced wattage) or identified average verified savings for such measures.

Guidehouse first calculated spillover savings for each spillover measure reported as the product of the measure savings, number of units, and influence score:

$$\text{Measure SO} = \text{Measure Savings} * \text{Number of Units} * \text{Program Influence}$$

For each of the above categories, Guidehouse completed the following tasks:

- Totaled the savings associated with each program participant, to give the overall participant spillover savings.

$$\text{Participant SO} = \Sigma \text{ Measure SO}$$

- Multiplied the mean participant spillover savings for the participant sample by the total number of participants to yield an estimated total participant spillover savings for the program.

$$\Sigma \text{ Participant SO (population)} = ((\sum\ 〖\text{Participant SO (sample)}〗) / (\text{Sample n})) \times \text{Population N}$$

- Divided that total savings by the total program savings to yield a participant spillover percentage:

  % Participant SO = ((∑▒〖Participant SO (population)〗) / (Program Savings)) x 100

E.1.2.3 Estimating the NTGR

Guidehouse estimated the final NTGR score using Equation E-1.

Equation E-1. NTG Equation

$$NTG = 1 - Free\ Ridership + Spillover + Market\ Effects$$

Where:

$Free\ Ridership$	The estimated savings that would have occurred even if the program did not exist
$Spillover$	The estimated savings occurring outside of the program but directly influenced by the program
$Market\ Effects$	The estimated savings occurring in the Residential market due to general knowledge and education around energy efficiency, not to be double counted with spillover (not applicable in PY16)

E.1.3 Process Evaluation

Residential EE Program process evaluation activities and findings are discussed in Section 3.1.5. This section describes additional insights from process evaluation activities conducted for the Rebates and Marketplace component specifically. Guidehouse fielded separate surveys and interviews for the Downstream and Point of Purchase delivery pathways due to the size of the component and difference in program delivery methods.

Rebates and Marketplace Downstream Pathway Solar Measure

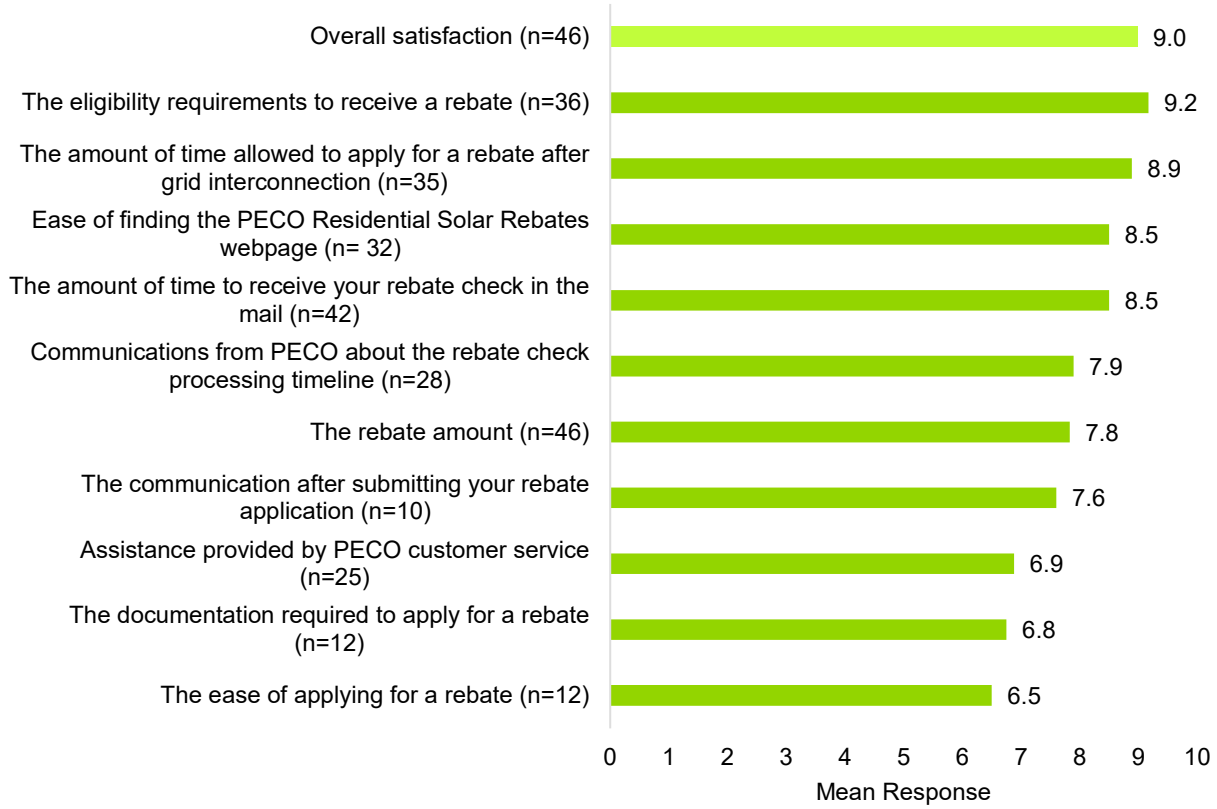
Guidehouse contacted 121 customers who received a rebate through the Downstream pathway solar measure (referred to throughout this section as “Solar”) to conduct the process evaluation. Forty-six Solar participants replied to the survey resulting in a 38% response rate.

Guidehouse removed “don’t know” responses from analysis for most questions. Therefore, n values may vary between questions.

Respondents reported satisfaction levels for Solar overall, using a scale of 0 to 10 with 0 representing “extremely dissatisfied” and 10 representing “extremely satisfied.” The mean satisfaction for Solar overall is 9.0 out of 10 (n=46).

Respondents also provided satisfaction scores for aspects of their participant experience. Solar respondents provided the highest satisfaction scores for the eligibility requirements to receive a rebate (9.2 out of 10; n=36) and the amount of time allowed to apply for a rebate after grid interconnection (8.9 out of 10; n=42), as Figure E-5 shows.

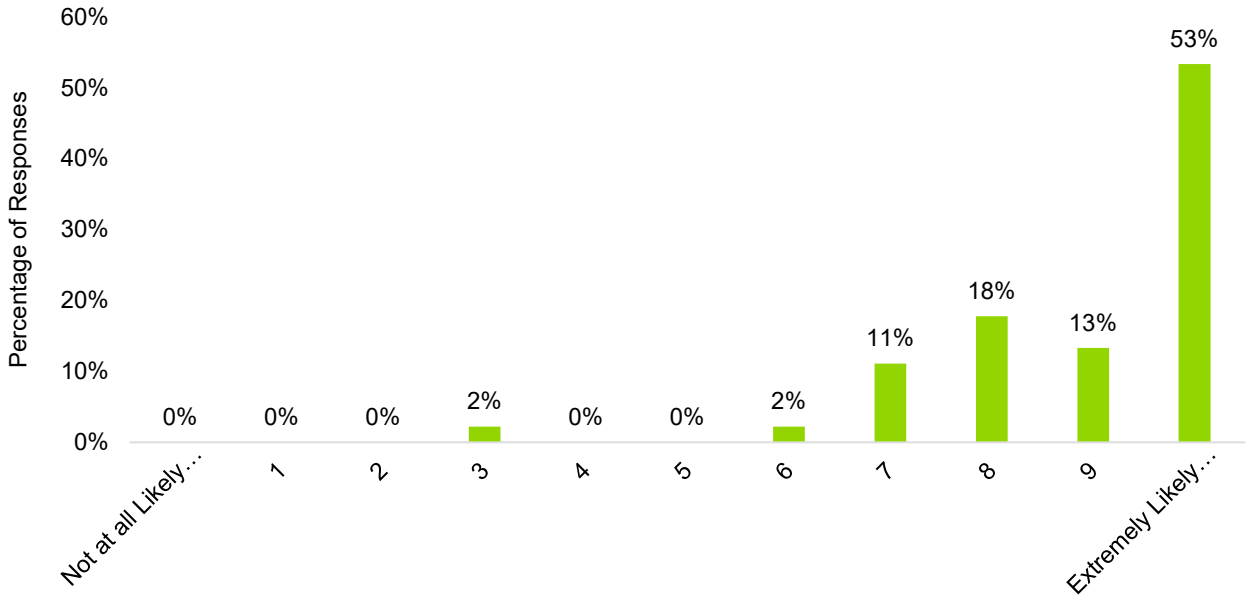
Figure E-5. Solar Satisfaction



Respondents received the following questions: “How would you rate your satisfaction with the PECO Residential Solar Rebates offering overall?” and “How would you rate your satisfaction with the following aspects of the PECO Residential Solar Rebates offering?”
Note: The pathway is referred to as “PECO Residential Solar Rebates offering” as this is a more familiar name for customers.
Source: Guidehouse analysis

As Figure E-6 shows, over half of respondents rated their likelihood to recommend Solar to others as 10 out of 10. Respondents were asked to use a scale of 0 to 10 where 0 is “not at all likely” and 10 is “extremely likely.”

Figure E-6. Likelihood of Recommending Solar (n=45)

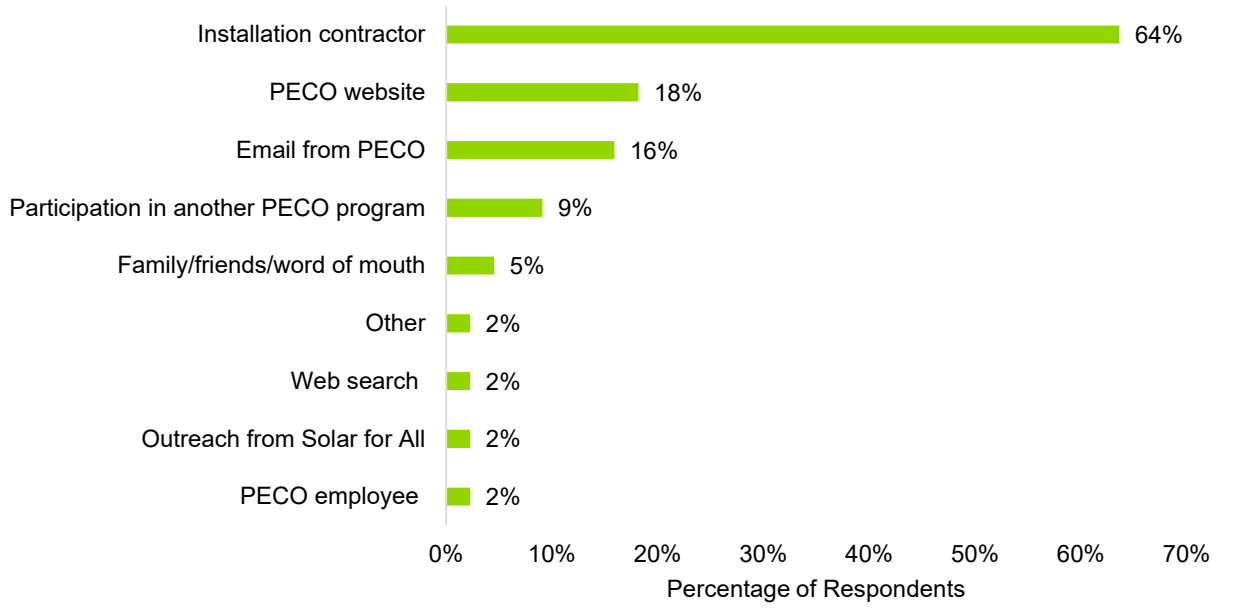


Respondents received the following question: "How likely are you to recommend the PECO Residential Solar Rebates offering to others?"

Source: Guidehouse analysis

Rebate respondents were asked how they learned about Solar, most frequently reporting learning through their installation contractor (64%) (Figure E-7).

Figure E-7. Awareness of Solar (n=46)

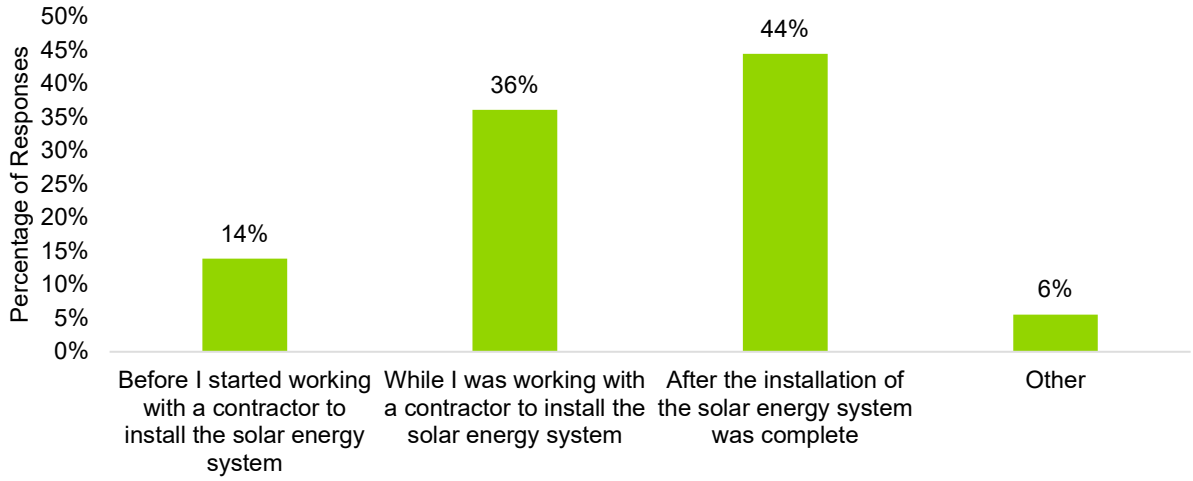


Respondents received the following question: "How did you learn about the PECO Residential Solar Rebates offering? Select all that apply."

Source: Guidehouse analysis

Nearly half of respondents (44%) first heard about the PECO solar offering after the installation of the solar energy system was complete, as Figure E-8 shows. About a third (36%) heard about it while working with a contractor to install the solar energy system. Only 14% first heard about it before they started working with a contractor to install the solar energy system (n=36). As mentioned in 3.1.5, through staff interviews, Guidehouse learned that PECO's outreach strategy is evolving given that this is a new offering. PECO expects to be generating awareness earlier in the decision-making process moving forward.

Figure E-8. Timing of Awareness of Solar (n=36)



Respondents received the following question: “At what point in the process of adding a solar system to your home did you first hear about the PECO Residential Solar Rebates offering?”

