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September 29, 2023

VIA E-Filing

Rosemary Chiavetta, 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, 2022 through May 31, 2023

Dear Secretary Chiavetta:

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 Final Annual Energy Efficiency & Conservation Report for the period June 1, 2022 through May 31, 2023.

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,

Rosemary Chiavetta, Secretary
September 29, 2023
Page 2

Enclosures

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Final Annual Report to the Pennsylvania Public Utility Commission Phase IV of Act 129

**Program Year 14
(June 1, 2022–May 31, 2023)**

**For Pennsylvania Act 129 of 2008
Energy Efficiency and Conservation Plan**

Prepared for:



Submitted by:

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September 30, 2023

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Acronyms

ASHP	Air Source Heat Pump
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
CO	Carryover
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
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 Protocols
kW	Kilowatt
kWh	Kilowatt-Hour

L	Liter
LAH	Lighting, Appliances & 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
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
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 nonparticipant 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 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.

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: The ratio of reported gross savings divided by the adjusted database savings.

Verification Ratio: The ratio of adjusted database savings divided by the verified gross 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 TRM¹ 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.
- **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.

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 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.



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).

PY14



302,048 MWh/yr
claimed of electric energy
savings, or 94% of target



55.66 MW/yr
claimed of peak
demand savings,
or 84% of target



\$82,299,189
spent in the
program year

Phase IV



651,456 MWh/yr
claimed of electric energy
savings (including Phase
III carry-over), or 47% of
target

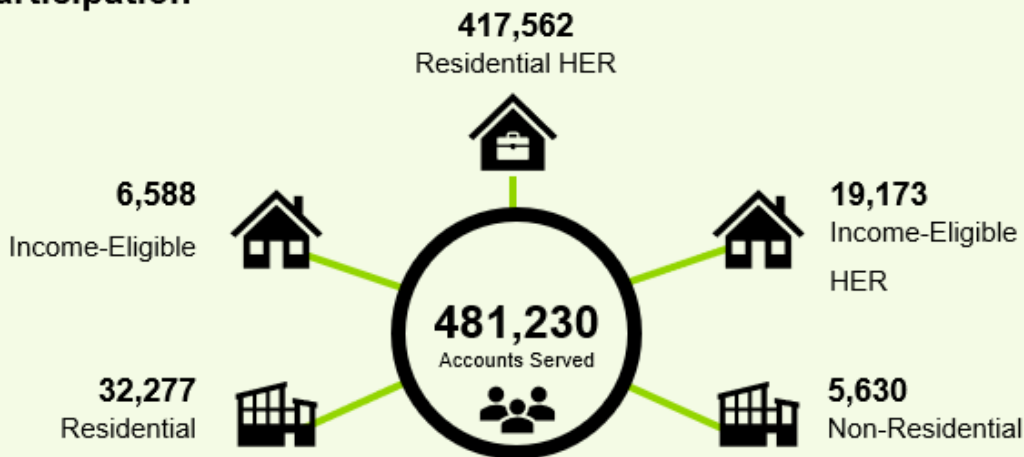


97.77 MW/yr
claimed of peak
demand savings,
or 38% of target



\$137,120,160
spent in the
phase to date

Participation



Benefit-Cost Ratios



1.83
Residential



1.00
Portfolio TRC



0.85
Non-Residential

Accounts served excludes Residential Rebates and Marketplace Upstream Lighting and Income-Eligible Giveaways. 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) plan² 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 14 (PY14), which spans June 1, 2022, through May 31, 2023, 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 programs in PY14. Compliance with Act 129 savings goals are ultimately based on verified gross savings. This report also includes estimates of cost-effectiveness according to the total resource cost (TRC)³ 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 PY14 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 considered 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 PECO, PECO Program Years 2021-2026 Act 129 – Phase IV Energy Efficiency and Conservation Plan, filed June 18, 2020, <https://www.puc.pa.gov/pcdocs/1666981.docx>.

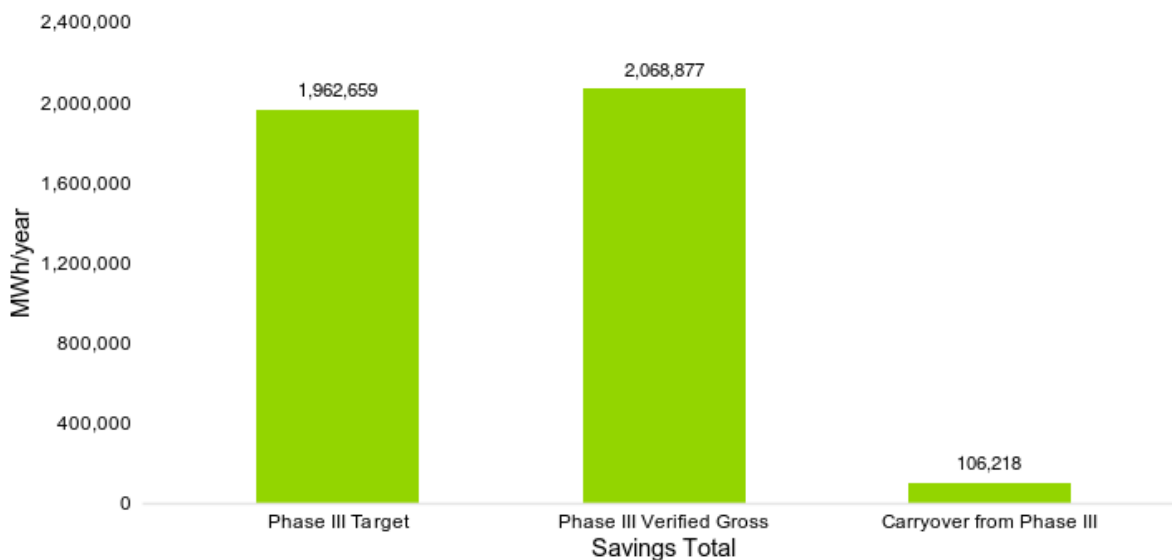
³ The Pennsylvania TRC Test for Phase I was adopted by PUC Order at Docket No. M-2009-2108601 on June 23, 2009 (2009 PA TRC Test Order). The TRC Test Order for Phase I later was refined in the same docket on August 2, 2011 (2011 PA TRC Test Order). The 2013 TRC Test Order for Phase II of Act 129 was issued on August 30, 2012. The 2016 TRC Test Order for Phase III of Act 129 was adopted by PUC Order at Docket No. M-2015-2468992 on June 11, 2015. The 2021 TRC Test Order for Phase IV of Act 129 was adopted by PUC Order at Docket No. M-2019-3006868 on December 19, 2019.

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 to the Phase III compliance target to illustrate the carryover calculation.

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



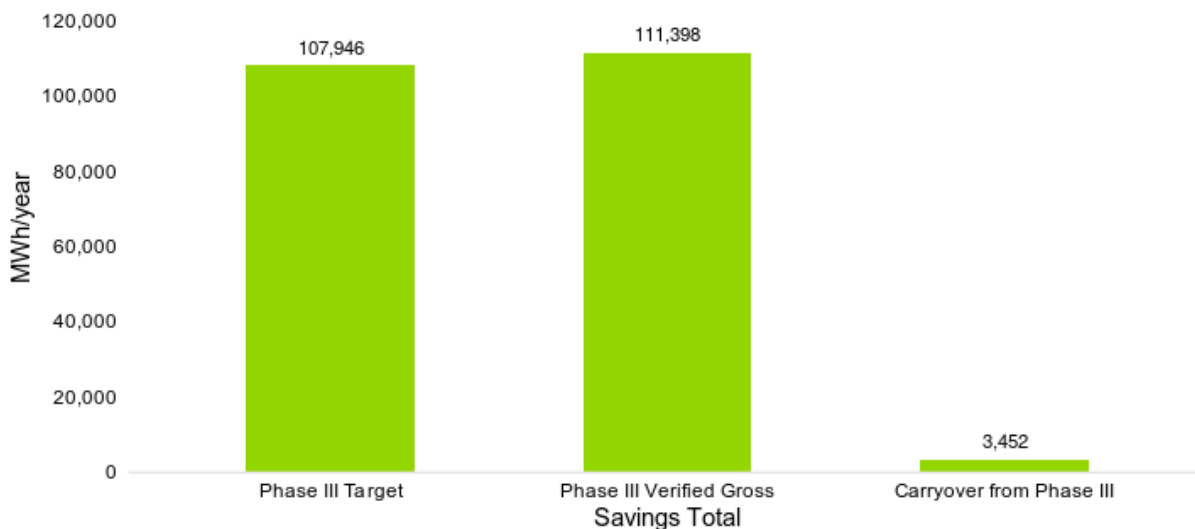
Sources: SWE Phase III Report⁴

The Commission's Phase IV Implementation Order⁵ also allowed EDCs to carry over savings in excess of the Phase III income-eligible (IE) savings goal.⁶ Figure 2-2 shows the calculation of carryover savings for the IE customer segment.

⁴ PA SWE, *SWE Annual Report Act 129 Phase III and Program Year 12*, March 31, 2022, <https://www.puc.pa.gov/pdocs/1746475.pdf>.

⁵ 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.

⁶ Proportionate to those savings achieved by dedicated Phase III IE programs.

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


Sources: SWE Phase III Report⁷

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 losses to reflect system-level savings. Since the beginning of PY14 on June 1, 2022, PECO has claimed:

- 302,566 MWh/yr of reported gross electric energy savings (PYRTD)
- 54.81 MW/yr of reported gross peak demand savings (PYRTD)
- 302,048 MWh/yr of verified gross electric energy savings (PYVTD)
- 55.66 MW/yr of verified gross peak demand savings (PYVTD)

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

- 541,041 MWh/yr of reported gross electric energy savings (RTD)
- 98.05 MW/yr of reported gross peak demand savings (RTD)
- 545,238 MWh/yr of verified gross electric energy savings (VTD)
- 97.77 MW/yr of verified gross peak demand savings (VTD)
 - This represents 38.2% of the May 31, 2026, peak demand savings compliance target of 256 MW/yr.

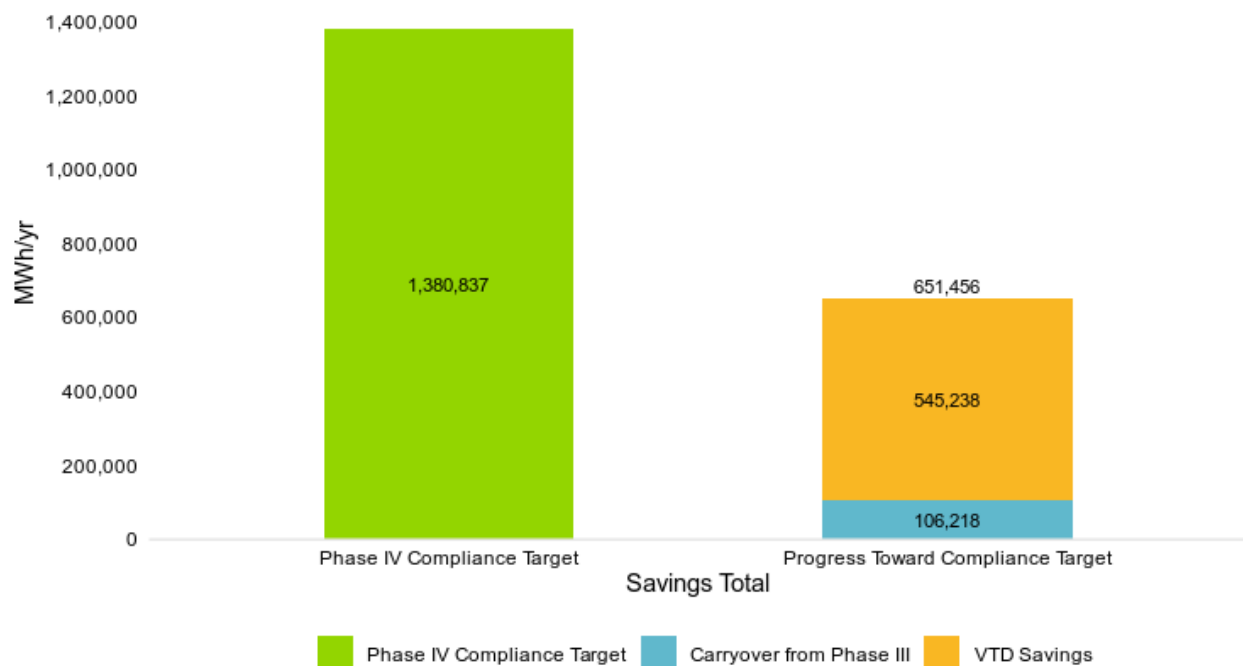
⁷ PA SWE, *SWE Annual Report Act 129 Phase III and Program Year 12*, March 31, 2022, <https://www.puc.pa.gov/pdocs/1746475.pdf>.

Including carryover savings from Phase III, PECO has achieved:

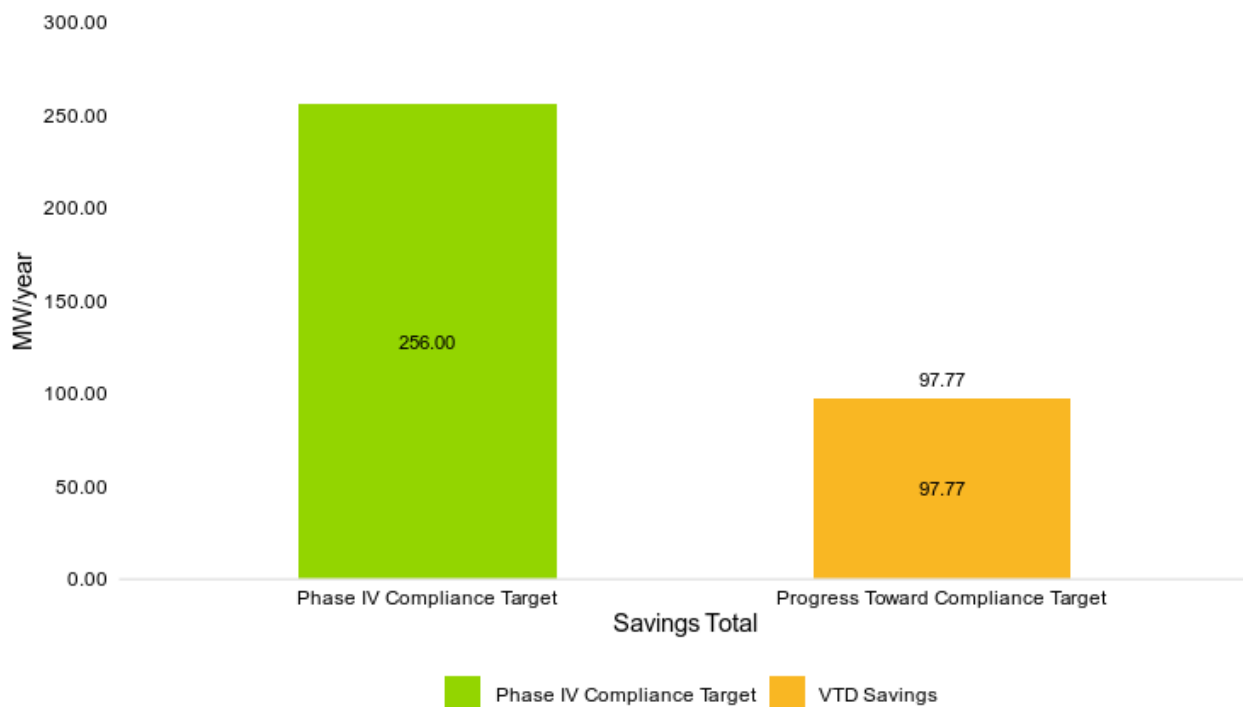
- 651,456 MWh/yr of VTD + portfolio-level CO energy savings — This represents 47.2% of the May 31, 2026, energy savings compliance target of 1,380,837 MWh/yr.

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

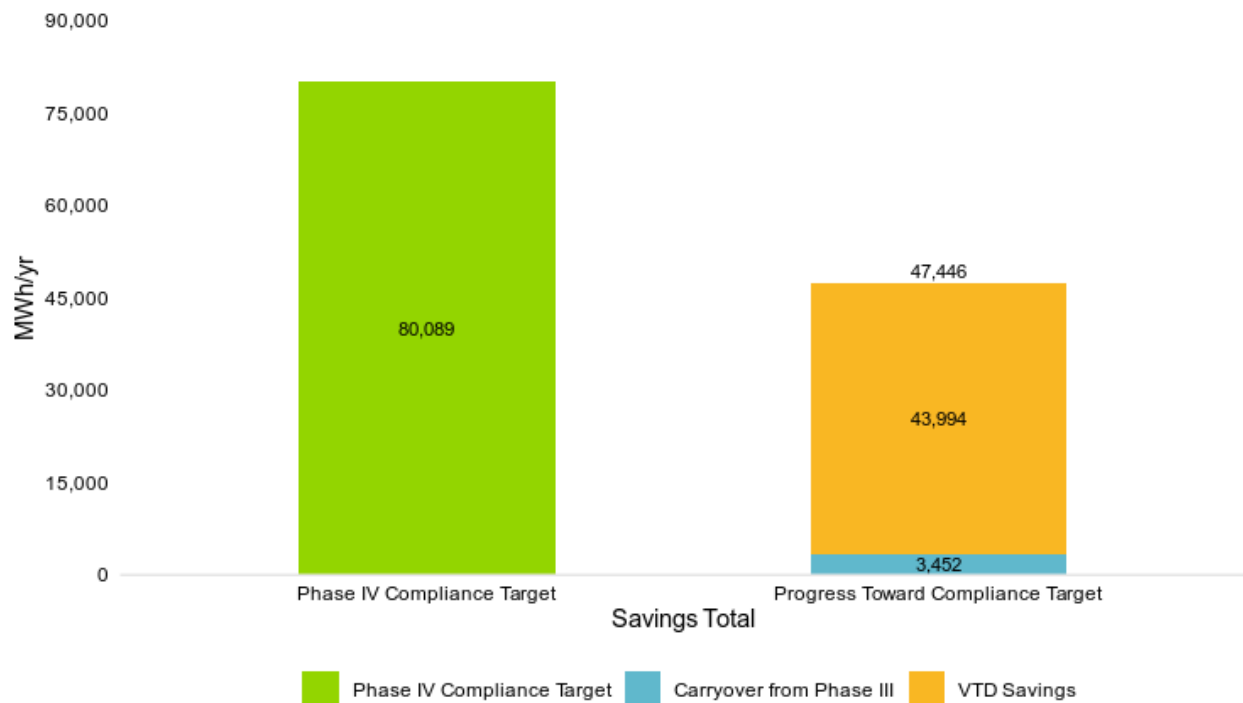
Figure 2-4. EE&C Plan Performance Toward Phase IV Portfolio Compliance Target (MW)


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 86 EE&C measures to its residential and non-residential customer classes. There are 25 measures available to the IE customer segment at no cost to the customer. This represents 29.4% of the total measures offered in the EE&C plan⁸ 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 to the Phase IV savings target. Based on the latest available information, PECO has achieved 59% of the Phase IV IE energy savings target.

⁸ PECO, *PECO Program Years 2021-2026 Act 129 – Phase IV Energy Efficiency and Conservation Plan*, filed June 18, 2020, <https://www.puc.pa.gov/pdocs/1666981.docx>.

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 8,801 MWh/yr of verified gross electric energy savings (PYVTD) from multifamily housing. This includes 1,708 MWh/yr of verified gross electric savings through the Residential Program multifamily component; 5,518 MWh/yr of verified gross electric energy savings (PYVTD) through the IE Program multifamily component; and 1,574 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 PY14. 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/non-profit (GNI) sector were 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 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. PY14 Summary Statistics by Customer Segment

Parameter	Residential (Non-IE)	Income-Eligible	Small C&I (Non-GNI)	Large C&I (Non-GNI)	Small C&I (GNI)	Large C&I (GNI)	Municipal Lighting	Total
Number of participants ¹	468,795	6,588	4,323	905	399	212	8	481,230
PYVTD MWh/yr	86,759	22,537	97,428	72,374	8,714	12,509	1,727	302,048

Parameter	Residential (Non-IE)	Income-Eligible	Small C&I (Non-GNI)	Large C&I (Non-GNI)	Small C&I (GNI)	Large C&I (GNI)	Municipal Lighting	Total
PYVTD MW/yr (system)	16.40	2.52	19.36	13.08	1.80	2.49	-	55.66
Incentives ² (\$1000)	7,564	4,863	18,934	52,801	1,991	2,018	364	88,534

¹ Includes pilot participants; excludes giveaways and upstream lighting from participants.

² Incentive totals also include Giveaway Costs as listed in the tracking data.

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	Small C&I (Non-GNI)	Large C&I (Non-GNI)	Small C&I (GNI)	Large C&I (GNI)	Municipal Lighting	Total
Number of participants ¹	1,059,153	40,155	6,399	1,869	771	386	30	1,108,763
VTD MWh/yr	148,243	34,706	149,568	171,709	16,583	21,717	2,712	545,238
VTD MW/yr (system)	27.51	3.67	30.50	28.45	3.40	4.23	0.01	97.77
Incentives ² (\$1000)	13,013	9,023	25,715	59,692	3,326	3,447	514	114,729

¹ Includes pilot participants; excludes giveaways and upstream lighting from participants.

² Incentive totals also include Giveaway Costs as listed in the tracking data.

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 channel 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 identifier by program year.
- Phase IV to date 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 Upstream Lighting delivery channel and Income-Eligible Single-Family Giveaways. Participation for those delivery channels is calculated as the sum of rebated measures. These are summarized separately in Table 2-4.

Table 2-3 provides the current participation for PY14 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
Rebates and Marketplace (exc. Upstream Lighting)	15,959	30,362
Appliance Recycling	9,294	18,637
In-Home Assessment	3,102	7,001
New Construction	1,973	3,864
Multifamily	86	247
Multifamily Income-Eligible	1,863	13,103
Residential Total	32,277	73,214
Single-Family	4,528	14,242
Appliance Recycling	1,986	3,636
Long-Term Savings	74	166
Income-Eligible Total	6,588	18,044
Residential HER	417,562	550,187
Income-Eligible HER	19,173	21,981
Downstream	908	1,609
Midstream	4,124	6,277
Small Business Direct Install	546	633
New Construction	52	83
Non-Residential Total	5,630	8,602
Portfolio Total	481,230	672,028

Source: Guidehouse analysis

Table 2-4. Upstream Lighting and Giveaway Measures

Program and Component	PYTD Participation	P4TD Participation
Rebates and Marketplace – Upstream Lighting	2,506,415	4,180,260
Income-Eligible Single-Family – Giveaways	102,399	340,356
Residential In-Home Assessment - Giveaways	96,609	96,609
Residential Multifamily - Giveaways	18,858	18,858
Residential Multifamily Income-Eligible - Giveaways	47,265	47,265
Upstream Lighting & Giveaway Total	2,771,546	4,683,348

Source: Guidehouse analysis

2.5 Summary of Impact Evaluation Results

During PY14, 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.