Source: Guidehouse analysis

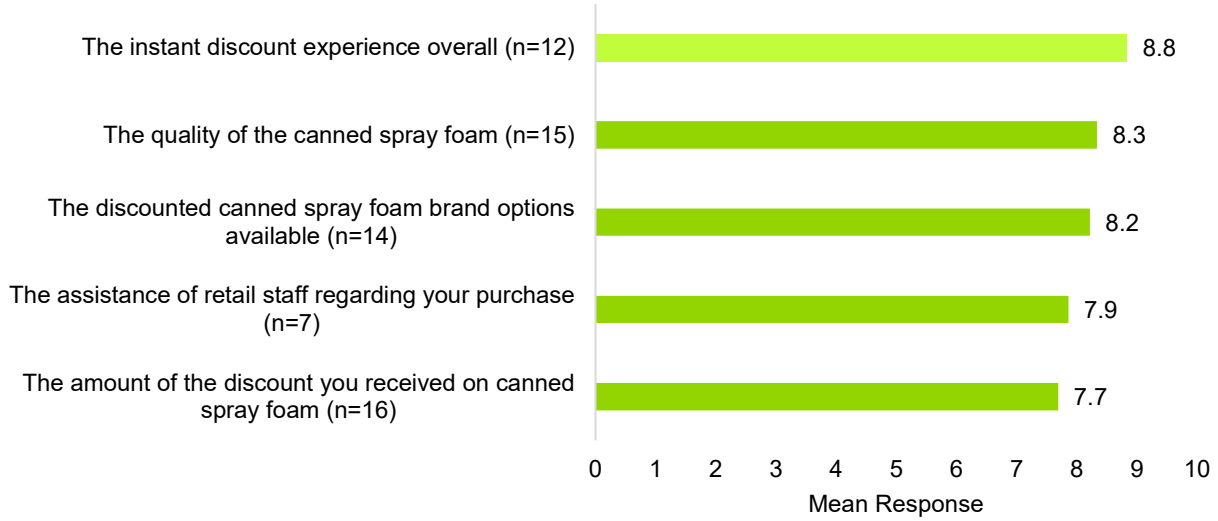
Rebates and Marketplace Point of Purchase Pathway Spray Foam Measure

Guidehouse contacted 110 customers who purchased canned spray foam through the Point of Purchase pathway (referred to throughout this section as Spray Foam) to conduct the process evaluation. Seventeen Spray Foam customers replied to the survey resulting in a 15% response rate. Guidehouse removed “don’t know” responses from analysis for most questions. Therefore, n values may vary between questions.

Respondents reported satisfaction levels for Spray Foam overall, using a scale of 0 to 10 with 0 representing “extremely dissatisfied” and 10 representing “extremely satisfied.” The mean satisfaction for Spray Foam overall is 8.8 out of 10 (n=12).

Respondents also provided satisfaction scores for aspects of their participant experience. Respondents provided the highest satisfaction scores for the quality of the canned spray foam (8.3 out of 10; n=15) and the discounted canned spray foam brand options available (8.2 out of 10; n=14), as Figure E-9 shows.

Figure E-9. Spray Foam Satisfaction

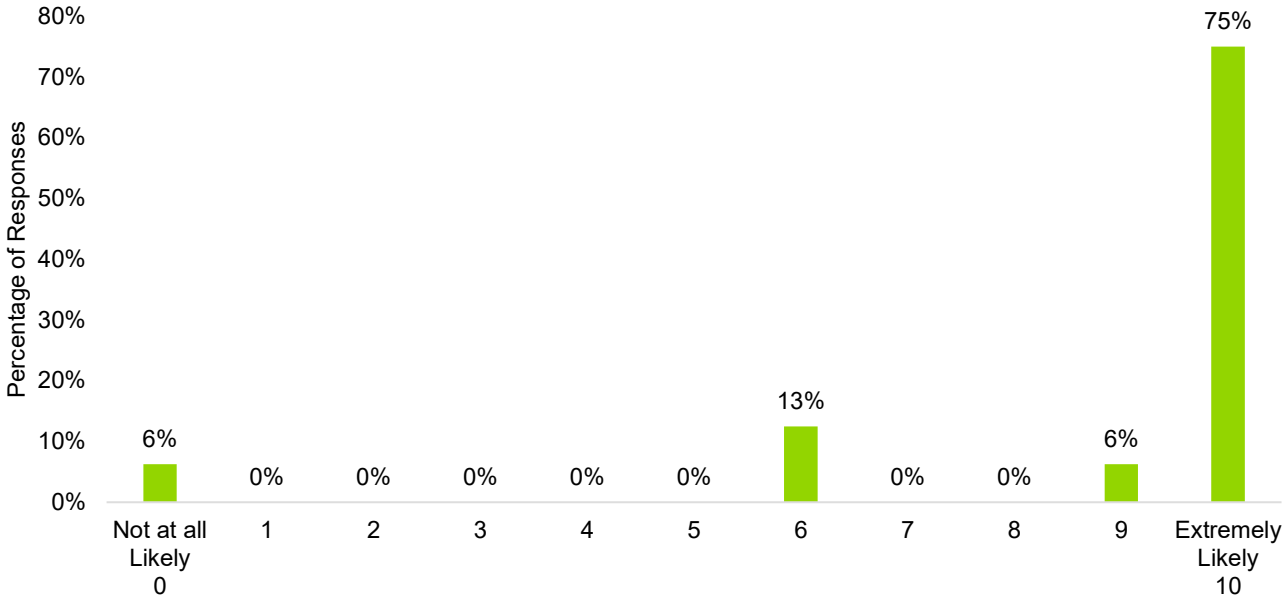


Respondents received the following question: "How would you rate your satisfaction with the following aspects of your purchase of canned spray foam?"

Source: Guidehouse analysis

As Figure E-10 shows, over half of respondents rated their likelihood to Spray Foam to others as 10 out of 10. Respondents were asked to use a scale of 0 to 10 where 0 is "not at all likely" and 10 is "extremely likely."

Figure E-10. Likelihood of Recommending Spray Foam (n=16)

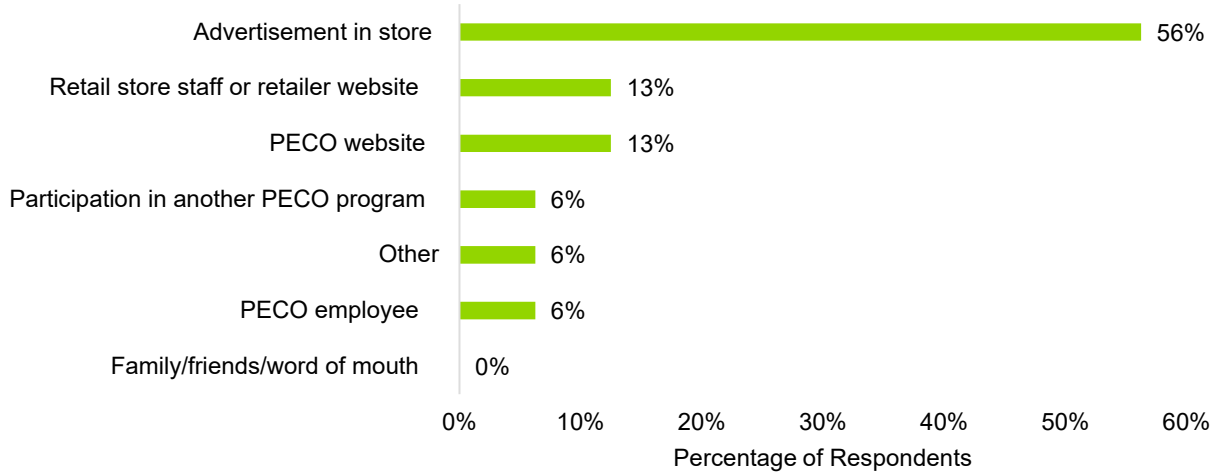


Respondents received the following question: "How likely are you to recommend the PECO-provided instant discount on canned spray foam to others?"

Source: Guidehouse analysis

Spray Foam respondents were asked how they learned about the pathway. Respondents most frequently reported learning about the pathway through advertisement in the retail store in which they made their purchase (56%) (Figure E-11).

Figure E-11. Awareness of Spray Foam (n=16)



Respondents received the following question: "How did you learn about the PECO-provided instant discount on canned spray foam? Select all that apply."

Source: Guidehouse analysis

Rebates and Marketplace Point of Purchase Pathway Upstream Channel

Guidehouse contacted 34 retail store managers who participated in the Point of Purchase pathway Upstream channel (referred to throughout this section as "Upstream") to conduct the process evaluation for this program. Two retail store managers responded to the Upstream interview resulting in a 6% response rate. Guidehouse removed "don't know" responses from analysis for most questions. Therefore, n values may vary between questions.

Upstream respondents reported overall satisfaction levels using a scale of 0 to 10 with 0 representing "extremely dissatisfied" and 10 representing "extremely satisfied." The mean satisfaction for Upstream overall is 4.5 out of 10 (n=2).

Respondents also provided satisfaction scores for aspects of their participant experience. Respondents provided the highest satisfaction scores (10 out of 10) for the ease of program participation (n=2), communications with PECO staff (n=1), the quality of the discounted products (n=2), and the selection of products that qualify for the discounts (n=2), as Figure E-12 shows.

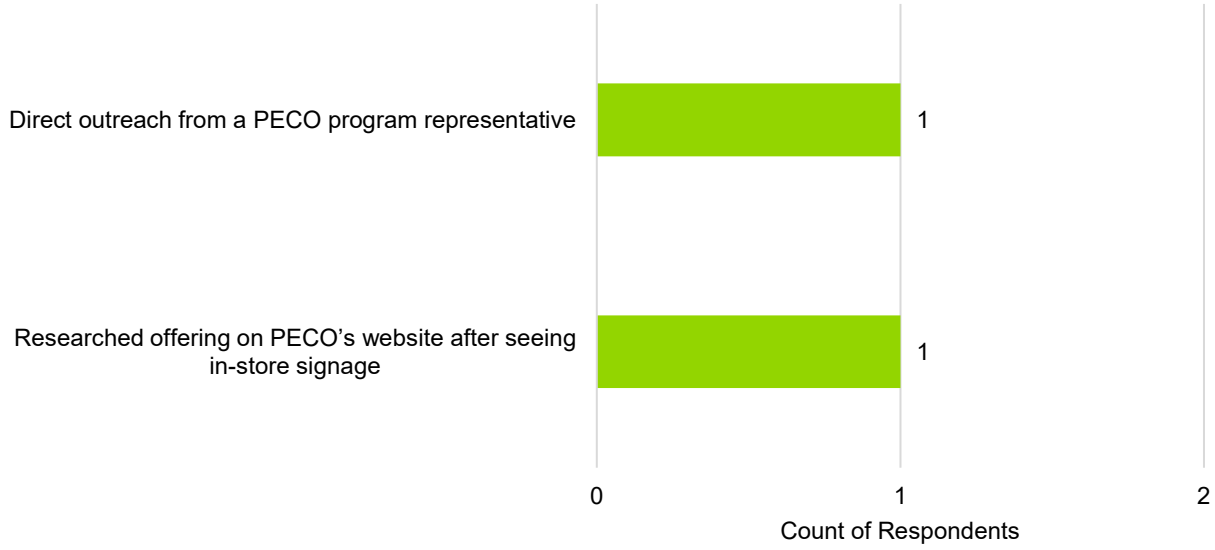
Figure E-12. Upstream Satisfaction

Respondents received the following question: "How would you rate your satisfaction with the following aspects of the program?"

Source: Guidehouse analysis

Upstream respondents were asked how they learned about the pathway. Respondents reported learning about the pathway through direct outreach from a PECO program representative or from conducting research after seeing in-store signage for the discount (Figure E-13).

Figure E-13. Awareness of Upstream (n=2)



Respondents received the following question: "How did you learn about the PECO-provided instant discount on canned spray foam? Select all that apply."

The response "Researched when stickers went up went on PECO's page" was initially submitted as an "Other" response.

Response options that were not selected by respondents are excluded from this graph.

Source: Guidehouse analysis

E.2 Appliance Recycling (Market-Rate and IE)

The Appliance Recycling component focuses on recycling refrigerators, freezers, and window air conditioning units responsibly. The component serves both market-rate and IE customers. According to the Phase IV EE&C Plan,[66] this component is planned to account for 16% of Residential EE Program energy savings, 16% of Residential EE Program demand savings, 13% of Income-Eligible EE Program energy savings, 14% of Income-Eligible EE Program demand savings, 3% of total portfolio energy savings, and 3% of total portfolio demand savings. ARCA implemented the Appliance Recycling component at the beginning of Phase IV but has since gone out of business. The program has switched partners and now works with eForce. eForce holds local drop-off events and PECO incentivizes customers to recycle their smaller window air conditioning units and dehumidifiers by paying for their drop-off fee.

E.2.1 Gross Impact Evaluation

E.2.1.1 Methodology

Guidehouse conducted a tracking database analysis. The tracking database analysis was conducted for all measures outlined in the PA TRM and latest IMPs using a combination of TRM

[66] PECO, *PECO Program Years 13 to 17 Act 129 – Phase IV Energy Efficiency and Conservation Plan*, filed June 19, 2024, https://www.puc.pa.gov/pcdocs/1834379.pdf.

default values and EDC-provided data. The tracking data analysis found no notable findings, with all TDR near 1.00.

E.2.2 Net Impact Evaluation

As described in the Phase IV Evaluation Plan[67] approved by the SWE, Guidehouse did not conduct NTG research for this component in PY16.

E.2.3 Process Evaluation

As described in the Phase IV Evaluation Plan[68] approved by the SWE, Guidehouse did not conduct in-depth process activities for this component in PY16. Instead, Guidehouse interviewed the PECO program managers and CSP staff to understand the goals of the program, identify significant implementation changes, and identify areas of strength and areas of improvement. Guidehouse will use findings from these interviews to inform evaluation research in future years.

E.3 In-Home Assessment (Market-Rate)

The In-Home Assessment component provides in-home or virtual assessments and comprehensive audits to educate customers; install energy efficient measures; identify additional, potentially larger, energy efficiency opportunities (such as insulation and air sealing); and encourage greater participation in other Residential EE Program components. There are two program pathways: direct install (DI) and rebated measures (REB). According to the Phase IV EE&C Plan,[69] this component is planned to account for 13% of Residential EE Program energy savings, 9% of Residential EE Program demand savings, 2% of total portfolio energy savings, and 1% of portfolio demand savings. CLEAResult implements the In-Home Assessment component.

E.3.1 Gross Impact Evaluation

E.3.1.1 Methodology

Guidehouse conducted three activities to verify savings for this component: a tracking database analysis, engineering desk reviews, and online surveys of sampled program participants. The tracking database analysis was conducted for all measures outlined in the PA TRM and latest IMPs using a combination of TRM default values and EDC-provided data.

Table E-9 illustrates the factors that led to variation between the reported and adjusted database savings and impacted the observed realization rates reported in Section 3.1.2.

[67] Guidehouse, Phase IV Evaluation Plan, Energy Efficiency and Conservation Portfolio, revised November 18, 2024.
[68] Guidehouse, Phase IV Evaluation Plan, Energy Efficiency and Conservation Portfolio, revised November 18, 2024.
[69] PECO, *PECO Program Years 13 to 17 Act 129 – Phase IV Energy Efficiency and Conservation Plan*, filed June 19, 2024, https://www.puc.pa.gov/pcdocs/1834379.pdf.