Table 2-5. Impact Evaluation Results Summary

Program and Component	Energy Realization Rate	Demand Realization Rate	NTG Ratio
Rebates and Marketplace	0.98	1.02	0.60
Appliance Recycling	1.08	1.06	0.53
In-Home Assessment	0.96	0.95	0.79
New Construction	1.01	0.65	0.55
Multifamily	0.60	0.64	0.99
Multifamily Income-Eligible	0.96	0.94	1.00
Residential Total	0.97	0.97	0.65
Single-Family	1.04	1.06	1.00
Appliance Recycling	1.08	1.05	1.00
Long-Term Savings	1.04	1.04	1.00
Income-Eligible Total	1.04	1.06	1.00
Residential HER	0.99	1.23	1.00
Income-Eligible HER	0.89	0.82	1.00
Downstream	0.93	0.91	0.72
Midstream	1.06	1.05	0.69
Small Business Direct Install	0.98	0.93	0.90
New Construction	1.03	1.14	0.39
Non-Residential Total	1.01	0.99	0.70
Portfolio Total	1.00	1.01	0.72

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 are 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 Table 2-6. Incremental Annual Energy Savings by Programs (MWh/Yr) presents a summary of the PY14 and Phase IV to date energy savings by program. The energy impacts in this report are presented at the meter level and do not reflect adjustments for transmission and distribution 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 the NTG ratio.

Table 2-6. Incremental Annual Energy Savings by Programs (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	58,515	56,823	37,029	100,524	97,686	64,901
Residential Income-Eligible	21,369	22,221	22,221	37,338	33,532	33,532
Residential HER	34,048	33,821	33,821	57,837	57,602	57,602
Residential Income-Eligible HER	1,246	1,108	1,108	2,039	1,903	1,903
Non-Residential	187,388	188,075	131,352	343,303	354,515	237,858
Portfolio Total	302,566	302,048	225,531	541,041	544,238	395,796

Source: Guidehouse analysis

The previously reported VTD savings from prior years for the following programs have changed since the PY13 final annual report was submitted:

- Residential: SWE audit activities recommended an adjustment of 75 MWh/year to the PY13 gross verified savings primarily due to adjustments to lighting wattage values.
- Income-Eligible: SWE audit activities recommended an adjustment of -756 MWh/year to the PY13 gross verified savings primarily due to kit-delivered faucet aerators, where kitchen installation location was assumed rather than “unknown” location.

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 EUL in PY14 ranges from 9-12 years while the home energy report 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 (MWh)	VTD Gross Lifetime (MWh)	VTD Net Lifetime (MWh)
Residential	687,882	448,004	1,180,230	807,418
Residential Income-Eligible	262,012	262,012	384,306	384,306
Residential HER	82,602	82,602	123,951	123,951
Residential Income-Eligible HER	2,706	2,706	3,501	3,501
Non-Residential	1,753,686	1,224,287	3,615,462	2,415,824
Portfolio Total	2,788,887	2,019,610	5,307,449	3,734,998

Source: Guidehouse analysis

The previously reported VTD lifetime savings from prior years, for the following programs, have changed since the PY13 final annual report was submitted:

- Residential: SWE audit activities recommended an adjustment of 75 MWh/year to the PY13 gross/net verified savings primarily due to adjustments to lighting wattage values. This corresponds to an adjustment of 1,183 MWh to the VTD gross lifetime savings and 864 MWh to the VTD net lifetime savings.

- Income-Eligible: SWE audit activities recommended an adjustment of -756 MWh/year to the PY13 gross/net verified savings primarily due to kit-delivered faucet aerators, where kitchen installation location was assumed rather than “unknown” location. This corresponds to an adjustment of -7,214 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 transmission and distribution 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	10.34	9.99	6.47	17.98	17.43	11.60
Residential Income-Eligible	2.35	2.50	2.50	4.16	3.75	3.75
Residential HER	5.54	6.83	6.83	9.41	10.93	10.93
Residential Income-Eligible HER	0.20	0.17	0.17	0.33	0.05	0.05
Non-Residential	36.38	36.18	25.26	66.16	65.60	44.35
Portfolio Total	54.81	55.66	41.22	98.05	97.77	70.68

Source: Guidehouse analysis

The previously reported VTD savings from prior years, for the following programs, have changed since the PY13 final annual report was submitted:

- Residential: SWE audit activities recommended an adjustment of 0.01 MW/year to the PY13 net verified savings primarily due to adjustments to lighting wattage values.
- Income-Eligible: SWE audit activities recommended an adjustment of -0.11 MW/year to the PY13 net verified savings primarily due to kit-delivered faucet aerators, where kitchen installation location was assumed rather than “unknown” location.

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).⁹ If the resources clear, proceeds flow back to the rate class that generated the Act 129 savings to offset cost recovery via riders. 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	24.9	24.9				
PY14	25.2	25.2	25.2	25.2	25.2			
PY15	15 to 44		15 to 44	15 to 44	15 to 44	15 to 44		
PY16	15 to 44			15 to 44	15 to 44	15 to 44	15 to 44	
PY17	10 to 28				10 to 28	10 to 28	10 to 28	10 to 28
Phase IV Total	90.1 to 166.1	50.1	65.1 to 94.1	80.1 to 138.1	65.2 to 141.2	40 to 116	25 to 72	10 to 28

DY = Demand Year for PJM

Source: Guidehouse analysis

PECO will submit no less than ten (10) MW and up to (50) MWs of PJM verified peak demand savings associated with each Act 129 program year into the PJM FCM on behalf of its customers over the five-year Phase IV EE&C Plan. PECO will target installed EE 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, M&V requirements, and anticipated resulting MW savings in the PJM FCM. The measures may include lighting, retrocommissioning, variable speed drives, new construction, and more. PECO hired a turnkey service provider to handle the strategy and details for bidding into PJM's FCM. This approach balances the benefits to PECO customers with the risk posed to customers by the potential for deficiency charges from PJM. All revenues, net of those paid to the Provider, will be returned to customers as an offset to Plan costs.

⁹ PECO has assigned capacity rights to CPower to nominate to the PJM FCM.

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 in PY14 and to date in Phase IV.

Table 2-10. Fuel Switching Summary

Metric	PY14	P4TD
Fuel Switching Measures Offered	CHP	CHP
Fuel Switching Measures Implemented	-	1
VTD gross Energy Savings Achieved via Fuel Switching (MWh/yr)	-	57,870
P4TD gross Increased Fossil Fuel Consumption Due to Fuel Switching Measures (MMBTU/yr)	-	229,451
P4TD Incentive Payments for Fuel Switching Measures (\$1,000)	-	\$2,000

Source: Guidehouse analysis

2.9 Summary of Cost-Effectiveness Results

A detailed breakdown of portfolio finances and cost-effectiveness is presented in Table 2-11. TRC benefits in Table 2-11 were calculated using gross verified impacts. Net present value (NPV) PY14 costs and benefits are expressed in 2022 dollars; Phase IV values are in nominal dollars.

Table 2-11. Summary of Portfolio Finances – Gross Verified

Row	Cost Category*	PYTD (\$1,000)		P4TD (\$1,000)	
1	Incremental Measure Costs (IMCs)	\$152,288		\$269,779	
2	Rebates to Participants and Trade Allies	\$22,343		\$41,970	
3	Upstream/Midstream Incentives	\$20,562		\$26,139	
4	Material Cost for Self-Install Programs (EE&C Kits)	\$2,744		\$4,657	
5	Direct Installation Program Materials and Labor	\$4,080		\$4,950	
6	Participant Costs (row 1 minus the sum of rows 2-5)	\$102,559		\$192,062	
		EDC	CSP	EDC	CSP
7	Program Design	\$0	\$0	\$0	\$0
8	Administration and Management	\$25,130	\$0	\$47,349	\$0
9	Marketing	\$3,879	\$0	\$9,285	\$0
10	Program Delivery	\$0	\$0	\$0	\$0
11	EDC Evaluation Costs	\$3,561		\$4,562	
12	SWE Audit Costs	\$0		\$0	
13	Program Overhead Costs (sum of rows 7-12)	\$32,570		\$61,196	
14	Total NPV TRC Costs (sum of rows 1 and 13)	\$184,858		\$330,975	
15	Total NPV Lifetime Electric Energy Benefits	\$79,201		\$148,619	
16	Total NPV Lifetime Electric Capacity Benefits	\$70,652		\$122,182	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	\$26,383		\$41,419	
18	Total NPV Lifetime Fossil Fuel Impacts	-\$10,168		-\$22,358	
19	Total NPV Lifetime Water Impacts	\$19,963		\$39,535	
20	Total NPV TRC Benefits (sum of rows 15-19)	\$186,032		\$329,399	

Row	Cost Category*	PYTD (\$1,000)	P4TD (\$1,000)
21	TRC Benefit-Cost Ratio (row 20 divided by row 14)	1.01	1.00

* 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. 4.2Appendix D shows the TRC ratios by program and for the portfolio.

2.10 Comparison of Performance to Approved EE&C Plan

Table 2-12 presents PY14 expenditures compared with the budget estimates set forth in the EE&C plan for PY14. PY14 values are presented in 2022 dollars. Program-level comparisons of expenditures to plans are presented in 4.2Appendix D.

Table 2-12. Comparison of Expenditures to Phase IV EE&C Plan (\$1,000)

Expenditures	Budget from EE&C Plan	Actual Expenditures	Ratio (Actual/Plan)
PY14 Portfolio	\$84,860	\$82,299	0.97
P4TD	\$159,320	\$137,120	0.86

Source: Guidehouse analysis

Table 2-13 compares PY14 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 4.2Appendix D.

Table 2-13. Comparison of Actual Program Savings to EE&C Plan Projections

Expenditures	EE&C Plan Projections	VTD Gross MWh Savings	Ratio (Actual/Plan)
PY14 Portfolio MWh	322,986	302,048	0.94
P4TD MWh	581,605	545,238	0.94
PY14 Portfolio MW	66.50	55.66	0.84
P4TD MW	119.40	97.77	0.82

Source: Guidehouse analysis

The following list briefly discusses specific reasons why verified savings exceeded or fell short of projected savings in PY14 as well as contextual market factors being faced by each program.

- The Residential EE Program achieved 125% of EE&C plan projections for PY14 for energy savings and 145% of EE&C plan projections for PY14 demand savings. This is a result of verified savings differing from reported savings for a variety of TRM-based measures, as well as adjustments made based on installation rates determined by online surveys and field work activities. Detailed evaluation activities can be found in Section 3.1 of this report.

- The Income-Eligible EE Program achieved 130% of EE&C plan projections for PY14 for energy savings and 96% of EE&C plan projections for PY14 demand savings. This is a result of verified savings differing from reported savings for a variety of TRM-based measures, as well as adjustments made based on installation rates determined by an online survey. Detailed evaluation activities can be found in Section 3.2 of this report.
- The Residential HER Program achieved 133% of EE&C plan projections for PY14 for energy savings and 69% of EE&C plan projections for PY14 for demand savings. Differences between verified savings and EE&C plan projections for PY14 are due to modelled evaluation findings. This is discussed in Section 3.3 of this report.
- The Income-Eligible HER Program achieved 78% of EE&C plan projections for PY14 for energy savings and 57% of EE&C plan projections for PY14 for demand savings. Differences between verified savings and EE&C plan projections for PY14 are due to modelled evaluation findings. This is discussed in Section 3.4 of this report.
- The Non-Residential EE Program achieved 81% of EE&C plan projections for PY14 energy savings and 77% of EE&C plan projections for demand savings, with realization rates of 100% for energy and 99% for demand when comparing verified to reported savings. The most influential items driving realization rates were updates to input parameters such as hours of use (HOU), coincidence factors (CFs), and heating and cooling types, based on evaluation findings. These details are discussed in Section 3.5 of this report. Market factors impacting PY14 implementation and participation included supply chain disruptions and may also include businesses being financially conservative with expenditures due to economic uncertainty (i.e., office buildings more hesitant to participate due to higher vacancy rates).