Table E-9. Detailed Findings for In-Home Assessment

Measure	Percentage of Residential Energy Savings[1]	Tracking Database Energy Ratio	Tracking Database Demand Ratio	Reason for Adjustment
Ceiling/Attic, Wall, Floor and Rim Joist Insulation	0.4%	1.11	1.11	Unable to recreate reported savings from the information provided.

[1] Percentage of Residential Savings is the percentage of total Residential Program energy savings that each of these measures represent.

Source: Guidehouse analysis

E.3.1.2 Sampling

Guidehouse conducted an online survey of sampled recipients in PY16, as described in Section 3.1.2. The surveys included specific questions the customer could answer based on common knowledge of the measures they received. The survey responses showed the frequency of measures being installed, heating and cooling types, and other measure-specific parameters that may affect savings. Savings were recalculated based on customer survey responses. Findings from the survey are detailed in Section 3.1.2. These results were combined with the results of the tracking database analysis to determine final verified gross savings.

As Table E-10 presents, Guidehouse stratified based on project size, as described in the Sample Design Memo.[70] Overall, Guidehouse exceeded the sample response rate as a result of higher than expected survey participation across all strata.

Table E-10. In-Home Assessment Sample Project Count

Stratum	Target Count	Achieved Count
Kits	30	9
High impact	14	29
Medium impact	20	48
Low impact	20	17
Total Sampled Projects[1]	**84**	**103**

Source: Guidehouse analysis

E.3.2 Net Impact Evaluation

As described in the Phase IV Evaluation Plan[71] approved by the SWE, Guidehouse did not conduct NTG research for this component in PY16.

E.3.3 Process Evaluation

Guidehouse did not conduct an in-depth process evaluation for this component in PY16. Instead, Guidehouse interviewed the PECO program managers and CSP staff to understand the goals of the program, identify significant implementation changes, and identify areas of

[70] PECO, PY16 Residential and IE Impact Sample Design Memo FINAL, dated March 31, 2025.

[71] Guidehouse, Phase IV Evaluation Plan, Energy Efficiency and Conservation Portfolio, revised November 18, 2024.

strength and areas of improvement. Guidehouse will use findings from these interviews to inform evaluation research in future years.

E.4 New Construction (Market-Rate)

The Residential New Construction component supports the construction of more comfortable, durable, and energy efficient homes compared with those simply built to code. This component works with Home Energy Rating System (HERS) raters and builders to create more energy efficient homes during the design and construction phases. According to the Phase IV EE&C Plan,[72] this component is planned to account for 6% of Residential EE Program energy savings, 22% of Residential EE Program demand savings, 1% of total portfolio energy savings, and 3% of total portfolio demand savings. PSD implements the New Construction component.

E.4.1 Gross Impact Evaluation

E.4.1.1 Methodology

In PY16, Guidehouse conducted a tracking database analysis for all measures outlined in the PA TRM and latest IMPs using a combination of TRM default values and EDC-provided data.

As part of the tracking database analysis, Guidehouse verified algorithms used to estimate reported gross savings at the measure level and recalculated gross energy and demand savings estimates to confirm whether the tracking database was accurate as reported. Guidehouse used a programmatic approach in this step based solely on inputs provided in the tracking database and the relevant TRM and IMP sections. Non-TRM measures were passed through this process with no adjustment and adjusted savings for these measures equaled the reported savings.

Guidehouse did not conduct additional component-specific impact verification activities in PY16 and instead applied the energy and demand verification ratios based on evaluation activities in PY15 to the result of the tracking database analysis to arrive at final PY16 gross impact results.

E.4.2 Net Impact Evaluation

As described in the Phase IV Evaluation Plan[73] approved by the SWE, Guidehouse did not conduct NTG research for this component in PY16.

E.4.4 Process Evaluation

As described in the Phase IV Evaluation Plan[74] approved by the SWE, Guidehouse did not conduct in-depth process activities for this component in PY16. Instead, Guidehouse interviewed the PECO program managers and CSP staff to understand the goals of the program, identify significant implementation changes, and identify areas of strength and areas

[72] PECO, *PECO Program Years 13 to 17 Act 129 – Phase IV Energy Efficiency and Conservation Plan*, filed June 19, 2024, https://www.puc.pa.gov/pcdocs/1834379.pdf.
[73] Guidehouse, Phase IV Evaluation Plan, Energy Efficiency and Conservation Portfolio, revised November 18, 2024.
[74] Guidehouse, Phase IV Evaluation Plan, Energy Efficiency and Conservation Portfolio, revised November 18, 2024.

of improvement. Guidehouse will use findings from these interviews to inform evaluation research in future years.

E.5 Multifamily (Market-Rate and IE)

The Multifamily component provides analysis, direct install measures, and larger, investment-level upgrades to improve the energy efficiency of multifamily buildings, both in units and common areas. The component serves buildings with market-rate customers, IE customers, and a mix of residential and commercial customer types. According to the Phase IV EE&C Plan,[75] this component is planned to account for 11% of Residential EE Program energy savings, 9% of Residential EE Program demand savings, 21% of Income-Eligible EE Program energy savings, 16% of Income-Eligible EE Program demand savings, 3% of total portfolio energy savings, and 2% of total portfolio demand savings. CMC implements the Multifamily component for both the residential and IE customers.

E.5.1 Gross Impact Evaluation

E.5.1.1 Methodology

In PY16, Guidehouse conducted a tracking database analysis for all measures outlined in the PA TRM and latest IMPs using a combination of TRM default values and EDC-provided data.

As part of the tracking database analysis, Guidehouse verified algorithms used to estimate reported gross savings at the measure level and recalculated gross energy and demand savings estimates to confirm whether the tracking database was accurate as reported. Guidehouse used a programmatic approach in this step based solely on inputs provided in the tracking database and the relevant TRM and IMP sections. Non-TRM measures were passed through this process with no adjustment and adjusted savings for these measures equaled the reported savings.

Table E-11. Detailed Findings for Multifamily (Market-Rate and IE)

Measure	Percentage of Residential Energy Savings[1]	Tracking Database Energy Ratio	Tracking Database Demand Ratio	Reason for Adjustment
ENERGY STAR Air Purifiers	3.8%	0.85	0.85	Updated guidance for this measure went into effect on December 31st, 2023. Reported savings updated the calculation on June 1, 2024.

[1] Percentage of Residential Savings is the percentage of total Residential Program energy savings that each of these measures represent.

Source: Guidehouse analysis

Guidehouse did not conduct additional component-specific impact verification activities in PY16 and instead applied the energy and demand verification ratios based on evaluation activities in PY15 to the result of the tracking database analysis to arrive at final PY16 gross impact results.

[75] PECO, *PECO Program Years 13 to 17 Act 129 – Phase IV Energy Efficiency and Conservation Plan*, filed June 19, 2024, https://www.puc.pa.gov/pcdocs/1834379.pdf.

E.5.2 Net Impact Evaluation

As described in the Phase IV Evaluation Plan[76] approved by the SWE, Guidehouse did not conduct NTG research for this component in PY16.

E.5.3 Process Evaluation

As described in the Phase IV Evaluation Plan[77] approved by the SWE, Guidehouse did not conduct in-depth process activities for this component in PY16. Instead, Guidehouse interviewed the PECO program managers and CSP staff to understand the goals of the program, identify significant implementation changes, and identify areas of strength and areas of improvement. Guidehouse will use findings from these interviews to inform evaluation research in future years.

E.6 Single-Family and Long-Term Savings (IE)

The Single-Family Income-Eligible component improves the energy efficiency of single-family homes for IE customers to help reduce their electric bills and make their homes more comfortable. This program, which is known to customers as the Free Energy Checkup, features an in-depth inspection of the home, energy usage analysis and recommendations, direct install measures, and an energy education session. The home visit is followed by a custom report and education materials.

The same CSP runs a similar program known as LIURP, which is not funded through Act 129. Customers from LIURP may have received certain measures through the Single-Family Income-Eligible component. When LIURP participants receive measures funded through Act 129, they are included in the evaluation activities, and the measure savings are fed into the Single-Family Income-Eligible results.

According to the Phase IV EE&C Plan,[78] the Single-Family Income-Eligible component is planned to account for 58% of Income-Eligible EE Program energy savings, 65% of Income-Eligible EE Program demand savings, 3% of total portfolio energy savings, and 3% of portfolio demand savings. CMC implements the Single-Family component.

The Long-Term Savings component is implemented as an overlay service through the Single-Family component to encourage the installation of long-term, comprehensive measures. The Long-Term Savings component measures include insulation, air sealing, duct sealing, heat pumps, air conditioners, thermostats, window repairs, and residential heat pump water heaters and solar water heaters. According to the Phase IV Plan, this component is planned to account for 7% of Income-Eligible EE Program energy savings, 5% of Income-Eligible EE Program demand savings, 0.4% of total portfolio energy savings, and 0.3% of total portfolio demand savings. CMC implements the Long-Term Savings component.

[76] Guidehouse, Phase IV Evaluation Plan, Energy Efficiency and Conservation Portfolio, revised November 18, 2024.
[77] Guidehouse, Phase IV Evaluation Plan, Energy Efficiency and Conservation Portfolio, revised November 18, 2024.
[78] PECO, *PECO Program Years 13 to 17 Act 129 – Phase IV Energy Efficiency and Conservation Plan*, filed June 19, 2024, https://www.puc.pa.gov/pcdocs/1834379.pdf.

E.6.1 Gross Impact Evaluation

E.6.1.1 Methodology

Guidehouse conducted a tracking database analysis for this component for all measures outlined in the PA TRM and the latest IMPs using a combination of TRM default values and EDC-provided data. Table E-12 illustrates the factors that led to variation between the reported and adjusted database savings and affected the observed realization rates reported in Section 3.2.2.

Table E-12. Detailed Findings for Single-Family

Measure	Percentage of IE Energy Savings[1]	Tracking Database Energy Ratio	Tracking Database Demand Ratio	Reason for Adjustment
ENERGY STAR Air Purifiers	18.2%	0.94	0.94	Updated guidance for this measure went into effect on Dec 31st, 2023. Reported savings updated the calculation on June 1st, 2024.
Low Flow Faucet Aerators	11.4%	0.45	0.46	Reported savings assume an average number of faucets per household to be equal to the number of aerators provided as part of the kit offering (one). Reported savings using the space type of "Kitchen" for kit delivery rows, Guidehouse and SWE use "Unknown" for all kit delivery.

[1] Percentage of IE Savings is the percentage of total Income-Eligible Program energy savings that each of these measures represents.

Source: Guidehouse analysis

E.6.1.2 Sampling

Guidehouse conducted an online survey of sampled recipients in PY16, as described in Section 3.2.2. The surveys included specific questions the customer could answer based on common knowledge of the measures they received. The survey responses showed the frequency of measures being installed as well as any issues with installation. Savings were recalculated based on the customer responses in the surveys. Findings from the survey are detailed in Section 3.2.2. These results were combined with the results of the tracking database analysis to determine final verified gross savings.

As Table 3-21 in Section 3.2.2 presents, Guidehouse stratified the sample by participant size, as described in the Sample Design Memo. The achieved sample counts are also outlined in Table 3-21 in Section 3.2.2.

E.6.2 Net Impact Evaluation

As described in the Phase IV Evaluation Plan[79] approved by the SWE, Guidehouse does not conduct NTG research for IE components.

[79] Guidehouse, Phase IV Evaluation Plan, Energy Efficiency and Conservation Portfolio, revised November 18, 2024.

E.6.3 Process Evaluation

As described in the Phase IV Evaluation Plan[80] approved by the SWE, Guidehouse did not conduct in-depth process activities for this component in PY16. Instead, Guidehouse interviewed the PECO program managers and CSP staff to understand the goals of the program, identify significant implementation changes, and identify areas of strength and areas of improvement. Guidehouse will use findings from these interviews to inform evaluation research in future years.

[80] Guidehouse, Phase IV Evaluation Plan, Energy Efficiency and Conservation Portfolio, revised November 18, 2024.

Appendix F. Residential and Income-Eligible HER Programs

This appendix details the evaluation methods and activities Guidehouse deployed in PY16 for the Residential and Income-Eligible HER Programs. According to the Phase IV EE&C Plan,[81] these programs are planned to account for 8% of total portfolio energy savings and 9% of total portfolio demand savings. Refer to Sections 3.3 and 3.4 and Appendix B for key evaluation findings, results, and conclusions for these components.

F.1 Gross Impact Evaluation

The HER Gross Impact Evaluation details are discussed in Sections 3.3 and 3.4 and Appendix B.

F.2 Net Impact Evaluation

As described in the Phase IV Evaluation Plan[82] approved by the SWE, Guidehouse does not conduct NTG research for IE components.

F.3 Process Evaluation

As described in the Phase IV Evaluation Plan[83] approved by the SWE, Guidehouse did not conduct in-depth process activities for this program in PY16. Instead, Guidehouse interviewed the PECO program managers and CSP staff to understand the goals of the program, identify significant implementation changes, and identify areas of strength and areas of improvement. Guidehouse will use findings from these interviews to inform evaluation research in future years.

[81] PECO, *PECO Program Years 13 to 17 Act 129 – Phase IV Energy Efficiency and Conservation Plan*, filed June 19, 2024, https://www.puc.pa.gov/pcdocs/1834379.pdf.

[82] Guidehouse, Phase IV Evaluation Plan, Energy Efficiency and Conservation Portfolio, revised November 18, 2024.

[83] Guidehouse, Phase IV Evaluation Plan, Energy Efficiency and Conservation Portfolio, revised November 18, 2024.

Appendix G. Non-Residential EE Program

This appendix details the evaluation sample design, methods, and activities deployed in PY16 for select Non-Residential EE Program components. Refer to Section 3.5 for evaluation findings, results, and conclusions for these components.

G.1 Downstream Rebates

The Downstream Rebates component includes incentives for existing building retrofit projects with either deemed, partially deemed, or custom measures. Typical measures include lighting, VFDs, HVAC systems, motors, refrigeration, and controls. According to the Phase IV EE&C Plan,[84] this component is planned to account for 45% of Non-Residential EE Program energy savings, 48% of Non-Residential EE Program demand savings, 32% of total portfolio energy savings, and 36% of total portfolio demand savings. DNV implements the Downstream Rebates component.

G.1.1 Gross Impact Evaluation

G.1.1.1 Methodology

In the first step of the gross impact evaluation, Guidehouse conducted a tracking database analysis for all 944 projects from all 744 participants in the component.[85] This analysis used a combination of TRM default values and EDC-provided data for open variables. Guidehouse verified approaches, algorithms, and assumptions used to estimate reported gross savings at the measure level and recalculated gross energy and demand savings estimates to confirm whether the tracking database was accurate as reported. Guidehouse used a programmatic approach in this step based solely on inputs provided in the tracking database and the relevant TRM and IMP sections. Non-TRM based measures passed through this step with no adjustments, and the adjusted database savings for these measures equaled the reported savings.

In the second step, Guidehouse sampled projects for further data collection and analysis. Guidehouse conducted engineering desk reviews for all projects in the evaluation sample. The engineering desk reviews used project applications, project-specific analysis files and associated calculation sheets, measure invoices, measure specification sheets, construction plans, and other construction documents provided by PECO. Documentation included scanned files of hard copy forms as well as electronic files of CSP inspection reports, photos of installed measures, important emails, and memoranda. In the engineering desk review, Guidehouse reviewed all available project documentation to verify whether all assumptions used in measure savings calculations were supported by the project documentation and that the calculation methodology was correct.

Guidehouse supplemented engineering desk reviews with phone verifications, which Guidehouse assigned to projects per the Sample Design Memo[86] that was submitted to and approved by the SWE. Phone verifications consisted of interviews with customers about their

[84] PECO, *PECO Program Years 13 to 17 Act 129 – Phase IV Energy Efficiency and Conservation Plan*, filed June 19, 2024, https://www.puc.pa.gov/pcdocs/1834379.pdf.

[85] Participants are defined as the count of unique bill accounts.

[86] Guidehouse, PECO PY16 NonResidential Impact Sample Design Memo FINAL, dated December 30, 2024.

projects. Common discussion points included the quantities and type of each measure installed, the operating status of the measures, equipment nameplate data, operating schedules, a careful description of site conditions, and overall verification of the information contained in the project files. Guidehouse updated the measure savings calculations based on customer responses during the phone verifications as warranted.

Guidehouse conducted onsite verification for sampled projects per the Sample Design Memo.[87] Projects assigned an onsite visit first received an engineering desk review to create the Site-Specific Measurement and Verification Plan (SSMVP). The primary objective of site visits was to collect the data required by the TRM and the Phase IV Evaluation Framework. This data included verifying the quantities and type of each measure, equipment nameplate data, and operating schedules, and carefully describing the site conditions. Guidehouse verified this information through visual inspection of the measures and by interviewing the customers, and updated measure savings calculations as warranted based on verified information obtained onsite.

Guidehouse made every attempt to complete its verification efforts. Guidehouse made repeated attempts via email and phone calls to schedule site visits or complete phone interviews. For projects that were assigned a phone verification, Guidehouse converted the project to an engineering desk review only after making at least five attempts to call or email the customer in alignment with the Evaluation Plan.[88] Twelve projects were converted to engineering desk review after Guidehouse exhausted all customer contact attempts.

Table G-1 shows the number of Downstream Rebates projects by evaluation method. Of the 944 completed projects, Guidehouse originally sampled 38 projects for additional data collection and analysis. An additional seven census projects and large projects were added to the sample throughout the evaluation period resulting in a total of 45 sampled projects.

Table G-1. Downstream Rebates Project Count by Evaluation Method

Verification Level	Evaluation Target	Number of Projects Evaluated
Tracking Database Analysis	944	944
Engineering Desk Review Only	0	12
Phone Verification	38	12
Onsite Verification	0	21
Total Sampled Projects	**38**	**45**

Source: Guidehouse analysis

Sixteen projects surpassed the energy (kWh) savings thresholds set in Table 1-2 of the TRM,[89] which requires site-specific data collection for enhanced evaluation rigor. For these 16 projects, Guidehouse used site-specific information to verify the project savings, including metering data, end use trend data, and trend data from building management systems. Guidehouse conducted site visits for 13 of the 16 projects that surpassed the savings threshold to gather site-specific

[87] Guidehouse, PECO PY16 NonResidential Impact Sample Design Memo FINAL, dated December 30, 2024.
[88] Guidehouse, Phase IV Evaluation Plan, Energy Efficiency and Conservation Portfolio, revised November 18, 2024.
[89] Pennsylvania Public Utility Commission, *Technical Reference Manual,* https://www.puc.pa.gov/filing-resources/issues-laws-regulations/act-129/technical-reference-manual/.

information. Guidehouse remotely gathered site-specific information, such as trend data, for the other three projects.

G.1.1.2 Sampling

Using tracking data from PY16, Guidehouse obtained the total number of projects and the total amount of energy savings in the population. With this project data, Guidehouse sampled at the project level for the impact evaluation activities in PY16 to bin projects into seven strata, as outlined in the PY16 Sample Design Memo.[90]

Guidehouse first separated CHP projects into their own separate stratum. Next the sampling team separated solar projects into their own stratum. Guidehouse then created a census stratum (Stratum 1 – Very High Impact Projects) for projects reporting more than 1,000 MWh of energy savings. Next, the Guidehouse sorted all remaining projects by size and excluded all the smallest projects, which combine to make up the lowest 3% of total energy savings. Finally, Guidehouse divided the remaining population into three additional strata: those projects make up the top, middle, and lowest third of the total remaining energy savings.

Of the 45 Downstream Rebates projects evaluated:

- Twenty-six included lighting or lighting control retrofits
- Nine were solar PV projects
- Three included RCx or custom HVAC improvements (one unverified PY15 project included in this count)
- Three were custom motor projects
- Two were compressed air projects
- Two were refrigeration projects

The SWE sampled 10 total projects for its review. The SWE conducted a site visit for two of the projects in addition to engineering desk reviews for all 10 projects.

G.1.2 Net Impact Evaluation

Guidehouse conducted NTG research for the Downstream Rebates component in PY16. Guidehouse sent online surveys to PECO customers who participated in PY15 and received 21 valid completes, 16 from lighting customers considered HIMs and 5 from solar installations. See Section 3.5.5 for information on the PY16 surveying effort.

G.1.2.1 Estimating Free Ridership

Non-Residential Downstream Rebates - HIM

The SWE's Phase IV Evaluation Framework for Non-Residential Downstream-type programs includes two metrics for estimating free ridership: intention and influence. This direction comes

directly from the Energy Trust of Oregon (ETO) Common Methods for conducting NTG research.

Intention

Intention, also known as the counterfactual, is assessed through a few brief questions used to determine how the upgrade or equipment replacement likely would have differed if the respondent had not received the program assistance. The initial question asks the respondent to identify with a limited set of options that best describe what most likely would have occurred without the program assistance.

The survey response options gathering feedback on intention in the PY16 Downstream Rebates component for Lighting HIM projects include:

- Without the program, would not have installed any energy efficient equipment
- Without the program, would have postponed installation
- Without the program, would have reduced the project size, scope, or efficiency
- Without the program, would have installed exactly the same equipment

The first (not installed any energy efficient equipment) and second (would have postponed installation) outcomes indicate zero free ridership and thus result in an intention score of 0.00. The third (would have reduced the project size, scope, or efficiency) and fourth (would have installed exactly the same equipment) indicate partial free ridership and are scored according to the Downstream Rebates algorithm in Figure G-1.

Scoring of Intention Assessment for Downstream Rebates - HIM

Table G-2 summarizes the possible response combinations to the questions described above and the intention score assigned to each unique combination.

Table G-2. Intention Scoring for Downstream Rebates - HIM

Measure		Response	Intention Score
Lighting Improvements (HIM)	FRS6. What would your organization have done without the PECO incentive?	Would not have installed any energy efficient equipment	0.0
		Would have postponed installation	0.0
		Would have reduced the project size, scope, or efficiency	Based on response to FRS8
		Would have installed exactly the same equipment	Based on response to FRS9
	FRS7. For how many months would your organization have postponed the installation?	-	0.0
	FRS8. How much would your organization have reduced the size, scope, or efficiency of the project?	Small reduction in size, scope, or efficiency (1% to 33% reduction)	0.375
		Moderate reduction in size, scope, or efficiency (34% to 66% reduction)	0.25
		Large reduction in size, scope, or efficiency (67%+ reduction)	0.125

Measure		Response	Intention Score
		Don't know	0.25*
	FRS9. Does this mean your organization would have paid the entire cost of the upgrade?	Yes	0.50
		Don't know	0.375*
		No	0.25

* Represents the midpoint of possible values for this question.

Source: Guidehouse analysis

Influence

Program influence was assessed by asking the respondent how much influence—from 0 (not at all influential) to 10 (extremely influential)—various program elements had on the decision to do the project the way it was done.

The program's influence score is equal to the maximum influence rating for any program element rather than, for example, the mean influence rating. The rationale is that if any given program element had a great influence on the respondent's decision, the program itself had a great influence, even if other elements had less influence.

Table G-3. Influence Ratings for Downstream Rebates - HIM

Influence Element	Not at all Influential					Extremely Influential	Don't know
PECO's Ways to Save program incentive	0	1-2	3-4	5-6	7-8	9-10	NA
Recommendation from PECO Ways to Save program staff	0	1-2	3-4	5-6	7-8	9-10	NA
Program marketing materials	0	1-2	3-4	5-6	7-8	9-10	NA
Recommendation from a PECO Ways to Save program contractor	0	1-2	3-4	5-6	7-8	9-10	NA

Source: SWE Framework

High program influence and free ridership have an inverse relationship - the greater the program influence, the lower the free ridership, as Table G-4 shows.

Table G-4. Influence Scoring for Downstream Rebates - HIM

Program Influence Rating	Influence Score
0 – not at all influential	0.50
1-2	0.44
3-4	0.38
5-6	0.25
7-8	0.13
9-10 – extremely influential	0.00
Don't know	0.25

Note: Guidehouse received approval from the SWE to shift from a 1-5 scale in Phase III to a 0-10 scale in Phase IV to align with the process evaluation best practices.

Source: SWE Framework

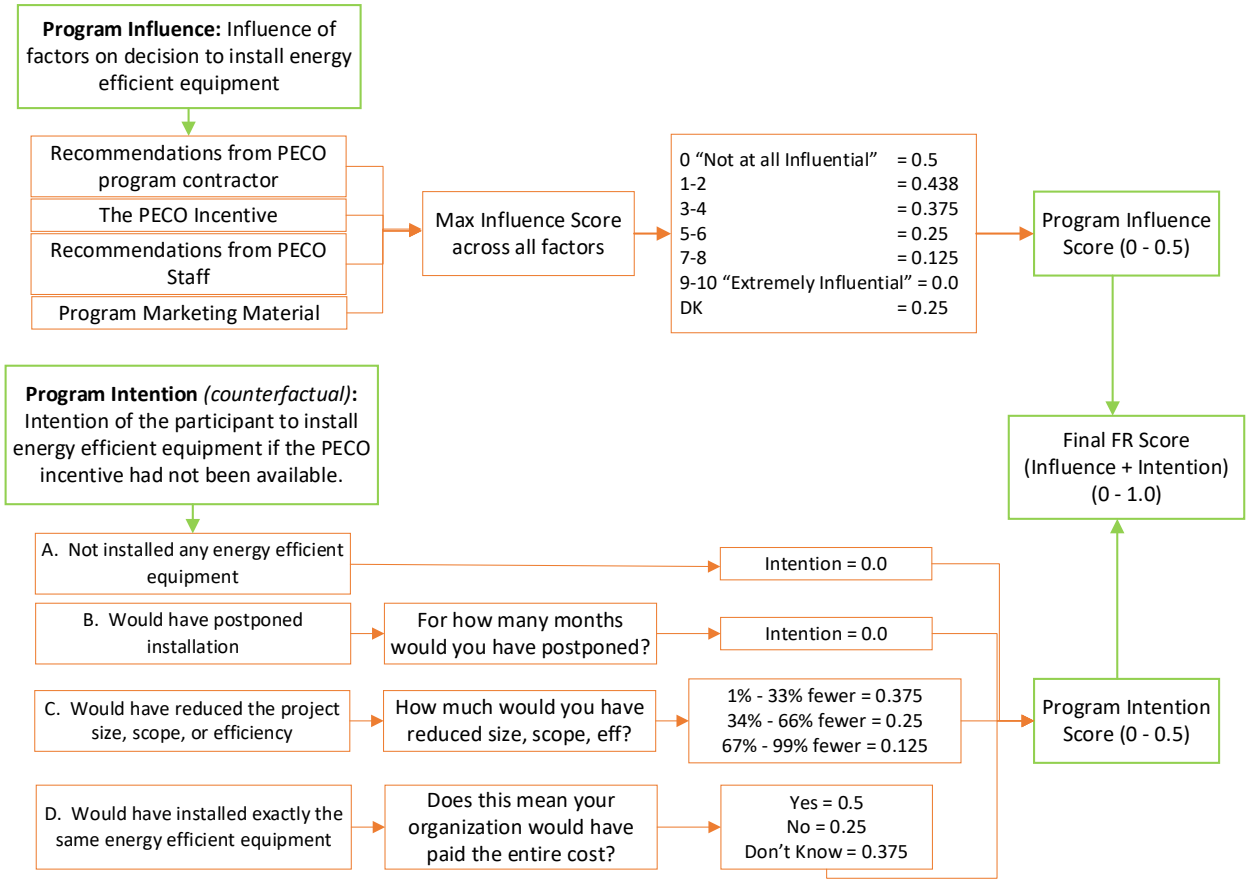
Total Free Ridership Score

Total free ridership is the sum of the intention and influence components, resulting in a score ranging from 0 to 1.00.

Free Ridership Algorithms

Figure G-1 details the algorithms used to estimate free ridership using self-reported survey responses for the Downstream Rebates component.

Figure G-1. Free Ridership Algorithm – Downstream Rebates – HIM



Source: Guidehouse analysis

Non-Residential Downstream Rebates - Solar

Intention

Intention, also known as the counterfactual, is assessed through a few brief questions used to determine how the upgrade or equipment replacement likely would have differed if the respondent had not received the program assistance. The initial question asks the respondent to identify with a limited set of options that best describe what most likely would have occurred without the program assistance.

The survey response options gathering feedback on intention in the PY16 Downstream Rebates component for solar projects include:

- Without the program, would not have installed any solar equipment
- Without the program, would have postponed installation of solar equipment
- Without the program, would have reduced the solar project size or scope
- Without the program, would have installed exactly the same solar equipment

The first (not installed any solar equipment) and second (would have postponed installation of solar equipment) outcomes indicate zero free ridership and thus result in an intention score of 0.00. The third (would have reduced the solar project size or scope) and fourth (would have installed exactly the same solar equipment) indicate partial free ridership and are scored according to the Downstream algorithm detailed in Figure G-2.

Scoring of Intention Assessment for Downstream Rebates - Solar

Table G-5 summarizes the possible response combinations to the questions described above and the intention score assigned to each unique combination.

Table G-5. Intention Scoring for Downstream Rebates - Solar

Measure		Response	Intention Score
Solar	FRS1. What would your organization have done without the PECO solar incentive?	Would not have installed any solar equipment	0.0
		Without the program, would have postponed the installation of the solar project	0.0
		Would have reduced the solar project size or scope	Based on response to FRS3
		Would have installed exactly the same solar equipment	Based on response to FRS4
	FRS2. For how many months would your organization have postponed the project	-	0.0
	FRS3. How much would your organization have reduced the size, scope, or efficiency of the project?	Small reduction in size, scope, or efficiency (1% to 33% reduction)	0.375
		Moderate reduction in size, scope, or efficiency (34% to 66% reduction)	0.25
		Large reduction in size, scope, or efficiency (67%+ reduction)	0.125
		Don't know	0.25*
	FRS4. Does this mean your organization would have paid the entire cost of the solar installation without the PECO incentive?	Yes	0.50
		Don't know	0.375*
		No	0.25

* Represents the midpoint of possible values for this question.