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

2.11 Findings and Recommendations

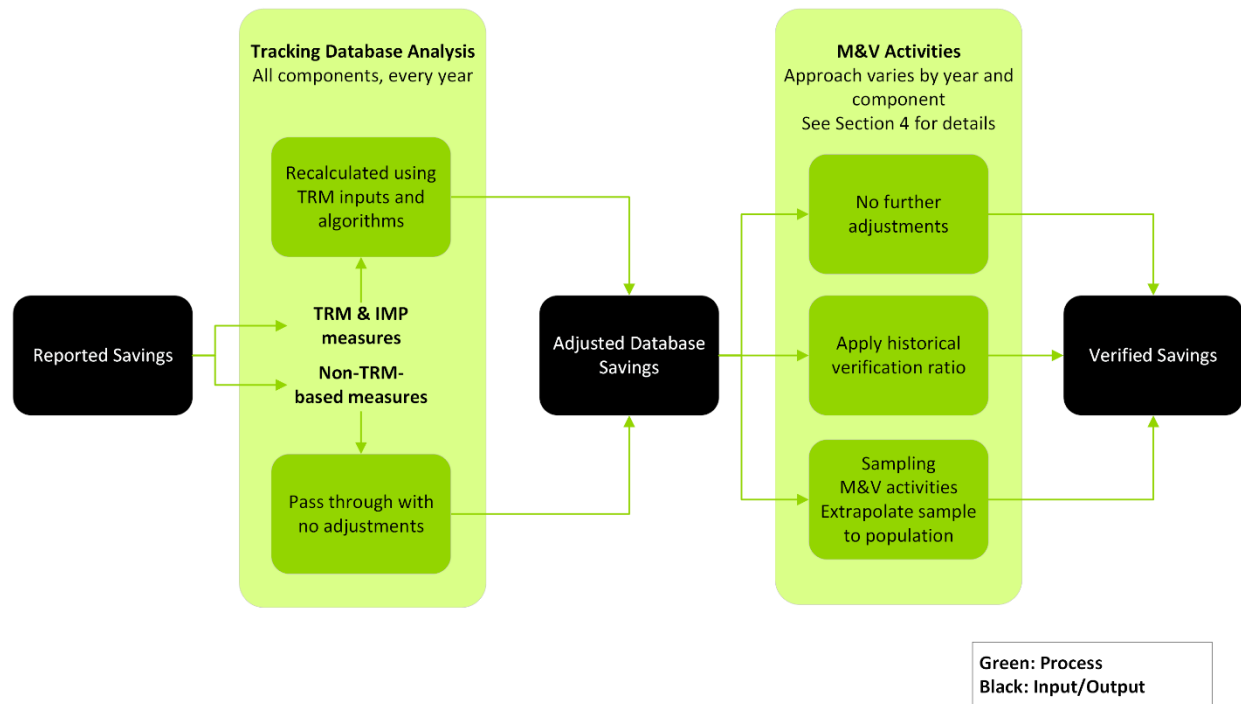
Guidehouse makes no overarching portfolio recommendations this year. See Sections 3.1.7, 3.2.7, 3.3.7, 3.4.7, and 3.5.7 for program-specific findings and recommendations.

3. Evaluation Results by Program

This section documents the gross impact, net impact, and process evaluation activities conducted in PY14 along with the outcomes of those activities.

Guidehouse used a two-part approach to determining verified gross impacts as described in the Evaluation Plan¹⁰ 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.” In the second part, Guidehouse determined the “verified savings” following the PY14 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” 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.

Figure 3-1. PECO Phase IV Verified Savings Pathways



Source: Guidehouse Evaluation Plan

Table 3-1. Gross Impact Evaluation Activities

Program	Component	PY13	PY14	PY15	PY16	PY17
Residential	Rebates and Marketplace	X	X ¹	X		
Residential	Appliance Recycling		X		X	
Residential	In-Home Assessment		X		X	

¹⁰ Guidehouse, *Phase IV Evaluation Plan, Energy Efficiency and Conservation Portfolio*, revised April 13, 2023.

Program	Component	PY13	PY14	PY15	PY16	PY17
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		X	
Income-Eligible	Long-Term Savings		X		X	
Income-Eligible HER	HER	X	X	X	X	X
Non-Residential	Downstream	X	X	X	X	X
Non-Residential	Midstream	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 except for upstream lighting, which had no further adjustments.

¹ Guidehouse conducted limited additional verification in PY14 of thermostat installations for the Marketplace delivery channel because of meaningful changes to implementation in PY13, including more detailed installation collateral, offering wiring kits to expand compatibility with a variety of wiring configurations, and connecting customers to installation contractors as needed.

Source: Guidehouse Evaluation Plan¹¹

Guidehouse similarly conducted process evaluation activities and determined verified net impacts as described in the Evaluation Plan¹¹ and shown in Table 3-2, where "X" denotes M&V activities, and a blank value denotes no specific research was undertaken in PY14.

Table 3-2. Process and NTG Evaluation Activities

Program	Component	PY13	PY14	PY15	PY16	PY17
Residential	Rebates and Marketplace		X ¹	X		NTG*
Residential	Appliance Recycling		Process	X	NTG	
Residential	In-Home Assessment		X			
Residential	New Construction		X	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		X		NTG*	
Non-Residential	Midstream	X ²	X ²			X ²
Non-Residential	New Construction		X	NTG		
Non-Residential	Small Business Direct Install		Process		NTG	

X indicates both process and NTG activities will be conducted in the same year. It is specified if only process or NTG activities occur in a given year.

* Indicates select high impact measures NTG evaluation through customer surveys.

¹ For the point of purchase pathway only in PY14

¹¹ Guidehouse, *Phase IV Evaluation Plan, Energy Efficiency and Conservation Portfolio*, revised April 13, 2023.

²Guidehouse contacted lighting distributors in PY13 for the Non-Residential Midstream Rebates component and plans to contact HVAC distributors in PY14 to gather process and NTG feedback.

Source: *Guidehouse Evaluation Plan*¹²

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 component having multiple pathways to participate. The Residential EE Program serves all customers who have a household income greater than 150% of the federal poverty level, also referred to as market-rate customers. The Appliance Recycling and Multifamily components serve both the Residential and Income-Eligible EE programs.

CMC 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 lighting, HVAC, appliances, and energy-saving devices. There are multiple delivery pathways to receive product rebates: Downstream, Trade Ally and Distributor Network, Marketplace, and Point of Purchase. The Phase IV Rebates and Marketplace component is implemented by CLEARResult.
- **Appliance Recycling:** The Appliance Recycling component focuses on recycling refrigerators, freezers, and window air conditioning units responsibly. The component serves both IE and market-rate customers. The Appliance Recycling component is implemented by ARCA.
- **In-Home Assessment (Single-Family):** The In-Home Assessment component provides in-home or virtual 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). The In-Home Assessment (Market-Rate) component is implemented by CLEARResult.

All In-Home Assessment program 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).

- **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. The New Construction component is implemented by PSD.
- **Multifamily:** The Multifamily component provides analysis, direct install measures, and larger, investment-level upgrades to improve the energy efficiency of multifamily buildings, both in tenant units and in common areas. The component serves buildings with market-rate customers, IE customers, and a mix of residential and commercial customer types. The Multifamily component for both the residential and IE segments is implemented by CMC. The IE and market-rate services are delivered consistently across

¹² Guidehouse, *Phase IV Evaluation Plan, Energy Efficiency and Conservation Portfolio*, revised April 13, 2023.

sectors, although incentives may vary. Verifying, sampling, and reporting program savings will differentiate between and allocate savings to either the Residential or Income-Eligible 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 PY14 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
PY14 # Participants ²	32,060	-	182	35	32,277
PYRTD MWh/yr	52,649	391	2,214	3,261	58,515
PYRTD MW/yr	9.61	0.04	0.35	0.33	10.34
PY14 Incentives (\$1,000)	7,564	42	122	244	7,971

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 lighting, but include pilot participants.

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 Plan¹³ for PY14. 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. Guidehouse was able to review all measures within the Residential EE Program. Guidehouse adjusted the verified savings based on discrepancies identified in the tracking database analysis. This results in adjusted database savings and the tracking database ratio.

Additionally, for the Rebates and Marketplace, Multifamily, Appliance Recycling, and In-Home Assessment components in PY14, Guidehouse conducted the following verification activities:

- **Rebates and Marketplace:** The evaluation team conducted both a customer survey and engineering desk review verification activities for a sample of 71 customers for ENERGY STAR Certified Connected Thermostats.
- **Appliance Recycling:** The evaluation team conducted both a customer survey and engineering desk review verification activities for a sample of 162 measures in PY14. The customer survey included both impact and process sections.

¹³ Guidehouse, *Phase IV Evaluation Plan, Energy Efficiency and Conservation Portfolio*, revised April 13, 2023.

- **In-Home Assessment:** The evaluation team conducted both a customer survey and engineering desk review verification activities for a sample of 185 customers in PY14. The customer survey included impact, NTG, and process sections.
- **Multifamily:** The evaluation team conducted both onsite verification and engineering desk-review verification activities for a sample of 60 customers in PY14.

All samples were designed and implemented to meet the targets set in Guidehouse's sampling design memos.¹⁴ Table 3-4. Residential Impact Survey Sample Targets and Completes 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. Additional detail of the impact evaluation completed in PY14 can be found in 4.2 Appendix E. Details on the survey activities, approach, incentives, sample targets and completes for the Appliance Recycling and In-Home Assessment surveys can be found in Section 3.1.5.1.

Table 3-4. Residential Impact Survey Sample Targets and Completes

Component	Stratum	Number Contacted	Target Completes	Actual Completes	Response Rate	Percentage of Target Achieved
Rebates and Marketplace	Thermostats	3,054	40	71	2%	178%
Multifamily	Kits	32	14	6	19%	43%
	High Impact	18	12	6	33%	50%
	Total	50	26	12	24%	46%
Multifamily - IE	Kits	88	14	42	47%	300%
	High Impact	22	10	6	27%	60%
	Total	110	24	48	44%	200%

Note: Details on the Appliance Recycling and In-Home Assessment Surveys can be found in Table 3-13. Residential Sample Targets and Completes

Source: Guidehouse analysis

The gross impact results for energy are presented in Table 3-5 and gross impact results for demand in Table 3-6.

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	33,763	0.98	0.03	0.00
Appliance Recycling	9,114	1.08	0.17	0.02
In-Home Assessment	4,593	0.96	0.56	0.06
New Construction	2,471	1.01	0.06	0.04
Multifamily	2,854	0.60	0.25	0.11
Multifamily Income-Eligible	5,720	0.96	0.27	0.06
Program Total	58,515	0.97	0.14	0.01 [90% C.L.]