Source: Guidehouse analysis

Influence

Program influence was assessed by asking the respondent how much influence—from 0 (not at all influential) to 10 (extremely influential)—various program elements had on the decision to do the project the way it was done.

The program's influence score is equal to the maximum influence rating for any program element rather than, for example, the mean influence rating. The rationale is that if any given program element had a great influence on the respondent's decision, the program itself had a great influence, even if other elements had less influence.

Table G-6. Influence Ratings for Downstream Rebates - Solar

Influence Element	Not at all Influential					Extremely Influential	Don't Know
PECO's incentive for the solar project	0	1-2	3-4	5-6	7-8	9-10	NA
Recommendation from PECO program staff	0	1-2	3-4	5-6	7-8	9-10	NA
PECO Marketing materials promoting solar projects	0	1-2	3-4	5-6	7-8	9-10	NA

Source: SWE Framework

High program influence and free ridership have an inverse relationship - the greater the program influence, the lower the free ridership, as Table G-6 shows.

Table G-6. Influence Scoring for Downstream Rebates - Solar

Program Influence Rating	Influence Score
0 – not at all influential	0.50
1-2	0.44
3-4	0.38
5-6	0.25
7-8	0.13
9-10 – extremely influential	0.00
Don't know	0.25

Note: Guidehouse received approval from the SWE to shift from a 1-5 scale in Phase III to a 0-10 scale in Phase IV to align with the process evaluation best practices.

Source: SWE Framework

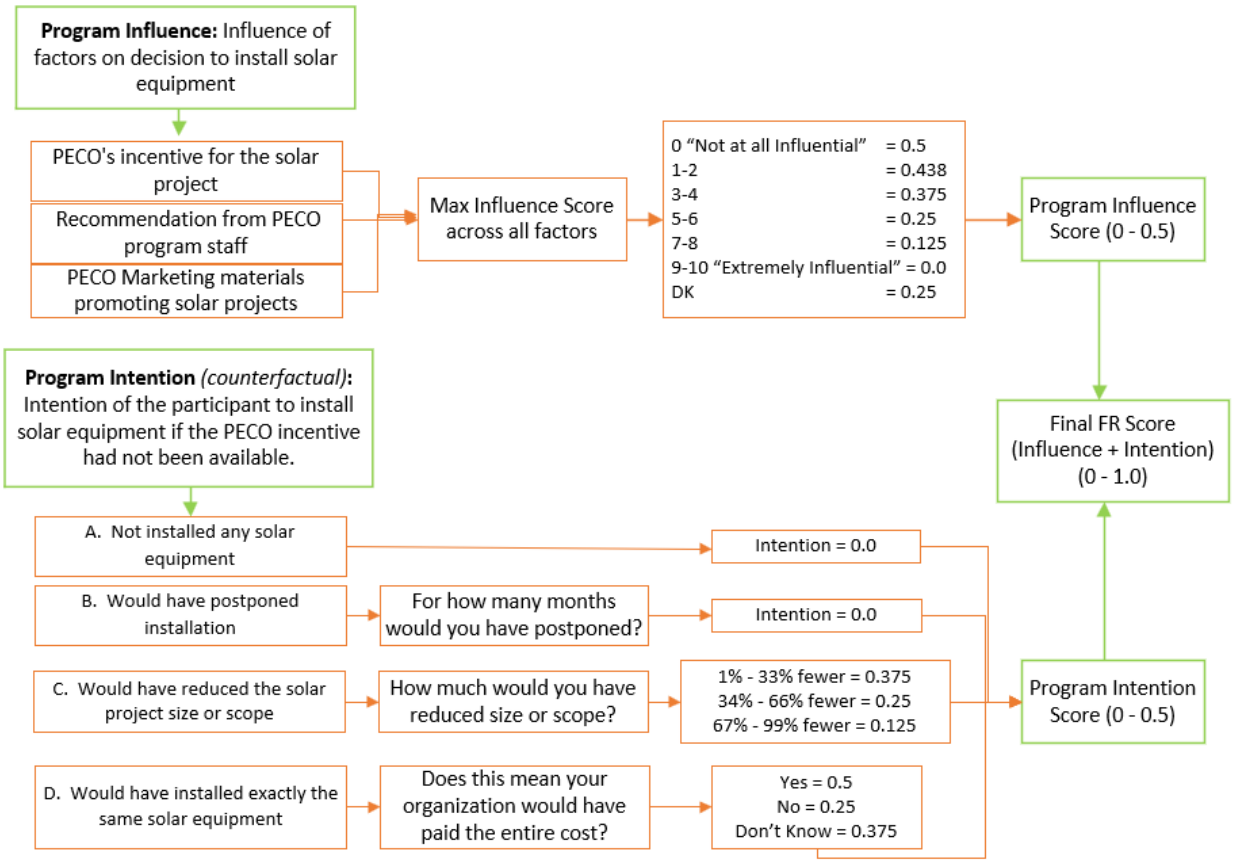
Total Free Ridership Score

Total free ridership is the sum of the intention and influence components, resulting in a score ranging from 0 to 1.00.

Free Ridership Algorithms

The following diagram details the algorithms used to estimate free ridership using self-reported survey responses for the Downstream Rebates solar component.

Figure G-2. Free Ridership Algorithm – Downstream Rebates - Solar



Source: Guidehouse analysis

G.1.2.2 Estimating Participant Spillover

The participant spillover battery of questions assessed, for each participant, the number and description of non-incented energy-efficient equipment installed since program participation; and the program's influence on the participant's decision to install those technologies. Methods for assessing spillover do not differ between solar and HIM evaluations. This section summarizes the spillover approach for the Downstream Rebates component in PY16.

Identification of Non-Rebated Downstream Rebates Equipment

The survey assessed the purchase and installation of any energy-efficient technologies, using the following questions:

- Since your organization participated in the PECO program, did you install any additional energy efficient equipment at your facility that did not receive incentives through a PECO program?[91]

[91] Guidehouse asked about the facility drawn in the random sample of projects, as well as a follow up question to the participant regarding additional, un-incented equipment at any other facilities they operate.

- [IF YES:] Please describe the energy-efficiency equipment. [Probe for equipment type, size, and quantity]

Guidehouse asked about and documented all additional, non-rebated equipment installed since program participation, whether eligible for program rebates, in the TRM but not eligible, or not in the TRM.

Assessment of Program Influence on Non-Rebated Equipment

The survey asked respondents about the level of influence the prior program participation had on their decision to install the additional equipment. The survey asks:

- On a 0 to 10 scale, with 0 meaning “not at all influential” and 10 meaning “extremely influential,” how influential was your experience in the PECO Ways to Save program on your decision to install this additional equipment at this facility?

Guidehouse asked the influence question only once to cover all the additional energy efficient equipment installed. The influence rating is assigned a value that determines what proportion of the equipment’s savings are attributed to the program:

- A rating of 8, 9, or 10 = 1.0 (full savings attributed to the program)
- A rating of 3, 4, 5, 6, or 7 = 0.5 (half of the savings attributed to the program)
- A rating of 0, 1, or 2 = 0.0 (no savings attributed to the program)

Assessment of Energy Savings for Non-Residential Spillover

Where applicable, the savings for each additional piece of equipment installed were calculated per the TRM. For partially deemed equipment, Guidehouse developed conservative working assumptions for any required inputs (e.g., square footage of home, R-value improvement, replaced wattage) or identified average verified savings for such equipment.

For equipment not in the TRM, Guidehouse conducted a brief engineering analysis to assess savings or, if applicable, identified an alternative source and methodology for assessing savings.

Evaluators first calculated spillover savings for each piece of spillover equipment reported as the product of the equipment savings, number of units, and influence score:

$$Equipment\ SO = Savings * Number\ of\ Units * Program\ Influence$$

Guidehouse then:

- Totaled the savings associated with each program participant, to give the overall participant SO savings.

$$Participant\ SO = \Sigma\ Equipment\ SO$$

- Multiplied the mean participant SO savings for the participant sample by the total number of participants to yield an estimated total participant SO savings for the program.

$$\Sigma\ Participant\ SO\ (population) = (\sum\ [Participant\ SO\ (sample)]) / (Sample\ n)$$

- Divided that total savings by the total program savings to yield a participant spillover percentage.

  % Participant SO = (∑ 〖Participant SO (population)〗) / (Program Savings)

G.1.2.3 Estimating the NTGR

Guidehouse calculated the final NTGR score using Equation G-1.

Equation G-1. NTGR Score Equation

$$NTG = 1 - Free\ Ridership + Spillover + Market\ Effects$$

Where:

$Free\ Ridership$	The estimated amount of savings that would have occurred even if the program did not exist
$Spillover$	The estimated amount of savings occurring outside of the program, but directly influenced by the program
$Market\ Effects$	The estimated amount of savings occurring in the Non-Residential marketplace due to general knowledge and education around energy efficiency, not to be double counted with spillover (Guidehouse did not conduct Market Effects research in PY16)

G.1.3 Process Evaluation

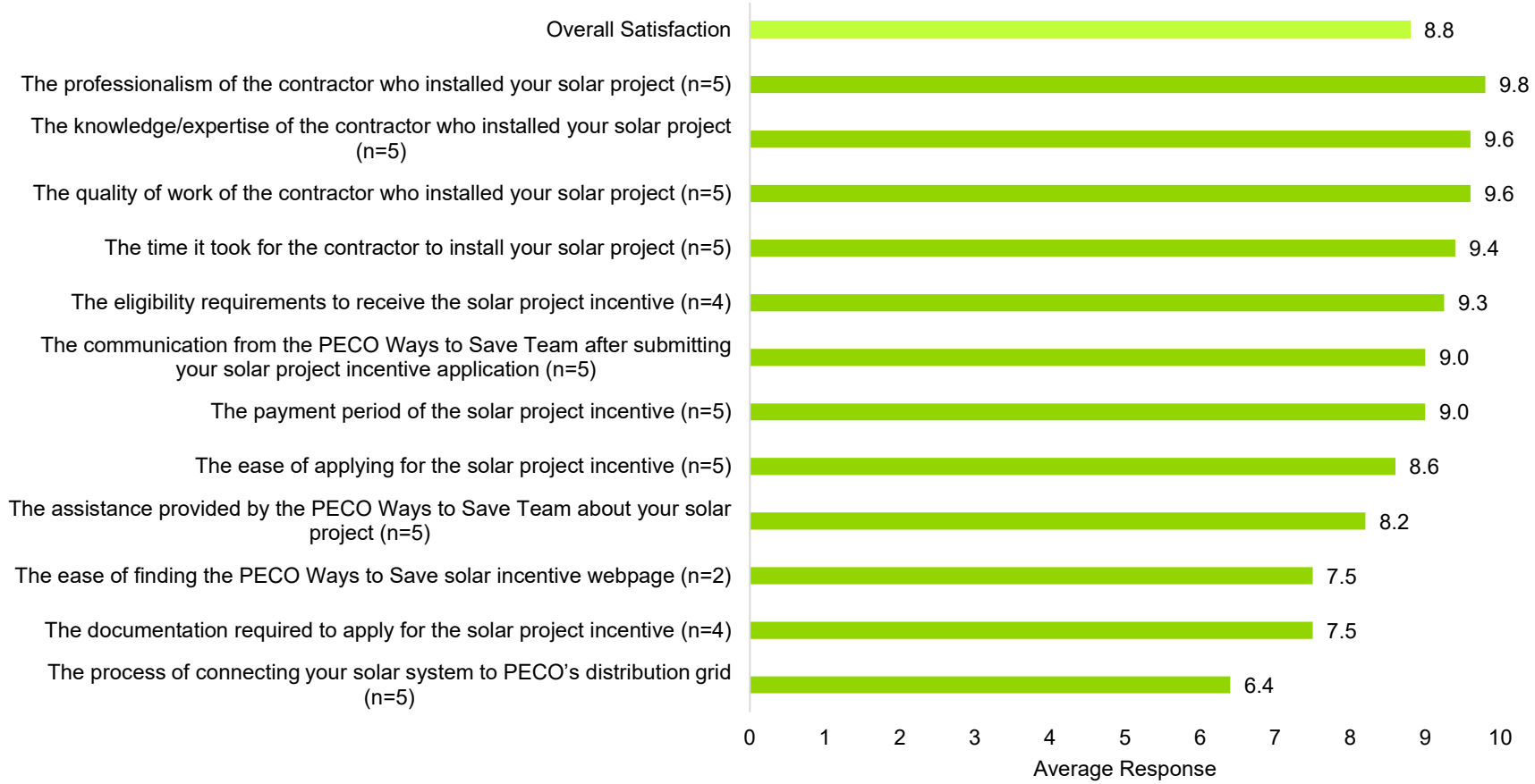
Non-Residential EE Program process evaluation activities and findings are discussed in Section 3.5.5. This section describes additional insights from process evaluation activities conducted for the Downstream Rebates component specifically.

Guidehouse contacted 31 customers who received an incentive for a solar energy system through PECO's Downstream Rebates component to conduct the process evaluation for this program. Five customers replied to the online survey resulting in a 16% response rate. Guidehouse removed "don't know" responses from analysis for most questions. Therefore, n values may vary between questions.

Respondents reported satisfaction levels for the component overall, using a scale of 0 to 10 with 0 representing "extremely dissatisfied" and 10 representing "extremely satisfied." The mean satisfaction for the Ways to Save component overall is 8.8 out of 10 (n=5).

Respondents also provided satisfaction scores for aspects of the component. Respondents provided the highest satisfaction scores for the professionalism of the contractor who installed the solar project (9.8 out of 10), the knowledge/expertise of the contractor (9.6), and the quality of work of the contractor (9.6), as Figure G-3 shows.