Note: Guidehouse conducted tracking database analysis for all components and primary data collection and analysis for the Rebates and Marketplace (Thermostats), Appliance Recycling, Multifamily, and In-Home Assessment components in PY14. For the New Construction component, Guidehouse applied the energy and demand verification ratios from the PY13 evaluation to the results of the PY14 adjusted database analysis.

Source: Guidehouse analysis

¹⁴ PECO, PY14 Residential and IE Impact Sample Design Memo 03-16-23, dated March 16, 2023.

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	5.85	1.02	0.04	0.00
Appliance Recycling	1.96	1.06	0.14	0.02
In-Home Assessment	0.54	0.95	0.64	0.07
New Construction	0.97	0.65	0.11	0.04
Multifamily	0.41	0.64	0.36	0.16
Multifamily Income-Eligible	0.60	0.94	0.36	0.08
Program Total	10.34	0.97	0.14	0.01 [90% C.L.]

Note: Guidehouse conducted tracking database analysis for all components and primary evaluation activities for the Rebates and Marketplace (Thermostats), Appliance Recycling, Multifamily, and In-Home Assessment components in PY14. For the New Construction component, Guidehouse applied the energy and demand verification ratios from the PY13 evaluation to the results of the PY14 adjusted database analysis.

Source: Guidehouse analysis

The introduction to Section 3 describes the two-step evaluation method, which results in the ratios shown in Table 3-7 and Table 3-8. The tracking database analysis is conducted annually while the verification ratio may be historical based upon the evaluation plan.¹⁵ The tracking database ratio and the verification ratio together represent the overall energy or demand realization rate.

Table 3-7. Residential Energy Ratios

Program and Component	Energy Tracking Database Ratio	Energy Verification Ratio	Energy Realization Rate
Rebates and Marketplace	0.98	0.99	0.98
Appliance Recycling	1.05	1.03	1.08
In-Home Assessment	0.96	0.99	0.96
New Construction	1.00	1.01	1.01
Multifamily	0.92	0.65	0.60
Multifamily Income-Eligible	1.03	0.94	0.96
Residential Total	0.99	0.98	0.97

Note: The Verification Ratio for New Construction and Rebates and Marketplace, for all measures except Thermostats, is from PY13 verification activities.

Source: Guidehouse analysis

Table 3-8. Residential Demand Ratios

Program and Component	Demand Tracking Database Ratio	Demand Verification Ratio	Demand Realization Rate
Rebates and Marketplace	1.02	0.99	1.02
Appliance Recycling	1.04	1.02	1.06
In-Home Assessment	0.98	0.96	0.95
New Construction	1.00	0.65	0.65
Multifamily	0.94	0.68	0.64
Multifamily Income-Eligible	1.01	0.93	0.94

¹⁵ Guidehouse, *Phase IV Evaluation Plan, Energy Efficiency and Conservation Portfolio*, revised April 13, 2023.

Program and Component	Demand Tracking Database Ratio	Demand Verification Ratio	Demand Realization Rate
Residential Total	1.02	0.95	0.97

Note: The Verification Ratio for New Construction and Rebates and Marketplace, for all measures except Thermostats, is from PY13 verification activities.

Source: Guidehouse analysis

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

- Tracking Database Analysis:** For all components, Guidehouse adjusted savings across a variety of measures, including ENERGY STAR air purifiers, ENERGY STAR dehumidifiers, electronically commutated motor (ECM) fans, ENERGY STAR lighting, ductless heat pumps, air source heat pumps, and variable speed pool pumps. The measure adjustment with the largest impact on savings were made for ENERGY STAR lighting. The tracking database analysis resulted in an overall energy tracking database ratio of 0.99 and demand tracking database ratio of 1.02.
- Rebates and Marketplace Survey:** The ENERGY STAR Certified Connected Thermostats marketplace survey found that a portion of the population that purchased smart thermostats from the PECO marketplace had yet to install the measure because they planned to return it. Reasons for returning the thermostat include that the thermostat doesn't work or is incompatible with their HVAC system. However, ENERGY STAR Certified Connected Thermostats were also evaluated in PY13, and it was determined that adapters and additional instructions were needed to assist the customer in the installation of the measure. These updates were implemented in PY14, which led to an increase in realization rate of 15 points for smart thermostats (from 0.72 in PY13 to 0.87 in PY14). This resulted in a verification ratio of 0.99 for both energy and demand for the Marketplace pathway of the Rebates and Marketplace component.
- Appliance Recycling Survey:** This survey found that the reporting data on number and type of recycled appliances was accurate. Customers had positive feedback about the program and expressed a desire for more types of electronics (TVs, computers) and appliances to be eligible for the program. This resulted in an energy verification ratio of 1.03 and a demand verification ratio of 1.02 for the Appliance Recycling component.
- In-Home Assessment Survey:** This survey found that some customers did not have all of the reported advanced power strips or ENERGY STAR light bulbs installed. Ten out of 89 survey respondents indicated that their power strip was not installed, and 62 out of 94 respondents had fewer ENERGY STAR light bulbs installed than indicated in the tracking data. On average there were 23% fewer light bulbs installed. Most customers who did not have the power strips installed stated that it was because they did not like the power strip. However, the CSP was applying the deemed in-service rate (ISR) from the TRM even though these measures were directly installed, thus claiming very conservative savings for the program. When savings were calculated without these deemed ISRs, this increased the verified savings. These survey findings and verified savings adjustments resulted in an energy verification ratio of 0.99 and a demand verification ratio of 0.96 for the In-Home Assessment component.
- Multifamily Site Inspections:** This field verification effort included both residential multifamily and income-eligible multifamily customers. The onsite verification found very

low verification ratios for kits specifically. This was due to customers not installing items from the kits in their homes, including low-flow faucet aerators, low-flow showerheads, power strips, and ENERGY STAR light bulbs. The field team noted that the reasons for this include that customers didn't know how to install the items or were too busy to install the items. This resulted in an energy verification ratio of 0.65 and a demand verification ratio of 0.68 for the Multifamily component. For the Multifamily Income-Eligible component, the resulting energy verification ratio was 0.94, and the demand verification ratio was 0.93. Specific percent installation rates for various measures are outlined below:

- 76% of power strips were not installed
- 54% of showerheads were not installed
- 84% of aerators were not installed
- 9% of sites had zero ENERGY STAR light bulbs installed
- 1 site had only 34% of common area lights installed

3.1.3 Net Impact Evaluation

As described in the Phase IV Evaluation Plan¹⁶ for PY14 and in Table 3-2, Guidehouse conducted NTG research for the Residential EE Program's Rebates and Marketplace Point of Purchase,¹⁷ In-Home Assessment, New Construction, and Multifamily components. The evaluation team used the NTG values established in Phase III for all other programs and components. Program and component NTGRs are summarized in Table 3-9.

3.1.3.1 Methodology

Guidehouse followed the SWE's framework¹⁸ for conducting NTG research and analysis for Upstream and Downstream programs. The SWE guidance included detail on gathering feedback from upstream retailers about changes in stocking and selling practices due to the Residential EE Program and downstream participants about their *intentions* for installing energy efficient upgrades and the *influence* the program had on their purchasing decisions.

In PY14, Guidehouse decided to remove the Don't Know (DK) option from the intention question battery (also known as "the counterfactual scenario") for all PECO NTG research. This change aligns with other portfolios Guidehouse evaluates across the country that have also removed the DK option from the counterfactual scenario. The DK option allows respondents an easy way out of the counterfactual question rather than require them to consider what they would have done in absence of the program.

¹⁶ Guidehouse, *Phase IV Evaluation Plan, Energy Efficiency and Conservation Portfolio*, revised April 13, 2023.

¹⁷ The Point of Purchase pathway is a delivery channel of the Rebates and Marketplace component, also referred to as the Upstream Lighting program. Participating retail stores know it as the PECO's Retail LED Instant Discounts program.

¹⁸ SWE. Evaluation Framework for Pennsylvania Act 129 Phase IV Energy Efficiency and Conservation Programs. July 16, 2021. https://www.puc.pa.gov/media/1584/swe-phaseiv_evaluation_framework071621.pdf.

The following describes the general methodology for estimating the Residential EE program NTG ratio (NTGR) including definitions of free ridership (FR), spillover (SO), and market effects (ME) 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 of assessing 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. When scored, each metric results in a value ranging from zero to 0.5, and a combined total free ridership score from zero to 1.0.
- **Spillover:** The self-reported spillover (SO) battery collects data on additional program eligible equipment installations in homes that did not receive a program incentive. Survey questions gather high-level information on the type of equipment installed, including quantity and the replaced equipment, to allow for estimates of energy savings. The Guidehouse team divides the total spillover savings by the total gross savings for the sample to arrive at the SO result.
- **Market Effects:** Guidehouse did not conduct market effects research in PY14. Future market effects research could include interviews with customers who have not participated in any PECO program offerings, otherwise known as non-participants. These research efforts can help triangulate self-reported survey results but are often costly and burdensome to PECO customers.

Guidehouse estimated the final NTG ratio (NTGR) score using Equation 3-1.

Equation 3-1. NTG Ratio Equation

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

Where:

<i>Free Ridership</i>	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
<i>Spillover</i>	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
<i>Market Effects</i>	include savings not already captured by spillover; some examples of these effects include increased availability of efficient technologies through retail channels, reduced prices for efficient models, build-out of efficient model lines, and an increase in the ratio of efficient to inefficient goods sold or practices undertaken in the market; (Guidehouse did not conduct Market Effects research in PY14)

The following bullets summarize the methods used to estimate the NTG for each Residential EE program components. See Appendix E for further detail on the algorithms used for each component.

- **Rebates and Marketplace Component – Point of Purchase Pathway** (known to customers as the PECO Retail LED Instant Discounts program): In alignment with the process evaluation survey activity detailed in Section 3.1.5, Guidehouse completed two surveys with retail store managers participating in the Point of Purchase pathway. The survey asked participants about the impacts of the incentive on their sales of lighting equipment over the past year, or since they began participating in the program.¹⁹ The survey also asked how influential the incentive was on the store’s stocking and selling practices for qualifying bulbs.
- **In-Home Assessment:** Guidehouse received feedback from 185 In-Home Assessment participants in PY14 through the process evaluation survey effort.²⁰ The team fielded unique NTG batteries for participants who received direct install (DI) equipment (e.g., equipment either installed by the program auditor during the in-home assessment or through kits mailed directly to customers) versus participants who purchased and installed rebated equipment identified by the in-home assessment auditor.²¹ The team followed the SWE guidance on estimating NTG from DI equipment versus downstream rebated equipment and estimated free ridership (FR) and spillover (SO) separately for both pathways and combined the results by strata to estimate the overall component NTG. Appendix E provides detail on the NTG methods and algorithms used to estimate free ridership and spillover for the IHA component.
- **New Construction:** Guidehouse surveyed builders working in the PECO territory about their decisions to build homes to ENERGY STAR® Certified or Code Plus home standards and receive PECO rebates. The team was able to receive feedback from three out of 24 builders participating in the Residential New Construction component and used the results to estimate the NTG results shown in Table 3-9. See Appendix E for additional detail on the NTG methods and algorithms for the Residential New Construction component.
- **Multifamily:** Guidehouse surveyed Multifamily tenants and property managers participating in the Residential Multifamily component:
 - **Residential Tenants:** The team surveyed residential tenants to inquire about the influence of the program on their decision to install the energy efficient equipment in their unit and what they would have done without the program’s intervention. Multifamily residents do not often have a say in what equipment gets installed in their homes, so Guidehouse included a screening question to ask whether the resident or property manager made the decision to participate in the program. Tenants who reported not making the decision did not receive the NTG questions.
 - **Property Managers:** The Multifamily component also incentivizes Property Managers (PMs) to install energy efficient equipment in both common areas and

¹⁹ The NTG battery asked participants how long they had participated in the point of purchase pathway before asking about lighting sales prior to participation. Interviews with PECO and implementation staff showed the majority of stores have been participating in the pathway for many years, so for these stores, Guidehouse adjusted questions to talk about the impact of the pathway on sales for the past year only.

²⁰ See Section 3.1.5 for further detail on the PY14 survey effort.

²¹ The IHA auditor identifies equipment upgrade opportunities that qualify for an incentive through the Rebates and Marketplace component. Customers can choose to purchase the equipment and pursue the incentive after the audit.

residential units of the buildings they manage. Guidehouse surveyed seven PMs on the program's influence regarding their decisions to install equipment in common areas and residential units. Table 3-9. shows the combined Multifamily NTG result. Appendix E provides detail on the NTG methods and algorithms used for the entire Multifamily component.

3.1.3.2 NTG Results

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

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

Component	PYVTD	Free Ridership	Spillover	NTG Ratio	Relative Precision (@ 85% CL)
In-Home Assessment	4,389	0.41	0.20	0.79	0.22
New Construction	2,488	0.45	0.00	0.55	0.07
Multifamily	1,708	0.01	0.00	0.99	0.52

Source: Guidehouse analysis

- Rebates and Marketplace Component – Point of Purchase Pathway:** The two survey responses are not statistically representative of the population, and therefore Guidehouse did not report the results in the PY14 report. The two respondents revealed a high level of free ridership, which is on par with other upstream lighting programs Guidehouse evaluates. Changes in codes and standards for general service lamps along with the free-ridership results, supports the conclusion that incentives for Upstream Lighting program incentives are no longer required. 4.2Appendix E provides detail on the NTG algorithm used to estimate free ridership from the results of the NTG survey.
- In-Home Assessment:** Guidehouse analyzed results for Direct Install (DI) equipment versus rebated equipment. The team received 151 NTG survey responses for DI equipment and estimated a NTG of 0.76 (FR = 0.30; SO = 0.06). Thirty-three participants answered the NTG questions for rebated equipment resulting in a NTG of 0.72 (FR = 0.45; SO = 0.17). The team used the strata defined in the sample design to roll up the total IHA NTG result shown in Table 3-9.
- New Construction:** Guidehouse received three survey responses from the 24 builders operating in the PECO territory in PY14. Even with the low number of responses, NTG results were within a 10% relative precision to be representative of the population of builders.
- Multifamily:** The team received survey responses from 37 Multifamily tenants, exceeding the sample design quota of 25 completes, and seven responses from property managers.
 - Residential Tenants:** Thirty-five respondents were in the Income-Eligible (IE) rate class and did not receive the NTG questions. The SWE Framework allows a NTG result of 1.0 for IE participants who are often not making the decisions to participate in utility programs. The two market-rate customers responding to the survey said the property manager for their building made the decision to

participate in the program and installed the energy efficient equipment in their residential unit. Therefore, they were also screened out of the NTG questions.

- **Property Managers:** Three of the seven PMs reported installing equipment in both common areas and residential units, two reported installing equipment in only common areas, and two other PMs reported installing equipment in only residential units. Guidehouse analyzed NTG results from PMs on common area space versus residential unit space. Common area space had an NTG of 0.80 (FR = 0.20; SO = 0.0). Residential unit space had an NTG of 0.99 (FR = 0.01; SO = 0.0). Guidehouse applied the 0.80 result to the common area kWh savings and the 0.99 result to the residential unit kWh savings to roll up the entire Multifamily component result shown in Table 3-9.

3.1.3.3 High Impact Measure Research

As described in the Phase IV Evaluation Plan for PY14, Guidehouse used the NTG surveys for downstream components to conduct NTG research for High Impact Measures (HIMs) and identified the top three energy saving measures for the Residential program in PY14 (Table 3-10).

Table 3-10. Residential EE Program HIM Results

HIM	Percentage of Program Savings ¹	Free Ridership	Spillover	NTG Ratio
Ceiling/attic, wall, floor, and rim joist insulation	28.1%	0.55	0.25	0.70
Basement or crawl space wall insulation	26.0%	0.14	0.02	0.87
Residential air sealing	17.0%	0.58	0.93	1.35

¹ The total program savings used for the Percentage of Program Savings calculation only includes the IHA component of the Residential EE Program since it was the only downstream component evaluated in the PY14 evaluation cycle.

Source: Guidehouse analysis

- HIMs included in the PY14 evaluation come from the Rebated Measure pathway of the In-Home Assessment component of the Residential EE Program. Program auditors recommended participants pursue rebates for the HIMs in Table 3-10. The low level of free ridership for basement/crawl space insulation shows that program intervention was key for this measure's success.
- Participants receiving a rebate for residential air sealing reported also installing insulation and other program qualifying equipment but not applying for an incentive through the program. This resulted in a high level of spillover savings for the component.

3.1.4 Verified Savings Estimates

In Table 3-11, the realization rates and NTG ratios determined by Guidehouse are applied to the reported energy and demand savings estimates to calculate the verified savings estimates for the Residential EE Program in PY14.

Table 3-11. PY14 and P4TD Savings Summary

Savings Type	Energy (MWh/yr)	Demand (MW/yr)
PYRTD	58,515	10.34
PYVTD Gross	56,823	9.99
PYVTD Net	37,029	6.47
RTD	100,524	17.98
VTD Gross	97,686	17.43
VTD Net	64,901	11.60

Source: Guidehouse analysis

3.1.5 Process Evaluation

The PY14 process evaluation of the Residential EE Program included PECO program manager and CSP staff interviews and a participant survey regarding some components. This section summarizes the evaluation methods, data collection techniques, sample design, and key results related to the surveys.

3.1.5.1 Methodology

The team interviewed the PECO program managers and CSP staff to understand the goals of the program in PY14, identify significant implementation changes, and identify areas of strength and areas of improvement. Guidehouse also conducted six surveys, as Table 3-12 outlines. The surveys assessed customer satisfaction, likeliness to recommend the program to others (also known as net promoter score), and program awareness. Some 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	PM/CSP Interview	Survey	Survey Recipient	Additional Survey Topics
Rebates and Marketplace	√	√	Point of Purchase Retailers	NTG
Appliance Recycling	√	√	Participant	Impact
In-Home Assessment	√	√	Participant	NTG, impact
New Construction	√	√	Builders	NTG
Multifamily – Property Managers	√	√	Participant – Property Managers	NTG
Multifamily – Tenants	√	√	Participant – Tenants	NTG

Source: Guidehouse analysis

Guidehouse fielded the surveys to sampled participants via an online survey. The team developed the survey instrument according to SWE requirements and had the SWE review and approve in advance of fielding. The evaluation team defined the survey population based on customer activity data from eTRACK+.

As Table 3-13 presents, Guidehouse created target completes for each component based on eTRACK+ participation data. Sample design memos were reviewed and approved by the SWE prior to survey fielding. Because Guidehouse conducted the Residential EE Program and Income-Eligible EE Program process evaluation together, strata for the Income-Eligible EE Program are included in this table, as applicable.

Note that completes are defined as a survey that includes responses for all questions until the final two sections of the survey, demographics and wrap-up. For the process evaluation, Guidehouse used only survey completes for analysis, because the process questions were spread across multiple sections in the survey. This differs from the net impact evaluation, which used any survey responses that included responses to all NTG questions. All NTG questions were included together in a single section.

Table 3-13. Residential Sample Targets and Completes

Component	Stratum	Number Contacted	Target Completes	Actual Completes	Response Rate	Percentage of Target Achieved
Rebates and Marketplace	Retailers	37	Census attempt (target 32)	2	5%	6%
Appliance Recycling	Residential EE	1,828	20	127	7%	635%
	Income-Eligible EE	272	10	12	4%	120%
	Total	2,100	30	139	7%	463%
In-Home Assessment	Large	483	6	35	7%	583%
	Medium	1,696	10	101	6%	1010%
	Small	447	22	29	6%	132%
	Very low impact	310	6	19	6%	317%
	Total	2936	44	184	6%	418%
Residential New Construction	All builders	24	Census attempt (target 11)	3	13%	27%
Multifamily – Tenants	MF Tenants	50	25	2 ¹	4%	8%
	MF IE Tenants (Income-Eligible EE)	548	40	28	5%	70%
	Total	598	65	30	5%	46%
Multifamily – Property Managers	Multifamily Property Managers	42	Census attempt (target 22)	7	17%	32%

¹No Multifamily tenants were eligible for the NTG section of the survey.

Source: Guidehouse analysis

Guidehouse anticipated that some components 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 electronic gift card (e-gift card) through the Tango platform.
- Phone calls: Guidehouse called participants from low-response strata who had not yet completed the survey to ask if they could complete the survey by a given date. The caller also offered to complete the survey over the phone if that was easier for the participant. Participants who indicated they did not wish to complete the survey did not receive a second or third phone call, if applicable.

- PECO reminder: Guidehouse provided PECO an email template and a list of customers (name and email only) from low-response strata who had not yet completed the survey. PECO sent an email encouraging respondents to complete the survey by a given date.

The implementation of these efforts by each component is summarized in Table 3-14.

Table 3-14. Residential Survey Approach

Component	Incentive Offered	Phone Calls	PECO Reminder
Rebates and Marketplace	\$50	One phone call per retailer, if phone number available	Yes
Appliance Recycling	None	None	No
In-Home Assessment	\$25 for the first 100 respondents	None	No
Residential New Construction	\$100	None	No
Multifamily – Tenants	\$25	None ¹	No
Multifamily – Property Managers	\$50	Up to two phone calls per manager	Yes