Figure G-3. Downstream Rebates Satisfaction

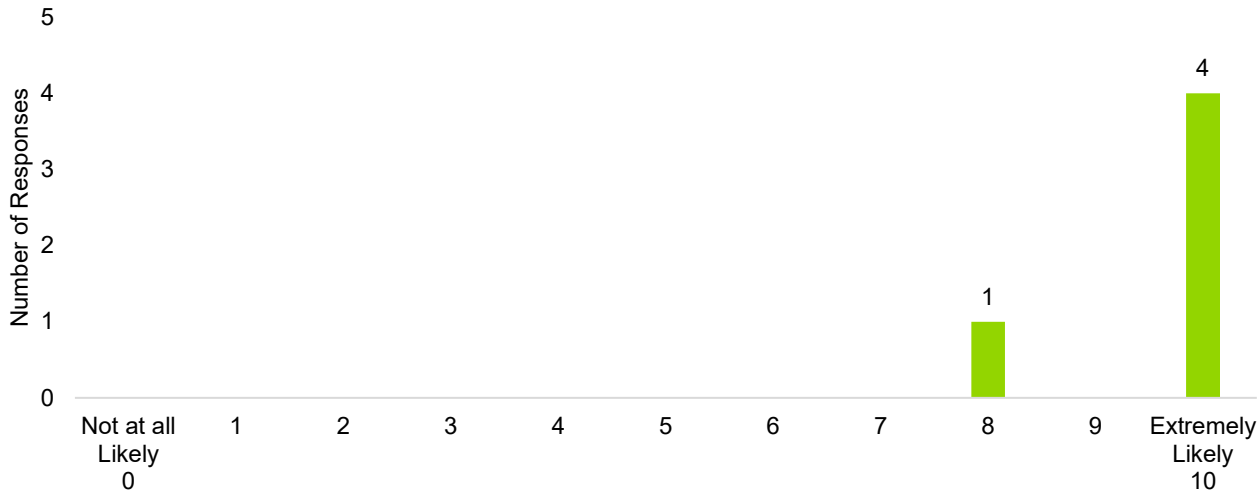


Respondents received the following questions: "How would you rate your satisfaction with the PECO Ways to Save program overall?" and "How would you rate your satisfaction with the following aspects of the PECO Ways to Save program?"
Note: The pathway is referred to as "Ways to Save" as this is a more familiar name for customers.

Source: Guidehouse analysis

As Figure G-4 shows, all but one respondent rated their likelihood to recommend the PECO Ways to Save component to others as 10 out of 10. Respondents were asked to use a scale of 0 to 10 where 0 is “not at all likely” and 10 is “extremely likely.”

Figure G-4. Likelihood of Recommending PECO’s Downstream Rebates Component (n=5)

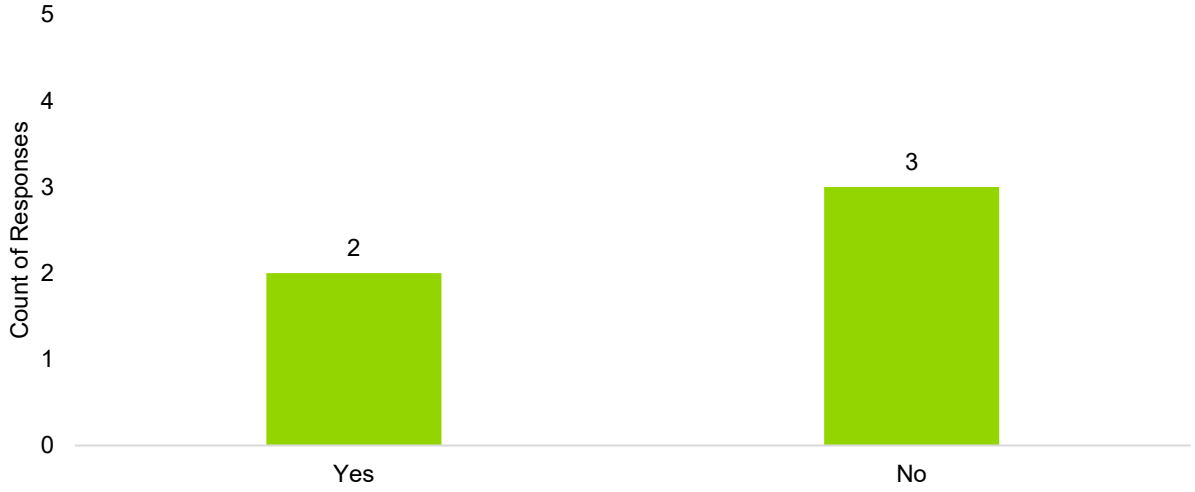


Respondents received the following question: “How likely are you to recommend the PECO Ways to Save program to others?”

Source: Guidehouse analysis

Respondents were asked if they recommended the component to others, with two out of five indicating they had (Figure G-5).

Figure G-5. Recommendation of Ways to Save (n=5)



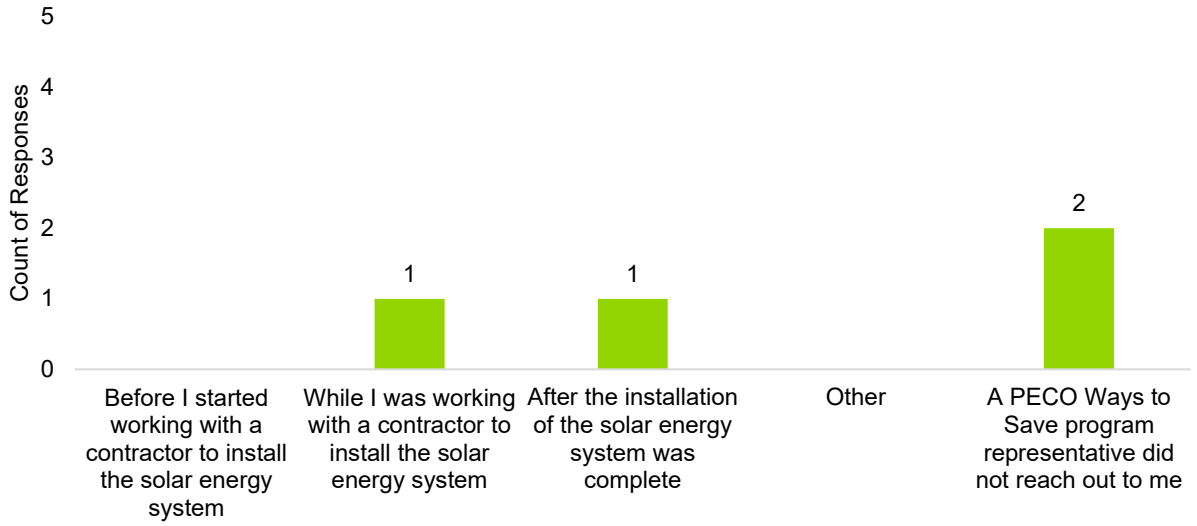
Respondents received the following question: “Have you recommended the PECO Ways to Save program to others?”

Source: Guidehouse analysis

Respondents were also asked at what point in the process of installing their solar system they received outreach from a PECO Ways to Save representative. One respondent was contacted while working with a contractor to install their solar system, and another was contacted after the

installation of their solar system. The remaining two respondents were not contacted by a Ways to Save representative (Figure G-6). Through staff interviews, Guidehouse learned that PECO's outreach strategy for the solar component is evolving given that this is a new offering and that PECO expects to be generating awareness earlier in the decision-making process moving forward.

Figure G-6. Contact from Ways to Save Representative (n=4)

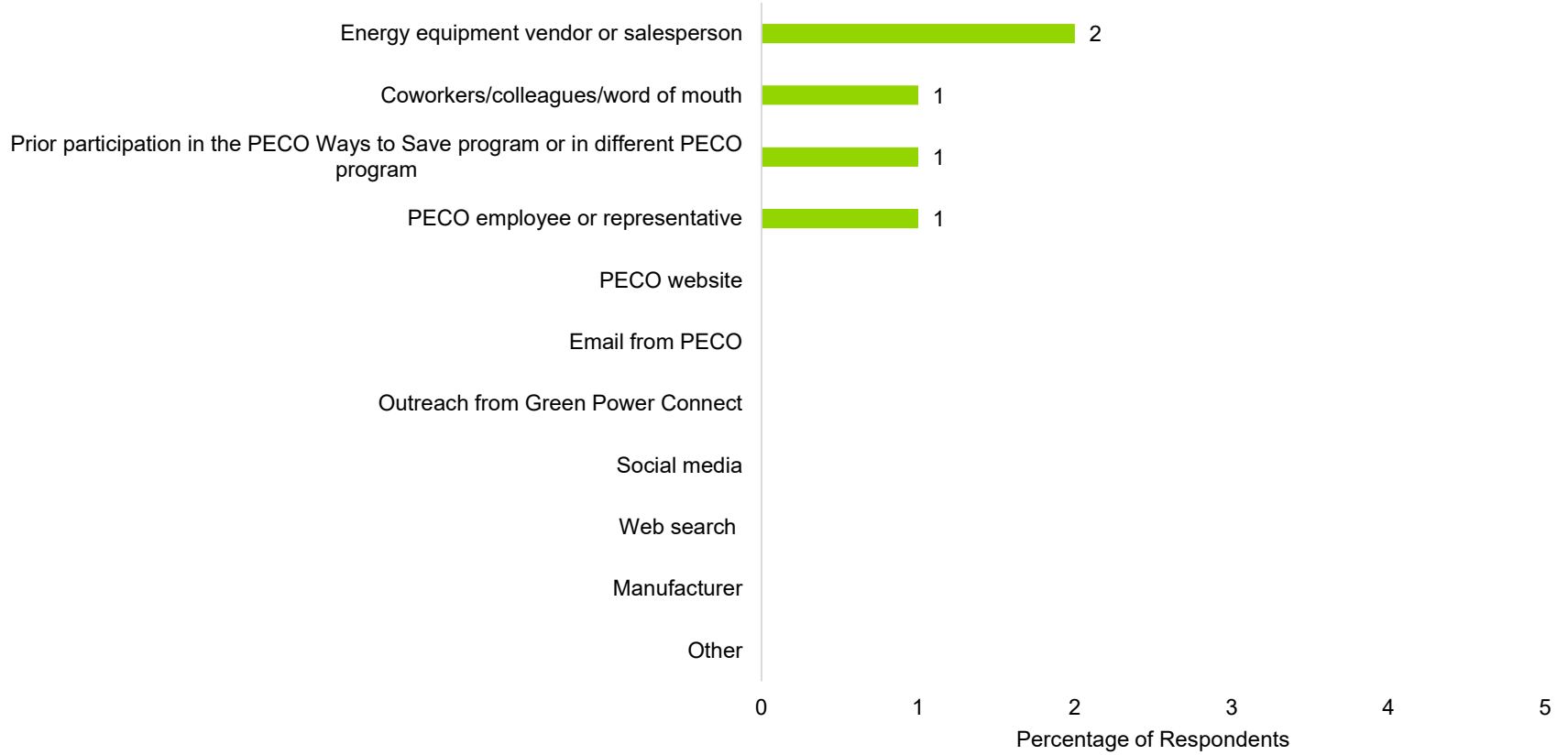


Respondents received the following question: “At what point in the process of adding a solar system to your business did a PECO Ways to Save program representative initially reach out to you?”

Source: Guidehouse analysis

Respondents were also asked how they learned about the component, and indicated they did through an energy equipment vendor or salesperson (2), word of mouth (1), prior participation in a program (1) or a PECO employee (1) (Figure G-7).

Figure G-7. Awareness of PECO's Downstream Rebates Component (n=5)



Respondents received the following question: "How did you learn about the PECO Ways to Save program?"
Source: Guidehouse analysis

G.2 Midstream Rebates

The Midstream Rebates component includes incentives at the distributor and manufacturer levels to encourage the purchase and installation of high efficiency lighting, HVAC, refrigeration and food service, compressed air, and other measures. PECO has several pathways to receive midstream rebates, including the Point of Sale (POS) for all measures, and LED Aggregation pathway (for lighting measures).

The LED aggregation pathway captures savings from manufacturer and national distributor direct-to-consumer transactions that did not go through the POS pathway. Manufacturer and national distributor (channel partner) sales and transaction data is collected and processed by Encentiv Energy, which identifies program-qualifying LED sales. The program then disperses incentive funds to the channel partners and Encentiv Energy to accelerate market transformation through product pricing buy-downs, sales promotions, and other mechanisms.

According to the Phase IV EE&C Plan,[92] this component is expected to account for 33% of Non-Residential EE Program energy savings, 29% of Non-Residential EE Program demand savings, 24% of total portfolio energy savings, and 22% of total portfolio demand savings. DNV implements the Midstream Rebates component.

G.2.1 Gross Impact Evaluation

G.2.1.1 Methodology

In the first step of the gross impact evaluation, Guidehouse conducted a tracking database analysis for all 6,971 projects from all 4,109 participants in the Midstream Rebates component. This analysis used a combination of TRM default values and EDC-provided data for open variables. Guidehouse verified approaches, algorithms, and assumptions used to estimate reported gross savings at the measure level and recalculated gross energy and demand savings estimates to confirm whether the tracking database was accurate as reported. Guidehouse used a programmatic approach in this step based solely on inputs provided in the tracking database and the relevant TRM and IMP sections. Non-TRM-based measures passed through this step with no adjustments, and the adjusted database savings for these measures equaled the reported savings.

In the second step, Guidehouse sampled projects for further data collection and analysis. Guidehouse conducted engineering desk reviews for all projects in the evaluation sample. The engineering desk reviews used project measure invoices and documents provided by PECO, as well as customized TRM Appendix C calculation sheets, specification sheets and DLC reports based on model numbers, and other information as it was available. PECO-provided documentation often included only invoices from the distributors. In the engineering desk review, Guidehouse reviewed all available project documentation to verify whether all assumptions used in measure savings calculations were supported by the project documentation and that the calculation methodology was correct.

[92] PECO, *PECO Program Years 13 to 17 Act 129 – Phase IV Energy Efficiency and Conservation Plan*, filed June 19, 2024, https://www.puc.pa.gov/pcdocs/1834379.pdf.

Guidehouse supplemented engineering desk reviews with phone verifications, which Guidehouse assigned to projects per the Sample Design Memo[93] that was submitted to and approved by the SWE. Phone verifications consisted of interviews with customers about their projects. Common discussion points included the quantities and type of each measure installed, the operating status of the measures, equipment model numbers, operating schedules, a careful description of site conditions, and overall verification of the information contained in the project files. Guidehouse made updates to the measure savings calculations based on customer responses during the phone verifications as warranted.

Guidehouse conducted onsite verification for sampled projects per the Sample Design Memo.[93] Projects assigned an onsite visit first received an engineering desk review to create the SSMVP. The primary objective of site visits was to collect the data required by the TRM and the Phase IV Evaluation Framework. This data included verifying the quantities and type of each measure, equipment nameplate data, and operating schedules, and carefully describing the site conditions. Guidehouse verified this information through visual inspection of the measures and by interviewing the customers, and updated measure savings calculations as warranted based on verified information obtained onsite.

Guidehouse made every attempt to complete its verification efforts. Guidehouse made repeated attempts via email and phone calls to schedule site visits or complete phone interviews. For projects that were assigned a phone verification, Guidehouse converted the project to an engineering desk review only after making at least five attempts to call or email the customer in alignment with the Evaluation Plan.[94] Thirty projects were converted to a file review after Guidehouse exhausted all customer contact attempts.

Table G-7 shows the number of Midstream Rebates projects by evaluation method. Of the 6,971 completed projects through 4,109 participants, Guidehouse originally sampled 51 projects for increased evaluation rigor.

Table G-7. Midstream Rebates Project Count by Evaluation Method

Verification Level	Evaluation Target	Final Evaluation Total
Tracking Database Analysis	6,971	6,971
Engineering Desk Review Only	0	30
Phone Verification	51	19
Onsite Verification	0	5
Total Sampled Projects	**51**	**54**

Source: Guidehouse analysis

Five projects surpassed the energy (kWh) savings thresholds set in Table 1-2 of the TRM,[95] which requires site-specific data collection for enhanced evaluation rigor.

G.2.1.2 Sampling

Using tracking data from PY16, Guidehouse obtained the total number of projects and the total amount of energy savings in the population. With this project data, Guidehouse sampled at the

[93] Guidehouse, PECO PY16 NonResidential Impact Sample Design Memo FINAL, dated December 30, 2024.
[94] Guidehouse, Phase IV Evaluation Plan, Energy Efficiency and Conservation Portfolio, revised November 18, 2024.
[95] Pennsylvania Public Utility Commission, *Technical Reference Manual,* https://www.puc.pa.gov/filing-resources/issues-laws-regulations/act-129/technical-reference-manual/.

project level for the impact evaluation activities in PY16 to bin projects within five strata, as outlined in the PY16 Sample Design Memo.[96]

Guidehouse first created a census stratum (Stratum 1 – Very High Impact Projects) for projects exceeding 1,000 MWh of energy savings. Next, Guidehouse sorted the remaining projects by size and excluded all projects making up the lowest 1% of total Midstream Rebates energy savings. Finally, Guidehouse divided the population into three additional strata: those projects making up the top, middle, and lowest third of the total remaining Midstream Rebates energy savings.

For Midstream Rebates projects, all 54 sampled projects included lighting or lighting control retrofits. The SWE sampled four total projects for its review and conducted a site visit for one of the projects in addition to engineering desk reviews for all four sites.

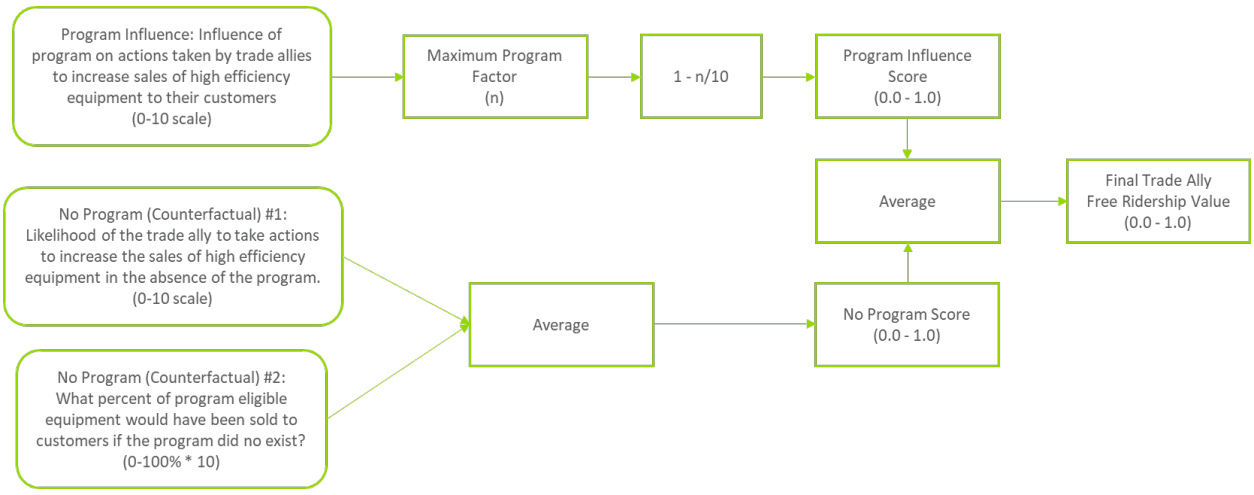
G.2.2 Net Impact Evaluation

Guidehouse conducted NTG research for the Midstream Rebates component in PY16. Guidehouse conducted phone surveys with distributors who participated in the program in the prior year and received four valid completes from respondents, all of whom are lighting distributors. See Section 3.5.5 for information on the PY16 surveying effort.

G.2.2.1 Estimating Free Ridership

The IL TRM provides guidance on estimating free ridership and spillover for midstream programs. The guidance includes interviews with both end-use customers and participating distributors, as well as just distributors if end-use customer data is unavailable. Guidehouse followed the guidance from the IL TRM to create the distributor interview guide and gather the appropriate feedback to estimate free ridership for PECO's Midstream Rebates component. Figure G-8 defines the algorithm for estimating free ridership using distributor feedback.

Figure G-8. Distributor Free Ridership Algorithm



Source: Guidehouse analysis

[96] Guidehouse, PECO PY16 NonResidential Impact Sample Design Memo FINAL, dated December 30, 2024.

Intention

Program intention for distributors is calculated using the average of two counterfactual scores: likelihood of distributors to take actions to increase sales of high efficiency equipment in the absence of the program and the program's impact on sales of high efficiency equipment.

Distributors were asked to identify actions they have taken since participating in the program that would impact the sales of high efficiency equipment. They were also asked to rate their likelihood of taking those actions in absence of the program on a scale from 0 to 10. Table G-8 lists the actions.

Table G-8. Intention Scoring for Midstream Rebates

Likelihood Element	Not at all Likely					Extremely Likely	Don't know
Upsell contractors to purchase program-qualified units	0	1-2	3-4	5-6	7-8	9-10	NA
Conduct training workshops for contractors	0	1-2	3-4	5-6	7-8	9-10	NA
Conduct training workshops for customers	0	1-2	3-4	5-6	7-8	9-10	NA
Increase marketing of program-qualified units	0	1-2	3-4	5-6	7-8	9-10	NA
Reduce the prices of program-qualified units	0	1-2	3-4	5-6	7-8	9-10	NA
Increase the stocking or assortment of program-qualified units	0	1-2	3-4	5-6	7-8	9-10	NA
Discuss the benefits of program-qualified units with design professionals	0	1-2	3-4	5-6	7-8	9-10	NA

Source: SWE Framework

Distributors were asked to identify which of the lighting types listed below they sell through the program, and report if they sold those types prior to participating in the program. They were then asked to estimate how much sales of each lighting category changed since participating in the program and asked to estimate how much sales would have changed in absence of the program. Distributors were also able to identify any other lighting types sold through the program not listed below.

- Interior ENERGY STAR Integrated LED Fixtures
- Interior ENERGY STAR Non-Integrated (tube replacement) LEDs
- Exterior ENERGY STAR Integrated LED Fixtures
- Exterior ENERGY STAR Non-Integrated (tube replacement) LEDs
- LED Exit Signs

Influence

Program influence may be assessed by asking the respondent how much influence—from 0 (not at all influential) to 10 (extremely influential)—various program elements had on the decision to take actions to increase the sales of high efficiency equipment.

The program's influence score is equal to the maximum influence rating for any program element rather than, for example, the mean influence rating. The rationale is that if any given

program element had a great influence on the respondent's decision, the program itself had a great influence, even if other elements had less influence.

Distributors were asked to rate the influence of the program on their organization's decision to take the same actions they identified as part of the counterfactual analysis.

Table G-9. Influence Ratings for Midstream Rebates

Influence Element	Not at all Influential					Extremely Influential	Don't know
Upsell contractors to purchase program-qualified units	0	1-2	3-4	5-6	7-8	9-10	NA
Conduct training workshops for contractors	0	1-2	3-4	5-6	7-8	9-10	NA
Conduct training workshops for customers	0	1-2	3-4	5-6	7-8	9-10	NA
Increase marketing of program-qualified units	0	1-2	3-4	5-6	7-8	9-10	NA
Reduce the prices of program-qualified units	0	1-2	3-4	5-6	7-8	9-10	NA
Increase the stocking or assortment of program-qualified units	0	1-2	3-4	5-6	7-8	9-10	NA
Discuss the benefits of program-qualified units with design professionals	0	1-2	3-4	5-6	7-8	9-10	NA

Source: SWE Framework

High program influence and free ridership have an inverse relationship, the greater the program influence, the lower the free ridership, as Table G-10 shows.

Table G-10. Influence Scoring for Midstream Rebates

Program Influence Rating	Influence Score
0 – not at all influential	0.50
1-2	0.44
3-4	0.38
5-6	0.25
7-8	0.13
9-10 – extremely influential	0.00
Don't know	0.25

Note: Guidehouse received approval from the SWE to shift from a 1-5 scale in Phase III to a 0-10 scale in Phase IV to align with the process evaluation best practices.

Source: SWE Framework

G.1.2.2 Estimating Participant Spillover

Guidehouse did not estimate spillover (SO) for the Midstream Rebates component in PY16.

G.1.2.3 Estimating the NTGR

Estimate the final NTGR score using Equation G-2.

Equation G-2. Final NTGR Score Equation2

$$NTG = 1 - Free\ Ridership + Spillover + Market\ Effects$$

Where:

$Free\ Ridership$	The estimated amount of savings that would have occurred even if the program did not exist
$Spillover$	The estimated amount of savings occurring outside of the program, but directly influenced by the program
$Market\ Effects$	The estimated amount of savings occurring in the Non-Residential marketplace due to general knowledge and education around energy efficiency, not to be double counted with spillover (Guidehouse did not conduct Market Effects research in PY16)

G.2.3 Process Evaluation

As described in the Phase IV Evaluation Plan[97] approved by the SWE, Guidehouse did not conduct in-depth process activities for this component in PY16 for lighting distributors. As no non-lighting distributors were surveyed in PY16, there are no process results to report in PY16. Instead, Guidehouse interviewed the PECO program managers and CSP staff to understand the goals of the program, identify significant implementation changes, and identify areas of strength and areas of improvement. Guidehouse will use findings from these interviews to inform evaluation research in future years.

G.3 Small Business Direct Install

The Small Business Direct Install component offers rebates to small businesses for the direct installation of energy efficiency measures to improve overall energy performance. Typical measure offerings include efficient lighting and lighting controls, refrigeration lighting, door gaskets, and efficient motors on refrigerators and freezers. According to the Phase IV EE&C Plan,[98] this component is predicted to account for 18% of Non-Residential EE Program energy savings, 19% of Non-Residential Program demand savings, 13% of total portfolio energy savings, and 14% of total portfolio demand savings. DNV implements the Small Business Direct Install component using an open contractor network.

G.3.1 Gross Impact Evaluation

G.3.1.1 Methodology

Guidehouse conducted a tracking database analysis for all 526 projects across all 505 participants in the Small Business Direct Install component. This analysis used a combination of TRM default values and EDC-provided data for open variables. Guidehouse verified approaches, algorithms, and assumptions used to estimate reported gross savings at the measure level and recalculated gross energy and demand savings estimates to confirm whether

[97] Guidehouse, Phase IV Evaluation Plan, Energy Efficiency and Conservation Portfolio, revised November 18, 2024.
[98] PECO, *PECO Program Years 13 to 17 Act 129 – Phase IV Energy Efficiency and Conservation Plan*, filed June 19, 2024, https://www.puc.pa.gov/pcdocs/1834379.pdf.

the tracking database was accurate as reported. Guidehouse used a programmatic approach in this step based solely on inputs provided in the tracking database and the relevant TRM and IMP sections. Non-TRM-based measures passed through this step with no adjustments, and the adjusted database savings for these measures equaled the reported savings.

In the second step, Guidehouse sampled projects for further data collection and analysis. Guidehouse conducted engineering desk reviews for all projects in the evaluation sample. The engineering desk reviews used project measure invoices and documents provided by PECO, as well as customized TRM Appendix C calculation sheets, specification sheets and DLC reports based on model numbers, and other information as it was available. In the engineering desk review, Guidehouse reviewed all available project documentation to verify whether all assumptions used in measure savings calculations were supported by the project documentation and that the calculation methodology was correct.

Guidehouse supplemented engineering desk reviews with phone verifications, which Guidehouse assigned to projects per the Sample Design Memo[99] that was submitted to and approved by the SWE. Phone verifications consisted of interviews with customers about their projects. Common discussion points included the quantities and type of each measure installed, the operating status of the measures, equipment model numbers, operating schedules, a careful description of site conditions, and overall verification of the information contained in the project files. Guidehouse made updates to the measure savings calculations based on customer responses during the phone verifications as warranted.

Guidehouse conducted onsite verification for sampled projects per the Sample Design Memo.[93] Projects assigned an onsite visit first received an engineering desk review to create the SSMVP. The primary objective of site visits was to collect the data required by the TRM and the Phase IV Evaluation Framework. This data included verifying the quantities and type of each measure, equipment nameplate data, and operating schedules, and carefully describing the site conditions. Guidehouse verified this information through visual inspection of the measures and by interviewing the customers, and updated measure savings calculations as warranted based on verified information obtained onsite.

Guidehouse made every attempt to complete its verification efforts. Guidehouse made repeated attempts via email and phone calls to schedule site visits or complete phone interviews. For projects that were assigned a phone verification, Guidehouse converted the project to an engineering desk review only after making at least five attempts to call or email the customer in alignment with the Evaluation Plan.[100] Ten projects were converted to a file review after Guidehouse exhausted all customer contact attempts.

Table G-11 shows the number of Small Business Direct Install projects by evaluation method. Of the 526 completed projects through 505 participants, Guidehouse originally sampled 15 projects for increased evaluation rigor.

Table G-11. Small Business Direct Install Project Count by Evaluation Method

Verification Level	Evaluation Target	Final Evaluation Total
Tracking Database Analysis	526	526

[99] Guidehouse, PECO PY16 NonResidential Impact Sample Design Memo FINAL, dated December 30, 2024.

[100] Guidehouse, Phase IV Evaluation Plan, Energy Efficiency and Conservation Portfolio, revised November 18, 2024.

Verification Level	Evaluation Target	Final Evaluation Total
Engineering Desk Review Only	0	10
Phone Verification	15	4
Onsite Verification	0	1
Total Sampled Projects	**15**	**15**

Source: Guidehouse analysis

No projects surpassed the energy (kWh) savings thresholds set in Table 1-2 of the TRM,[101] which requires site-specific data collection for enhanced evaluation rigor.

G.2.1.2 Sampling

Using tracking data from PY16, Guidehouse obtained the total number of projects and the total amount of energy savings in the population. With this project data, Guidehouse sampled at the project level for the impact evaluation activities in PY16 to bin projects within five strata, as outlined in the PY16 Sample Design Memo.[102]

Guidehouse first created a census stratum (Stratum 1 – Very High Impact Projects) for projects exceeding 300 MWh of energy savings. Next, Guidehouse sorted the remaining projects by size and excluded all projects that made up the lowest 2% of total Small Business Direct Install energy savings. Finally, Guidehouse divided the population into three additional strata: those projects making up the top, middle, and lowest third of the total remaining Small Business Direct Install energy savings.

For Small Business Direct Install projects, all 15 sampled projects included lighting or lighting control retrofits. The SWE sampled one project for its review and conducted engineering desk reviews it.