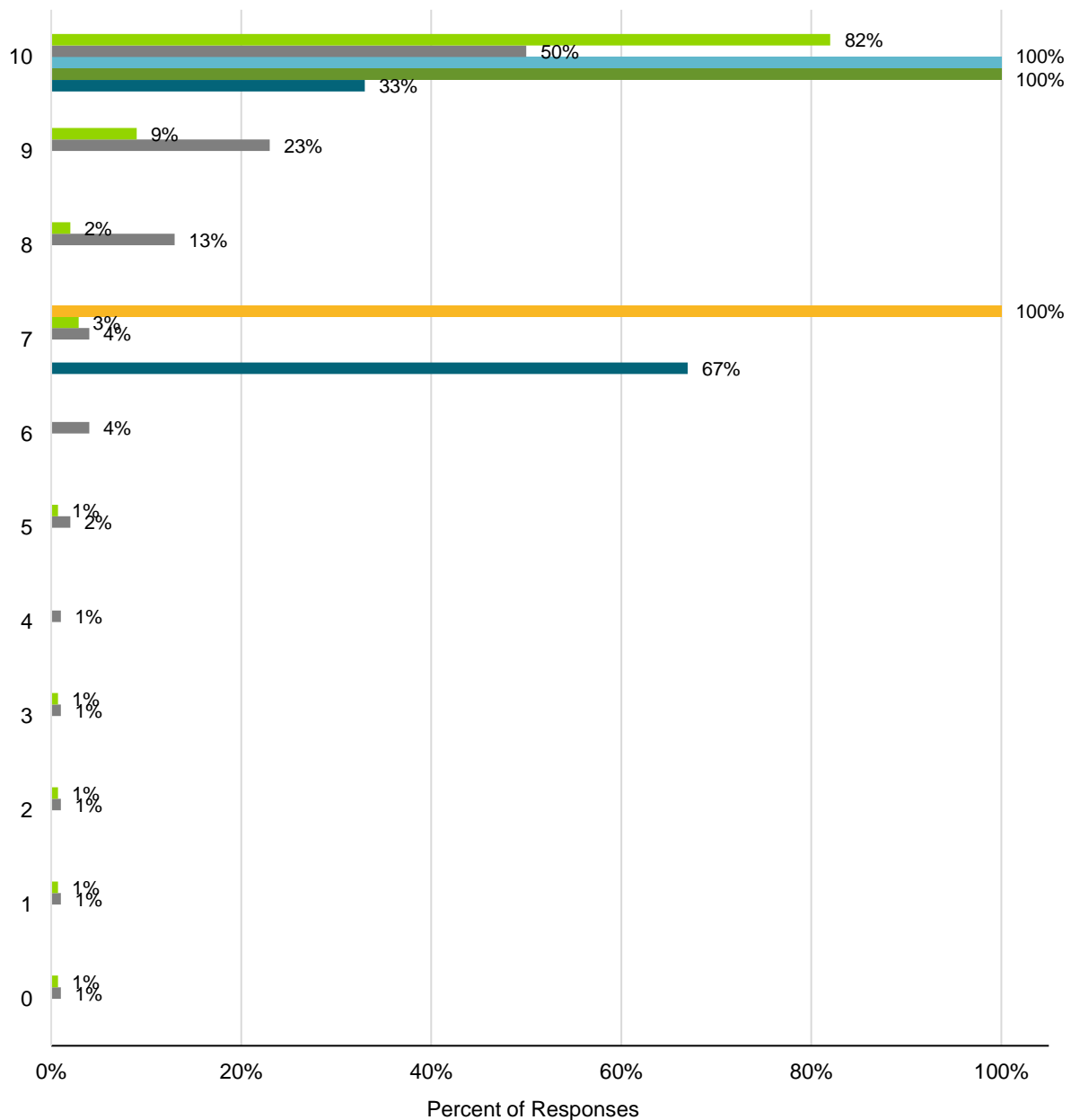
¹Based on Guidehouse's results from calling customers for the PY13 Home Energy Reports survey, Guidehouse judged that phone call reminders to Multifamily tenants would not yield additional survey completes. The Appliance Recycling and In-Home Assessment surveys exceeded target completes with email invitations only, so Guidehouse did not explore phone calls for those components.

Source: Guidehouse analysis

3.1.5.2 Key Findings from Process Evaluation

Guidehouse presents key findings for the Residential EE Program overall. Please see 4.2Appendix E for key findings by component.

As Figure 3-2 shows, respondents are overall satisfied with PECO's Residential EE Program. Most respondents listed their satisfaction as a 7 out of 10 or above, using a scale where 0 is "extremely dissatisfied" and 10 is "extremely satisfied". Respondents were most satisfied with the Multifamily component, which includes separate surveys for the tenants and property managers due to their different methods of engagement with the component. Within this component, 100% of respondents reported extreme satisfaction. It is important to note, however, that this component received low responses so this is based on low n values (Tenant n=1, Property Manager n=3). Following the Multifamily component, respondents most frequently reported they were extremely satisfied with the Appliance Recycling component (82%).

Figure 3-2. Residential EE Program Overall Satisfaction by Component


- Rebates and Marketplace (Point of Purchase) (n=1)
 ■ Appliance Recycling (n=127)
- In-Home Assessment (n=184)
 ■ Multifamily Property Manager (n=3)
- Multifamily Tenant (n= 1)
 ■ New Construction (n=3)

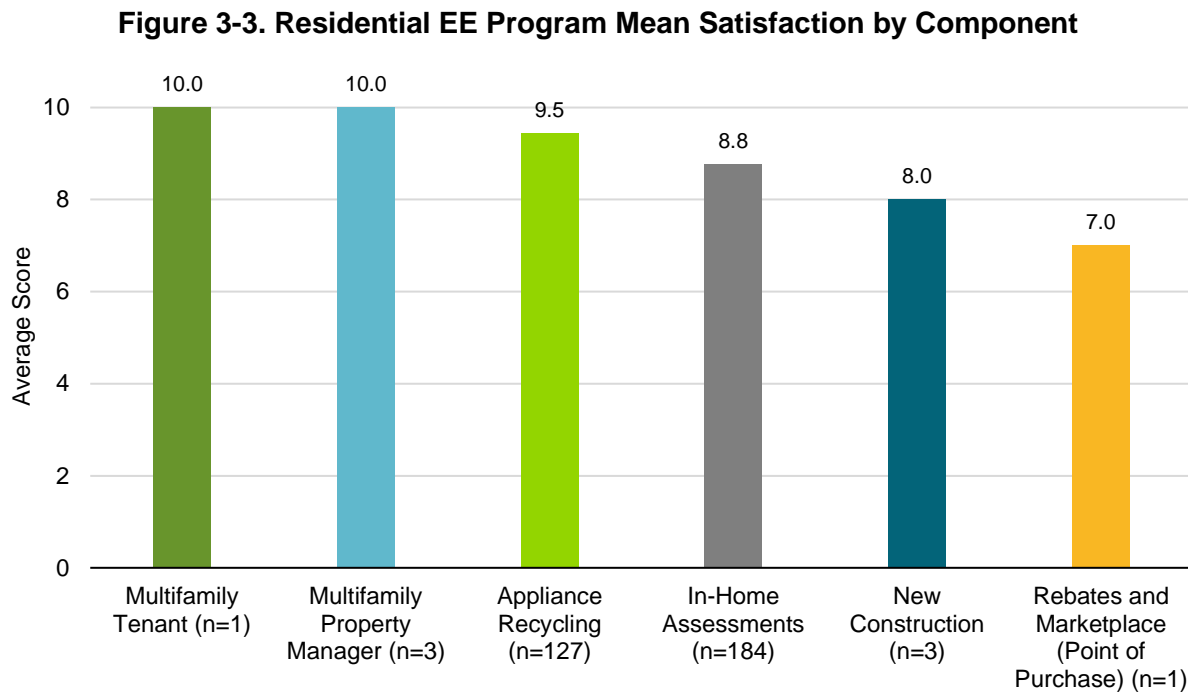
Respondents received the following question: “How would you rate your satisfaction with PECO’s [Component Name] overall?”

Guidehouse excluded “don’t know” responses from analysis.

Source: Guidehouse analysis

Mean satisfaction scores for all components reflect high levels of satisfaction as shown in Figure 3-3. All scores are a 7 out of 10 or above, using a scale where 0 is “extremely dissatisfied” and

10 is “extremely satisfied”. The mean satisfaction across all components of the Residential EE Program evaluated in PY14 is 9.1 out of 10.

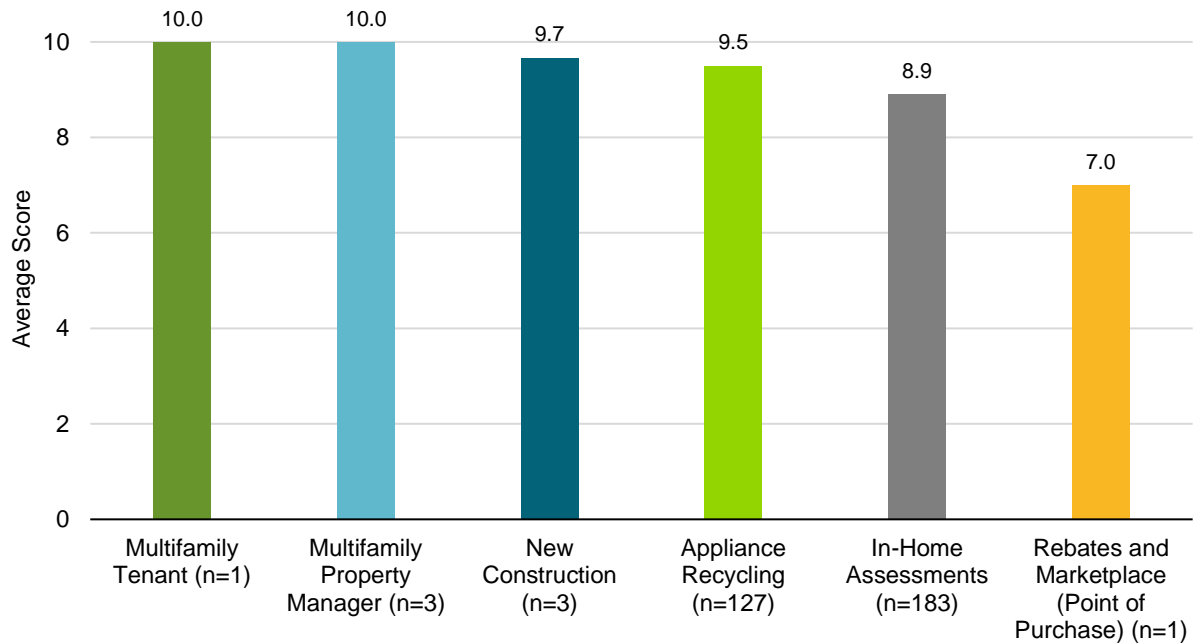


Respondents received the following question: “How would you rate your satisfaction with PECO’s [Component Name] overall?”

Guidehouse excluded “don’t know” responses from analysis.

Source: Guidehouse analysis

The mean likelihood to recommend PECO’s Residential EE Program is high as Figure 3-4. shows, with all scores being a 7 out of 10 or above using a scale where 0 is “not at all likely” and 10 is “extremely likely”. The mean likelihood to recommend across all components of the Residential EE Program evaluated in PY14 is 9.2 out of 10.