G.3.2 Net Impact Evaluation

Guidehouse conducted NTG research for the Small Business Direct Install component in PY16. Guidehouse sent online surveys to PECO customers who participated in the prior year and received 19 valid completes. See Section 3.5.5 for information on the PY16 surveying effort.

G.3.2.1 Estimating Free Ridership

Guidehouse followed the SWE's recommendation of gathering feedback from participating component customers on their intention to complete energy efficiency projects if they did not receive PECO program assistance, and the influence the program had on their decision to complete the energy efficiency project this program year. Guidehouse asked specific survey questions to inform these two metrics as follows.

Intention

Intention, also known as the counterfactual, is assessed through a few brief questions used to determine how the upgrade or equipment replacement likely would have differed if the respondent had not received the program assistance. The initial question asks the respondent

[101] Pennsylvania Public Utility Commission, *Technical Reference Manual,* https://www.puc.pa.gov/filing-resources/issues-laws-regulations/act-129/technical-reference-manual/.
[102] Guidehouse, PECO PY16 NonResidential Impact Sample Design Memo FINAL, dated December 30, 2024.

to identify one of a limited set of options that best describes what most likely would have occurred without the program assistance.

The offered response options for the PY16 Non-Residential Small Business Direct Install component include:

- Would not have installed any energy efficient equipment
- Would have postponed installation
- Would have reduced the project size, scope, or efficiency
- Would have installed exactly the same equipment

The first two outcomes (would not have installed any energy efficient equipment and would have postponed installation) indicates zero free ridership and thus results in a score of 0.0. The second and third options indicate some free ridership, but not total free ridership (a score ranging from 0.125 to 0.375 for the intention component). The level of free ridership depends on responses to follow up questions: "How many months would you have postponed?" and "How much would your organization have reduced the size, scope, or efficiency of the project?"

Scoring of Intention Assessment for Small Business Direct Install

Table G-12 summarizes the possible response combinations to the questions described earlier and the intention score assigned to each unique combination.

Table G-12. Intention Scoring for Small Business Direct Install

	Response	Intention Score
FR1. Please select the option below that best describes what your business would have done if you had not participated in PECO Small Business Solutions.	My business would not have installed any energy efficient equipment	0.0
	My business would have postponed installation	0.0
	My business would have reduced the project size, scope, or efficiency	Based on response to FRS3
	My business would have installed exactly the same equipment	Based on response to FRS4
FR3. How much would your business have reduced the size, scope, or efficiency of the project?	Small reduction in size, scope, or efficiency (1% to 33% reduction)	0.375
	Moderate reduction in size, scope, or efficiency (34% to 66% reduction)	0.25
	Large reduction in size, scope, or efficiency (67%+ reduction)	0.125
	Don't know	0.25*
FR4. Would your business have paid the entire cost of the project?	Yes	0.50
	Don't know	0.375*
	No	0.25

* Represents the midpoint of possible values for this question.

Source: Guidehouse analysis

Influence

Program influence may be assessed by asking the respondent how much influence—from 0 (not at all influential) to 10 (extremely influential)—various program elements had on the decision to do the project the way it was done.

The program's influence score is equal to the maximum influence rating for any program element rather than, for example, the mean influence rating. The rationale is that if any given program element had a great influence on the respondent's decision, the program itself had a great influence, even if other elements had less influence.

Table G-13. Influence Scoring for Small Business Direct Install

Influence Element	Not at all Influential					Extremely Influential	Don't know
PECO sending a PECO Small Business Solutions representative to my business to identify energy efficiency opportunities	0	1-2	3-4	5-6	7-8	9-10	NA
The information provided by the PECO Small Business Solutions representative	0	1-2	3-4	5-6	7-8	9-10	NA
Ease of participation	0	1-2	3-4	5-6	7-8	9-10	NA
PECO Small Business Solutions marketing materials	0	1-2	3-4	5-6	7-8	9-10	NA
The discount that PECO Small Business Solutions provided on the cost of the project	0	1-2	3-4	5-6	7-8	9-10	NA
The payback on my investment	0	1-2	3-4	5-6	7-8	9-10	NA

Source: SWE Framework

High program influence and free ridership have an inverse relationship—the greater the program influence, the lower the free ridership, as Table G-11 shows.

Table G-14. Influence Scoring for Small Business Direct Install

Program Influence Rating	Influence Score
0 – not at all influential	0.50
1-2	0.44
3-4	0.38
5-6	0.25
7-8	0.13
9-10 – extremely influential	0.00
Don't know	0.25

Note: Guidehouse received approval from the SWE to shift from a 1-5 scale in Phase III to a 0-10 scale in Phase IV to align with the process evaluation best practices.

Source: SWE Framework

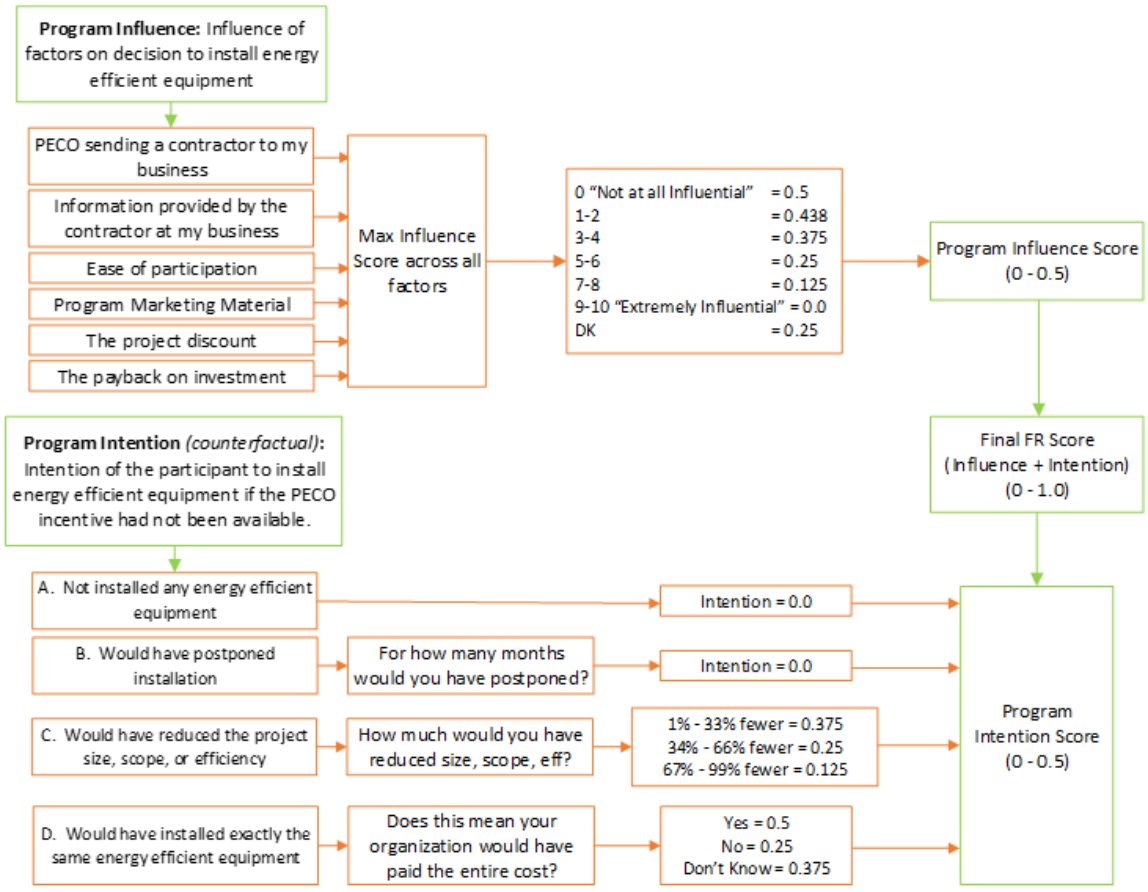
Total Free Ridership Score

Total free ridership is the sum of the intention and influence components, resulting in a score ranging from 0 to 1.00.

Free Ridership Algorithms

Figure G-9 details the algorithms used to estimate free ridership using self-reported survey responses for the Small Business Direct Install component.

Figure G-9. Free Ridership Algorithm – Small Business Direct Install



Source: Guidehouse analysis

G.3.2.2 Estimating Participant Spillover

The participant spillover battery of questions assessed, for each participant, the number and description of non-incented energy-efficient equipment installed since program participation; and the program's influence on the participant's decision to install those technologies. This section summarizes the spillover approach for the Small Business Direct Install component in PY16.

Identification of Non-Rebated Small Business Direct Install Equipment

The survey assessed the purchase and installation of any energy-efficient technologies, using the following questions:

- Since your business participated in PECO Small Business Solutions, have you installed any additional energy efficient equipment or made any energy efficiency improvements

for which you did not receive an incentive from PECO? (For example, upgrading insulation, installing new windows, or using canned spray foam.)

- [IF YES:] Please describe the energy-efficiency equipment. [Probe for equipment type, quantity, and why they did not receive an incentive]

Guidehouse asked about and documented all additional, non-rebated equipment installed since program participation, whether eligible for program rebates, in the TRM but not eligible, or not in the TRM.

Assessment of Program Influence on Non-Rebated Equipment

The survey asked respondents about the level of influence the prior program participation had on their decision to install the additional equipment. The survey asks:

- On a 0 to 10 scale, with 0 meaning “not at all influential” and 10 meaning “extremely influential,” how influential was your experience in the PECO Small Business Solutions program on your decision to install this additional equipment at your business?

Guidehouse asked the influence question only once to cover all the additional energy efficient equipment installed. The influence rating is assigned a value that determines what proportion of the equipment’s savings are attributed to the program:

- A rating of 8, 9, or 10 = 1.0 (full savings attributed to the program)
- A rating of 3, 4, 5, 6, or 7 = 0.5 (half of the savings attributed to the program)
- A rating of 0, 1, or 2 = 0.0 (no savings attributed to the program)

Assessment of Energy Savings

Where applicable, the savings for each additional piece of equipment installed were calculated per the TRM. For partially deemed equipment, Guidehouse developed conservative working assumptions for any required inputs (e.g., square footage of home, R-value improvement, replaced wattage) or identified average verified savings for such equipment. For equipment not in the TRM, Guidehouse conducted a brief engineering analysis to assess savings or, if applicable, identify an alternative source and methodology for assessing savings.

Guidehouse first calculated spillover savings for each piece of spillover equipment reported as the product of the equipment savings, number of units, and influence score:

$$Equipment\ SO = Savings * Number\ of\ Units * Program\ Influence$$

Guidehouse then:

- Totaled the savings associated with each program participant, to give the overall participant SO savings.

$$Participant\ SO = \Sigma\ Equipment\ SO$$

- Multiplied the mean participant SO savings for the participant sample by the total number of participants to yield an estimated total participant SO savings for the program.

$$\Sigma\ Participant\ SO\ (population) = (\sum\ [\![Participant\ SO\ (sample)]\!]) / (Sample\ n)$$

- Divided that total savings by the total program savings to yield a participant spillover percentage:

  % Participant SO = (∑ 〖Participant SO (population)〗) / (Program Savings)

Estimating the NTGR

Guidehouse estimated the final NTGR score using Equation G-3.

Equation G-3. NTGR Score Equation

$$NTG = 1 - Free\ Ridership + Spillover + Market\ Effects$$

Where:

$Free\ Ridership$	The estimated amount of savings that would have occurred even if the program did not exist
$Spillover$	The estimated amount of savings occurring outside of the program, but directly influenced by the program
$Market\ Effects$	The estimated amount of savings occurring in the Non-Residential marketplace due to general knowledge and education around energy efficiency, not to be double counted with spillover (Guidehouse did not conduct Market Effects research in PY16)

G.3.3 Process Evaluation

As described in the Phase IV Evaluation Plan[103] approved by the SWE, Guidehouse did not conduct in-depth process activities for this component in PY16. Instead, Guidehouse interviewed the PECO program managers and CSP staff to understand the goals of the program, identify significant implementation changes, and identify areas of strength and areas of improvement. Guidehouse will use findings from these interviews to inform evaluation research in future years.

G.4 New Construction

The New Construction component is designed to accelerate adoption of energy efficient design and construction practices in new and retrofit facilities. The program covers both new construction and buildings undergoing major renovation; major renovation is defined as construction projects that involve the complete removal, redesign, and replacement of two or more major building systems. The program provides facility designers and builders with training, design assistance, and financial incentives to incorporate energy efficient systems into their building designs. Many of the projects within the Non-Residential New Construction component involve efficient lighting, heating and cooling technologies, controls, and other measures. According to the Phase IV EE&C Plan,[104] this component is expected to account for 4% of Non-Residential EE Program energy savings, 3% of Non-Residential EE Program demand savings,

[103] Guidehouse, Phase IV Evaluation Plan, Energy Efficiency and Conservation Portfolio, revised November 18, 2024.
[104] PECO, *PECO Program Years 13 to 17 Act 129 – Phase IV Energy Efficiency and Conservation Plan*, filed June 19, 2024, https://www.puc.pa.gov/pcdocs/1834379.pdf.

3% of total portfolio energy savings, and 2% of total portfolio demand savings. DNV implements the New Construction component.

G.4.1 Gross Impact Evaluation

G.4.1.1 Methodology

Guidehouse conducted a tracking database analysis for all 50 projects across all 47 participants[105] in the component. This analysis used a combination of TRM default values and EDC-provided data for open variables. Guidehouse verified approaches, algorithms, and assumptions used to estimate reported gross savings at the measure level and recalculated gross energy and demand savings estimates to confirm whether the tracking database was accurate as reported. Guidehouse used a programmatic approach in this step based solely on inputs provided in the tracking database and the relevant TRM and IMP sections. Non-TRM-based measures passed through this step with no adjustments, and the adjusted database savings for these measures equaled the reported savings. Guidehouse applied the verification ratios from the PY15 evaluation of the New Construction program to the PY16 adjusted database savings for energy and demand to arrive at PY16 gross impact results.

G.4.2 Net Impact Evaluation

As described in the Phase IV Evaluation Plan[106] approved by the SWE, Guidehouse did not conduct NTG research for this component in PY16.

G.4.3 Process Evaluation

As described in the Phase IV Evaluation Plan[107] approved by the SWE, Guidehouse did not conduct in-depth process activities for this component in PY16. Instead, Guidehouse interviewed the PECO program managers and CSP staff to understand the goals of the program, identify significant implementation changes, and identify areas of strength and areas of improvement. Guidehouse will use findings from these interviews to inform evaluation research in future years.

[105] Participants are defined as the count of unique bill accounts.

[106] Guidehouse, Phase IV Evaluation Plan, Energy Efficiency and Conservation Portfolio, revised November 18, 2024.

[107] Guidehouse, Phase IV Evaluation Plan, Energy Efficiency and Conservation Portfolio, revised November 18, 2024.