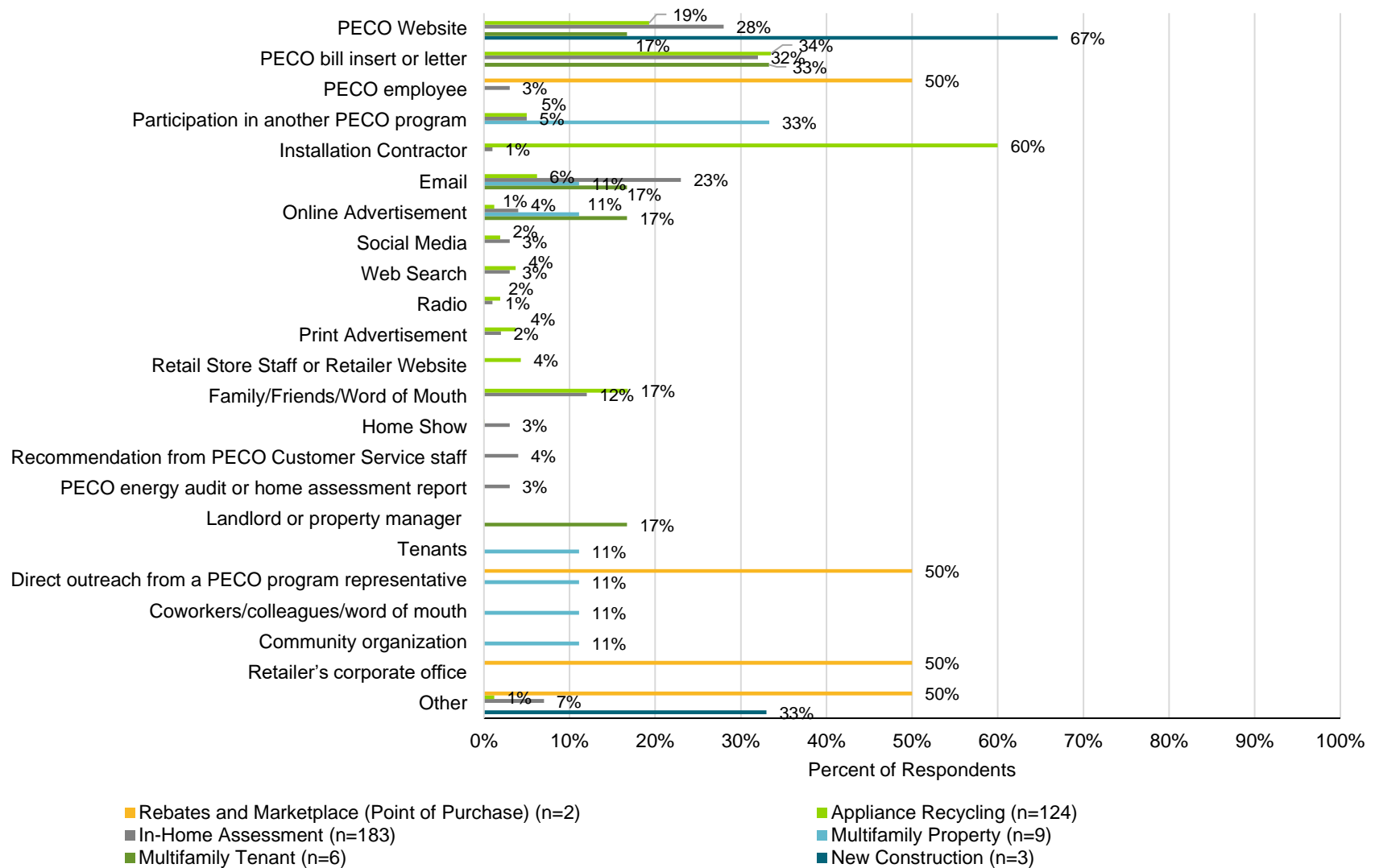
Figure 3-4. Residential EE Program Mean Likelihood to Recommend by Component


Respondents received the following question: “How likely are you to recommend PECO’s [Component Name] to others?”

Guidehouse excluded “don’t know” responses from analysis.

Source: Guidehouse analysis

Figure 3-5 indicates that for most components there is not one specific driver for program awareness. The PECO website and a PECO bill insert or letter appear to generate program awareness across several components.

Figure 3-5. Sources of Residential EE Program Awareness


Respondents received the following question: “How did you learn about PECO’s [Component Name]? Select all that apply.”

Guidehouse excluded “don’t know” responses from analysis.

Source: Guidehouse analysis

Detailed findings by component are presented in 4.2Appendix E.

3.1.6 Program Finances and Cost-Effectiveness Reporting

A detailed breakdown of program finances and cost-effectiveness is presented in Table 3-15. TRC benefits in Table 3-15 were calculated using gross verified impacts. NPV PY14 costs and benefits are expressed in 2022 dollars; Phase IV totals are in nominal dollars.

Table 3-15. Summary of Program Finances – Gross Verified

Row	Cost Category*	PYTD (\$1,000)		P4TD (\$1,000)	
1	Incremental Measure Costs (IMCs)	\$39,753		\$72,973	
2	Rebates to Participants and Trade Allies	\$4,235		\$9,960	
3	Upstream/Midstream Incentives	\$2,778		\$2,778	
4	Material Cost for Self-Install Programs (EE&C Kits)	\$959		\$1,356	
5	Direct Installation Program Materials and Labor	\$0		\$18	
6	Participant Costs (row 1 minus the sum of rows 2 through 5)	\$31,781		\$58,861	
		EDC	CSP	EDC	CSP
7	Program Design	\$0	\$0	\$0	\$0
8	Administration and Management	\$6,652	\$0	\$11,616	\$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)	\$6,652		\$11,616	
14	Total NPV TRC Costs (sum of rows 1 and 13)	\$46,405		\$84,589	
15	Total NPV Lifetime Electric Energy Benefits	\$19,527		\$32,979	
16	Total NPV Lifetime Electric Capacity Benefits	\$19,566		\$33,579	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	\$14,239		\$23,386	
18	Total NPV Lifetime Fossil Fuel Impacts	-\$4,332		-\$5,135	
19	Total NPV Lifetime Water Impacts	\$5,958		\$10,335	
20	Total NPV TRC Benefits (sum of rows 15 through 19)	\$54,959		\$95,127	
21	TRC Benefit-Cost Ratio (row 20 divided by row 14)	1.18		1.12	

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

Source: Guidehouse analysis

Table 3-16 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, O&M, interactive

effects, and secondary fossil fuel impacts. In addition, the NTGRs are applied to the IMC, therefore the IMC are different on a net savings basis compared to the gross savings basis.

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

Row	Cost Category*	PYTD (\$1,000)		P4TD (\$1,000)	
1	IMCs	\$25,890		\$50,141	
2	Rebates to Participants and Trade Allies	\$4,235		\$9,960	
3	Upstream/Midstream Incentives	\$2,778		\$2,778	
4	Material Cost for Self-Install Programs (EE&C Kits)	\$959		\$1,356	
5	Direct Installation Program Materials and Labor	\$0		\$18	
6	Participant Costs (row 1 minus the sum of rows 2 through 5)	\$17,919		\$36,029	
		EDC	CSP	EDC	CSP
7	Program Design	\$0	\$0	\$0	\$0
8	Administration and Management	\$6,652	\$0	\$11,616	\$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)	\$6,652		\$11,616	
14	Total NPV TRC Costs (sum of rows 1 and 13)	\$32,543		\$61,757	
15	Total NPV Lifetime Electric Energy Benefits	\$12,718		\$22,538	
16	Total NPV Lifetime Electric Capacity Benefits	\$12,743		\$22,973	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	\$9,274		\$15,950	
18	Total NPV Lifetime Fossil Fuel Impacts	-\$2,821		-\$3,420	
19	Total NPV Lifetime Water Impacts	\$3,881		\$7,076	
20	Total NPV TRC Benefits (sum of rows 15 through 19)	\$35,794		\$65,116	
21	TRC Benefit-Cost Ratio (row 20 divided by row 14)	1.10		1.05	

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

Source: Guidehouse analysis

3.1.7 Status of Recommendations

The impact and process evaluation activities in PY14 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 3-17. Summary of Evaluation Recommendations

Component	Evaluation Activity	Finding	Recommendation	EDC Status
Rebates and Marketplace	Impact	In the PY13 Marketplace impact survey, Guidehouse found evidence of thermostat incompatibility and returns. PECO adjusted its offerings by adding an adapter and additional educational material to the marketplace. Guidehouse conducted an independent evaluation of this component in PY14 and discovered an increase in realization rate from PY13 (0.72) to PY14 (0.87), thus demonstrating that PECO's adjustments had a positive impact on the program.	Continue identifying opportunities to improve customer interactions and measure installation rates with educational program materials.	In Process
Rebates and Marketplace	Impact	Guidehouse conducted an independent evaluation of thermostats via customer survey in PY14. One question asked customers if they planned to return their thermostat. For the customers who responded "yes", a majority provided written-in open comments that stated frustration with the returns process including slow response times from PECO, difficulty finding contact information to complete the return, delays in refunds, incorrect address listed for the return, and overall poor experience from the customer's perspective.	Identify ways to improve customer service to customers with difficulties operating or installing their thermostats to reduce the desire for returns and identify ways to improve customer experience for customers who want to complete a return.	In Process
Rebates and Marketplace	Impact	During Guidehouse's program database review for thermostats, the team identified two jobIDs with inflated savings due to the incorrect mapping of the heating system type.	Confirm that the correct heating system type is included in eTRACK+.	In Process
In-Home Assessment	Impact	<p>The IHA survey found:</p> <ul style="list-style-type: none"> approximately 15% of IHA customers no longer use the installed power strips. a discrepancy in the quantity of ENERGY STAR light bulbs as compared to reported. <p>An error in the eTRACK+ method of calculating ENERGY STAR lighting savings also contributed to a reduction in verified savings.</p>	<p>The CSP should focus on ensuring that its reporting of installed measures is accurate and explain to customers how each measure saves energy to entice them to continue using the measure as intended.</p> <p>The CSP has started to implement updated deemed savings algorithms and default inputs to match the TRM and IMPs, which will improve realization rates in future program years.</p>	Implemented
Multifamily	Impact	Guidehouse conducted onsite verification for Multifamily kits in PY14. The field team found a low installation rate for measures including low-flow faucet aerators, low-flow showerheads, power strips, and ENERGY STAR light bulbs. Customers most often cited that they did not know how to install the items or were too busy to install the items.	Due to the low installation rate, Guidehouse recommends discontinuing the distribution of Multifamily kits.	Implemented

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 IE EE Program serves customers with household income less than or equal to 150% of the federal poverty level. 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 IE EE Program and the Residential EE Program.

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

- **Appliance Recycling:** The Appliance Recycling component focuses on responsibly recycling refrigerators, freezers, and window air conditioning units. The component serves both IE and market-rate customers. The Appliance Recycling component is implemented by ARCA.
- **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. The Single-Family component is implemented by CMC. There are multiple pathways to receive program services. The Free Home Energy Check-Ups Program and Low Income Usage Reduction Program (LIURP)²² offer consistent services for IE households but are differentiated by funding sources.

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, although they are reported as discrete evaluation results.

- **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. The Long-Term Savings component is implemented by CMC.

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. The implementation and evaluation approaches are consistent with the Single-Family component, although they are reported as discrete evaluation results.

3.2.1 Participation and Reported Savings by Customer Segment

Table 3-18 presents the participation counts, reported energy and demand savings, and incentive payments for the IE EE Program in PY14 by customer segment.

Table 3-18. Income-Eligible EE Program Participation and Reported Impacts

Parameter	Income-Eligible	Total
PY14 # Participants ¹	6,588	6,588
PYRTD MWh/yr	21,369	21,369
PYRTD MW/yr	2.35	2.35

²² LIURP funding is not part of the Act 129 program.

Parameter	Income-Eligible	Total
PY14 Incentives (\$1,000)	4,821	4,821

¹ Participant counts exclude IE single-family giveaways but includes pilot participants. Savings and incentives from this pathway are included.

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 Plan²³ for PY14. 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.

Additionally, for the Appliance Recycling, Single-Family, and Single-Family Long-Term Savings components in PY14, Guidehouse conducted the following verification activities:

- **Appliance Recycling:** The evaluation team conducted both a customer survey and engineering desk review verification activities for a sample of 14 measures in PY14. The customer survey included both impact and process sections.
- **Single-Family Income-Eligible and Long-Term Savings:** The evaluation team conducted both a customer survey and engineering desk review verification activities for a sample of 138 projects in PY14.

All samples were designed and implemented to meet the targets set in Guidehouse's sampling design memos.²⁴ Table 3-19 outlines the impact survey sample targets and completes. Additional detail of the impact evaluation completed in PY14 can be found in 4.2Appendix E. Guidehouse conducted the Residential EE Program and Income-Eligible EE program impact evaluation together. See additional details on methodology in Section 3.1.2 and 3.1.5.1.

Table 3-19. Income-Eligible Impact Survey Sample Targets and Completes

Component	Number Contacted	Target Completes	Actual Completes	Response Rate	Percentage of Target Achieved
Single-Family Income-Eligible	4,000	126	138	4%	102%

Note: Details on Appliance Recycling can be found in Table 3-13.

Source: Guidehouse analysis

The gross impact results for energy are presented in Table 3-20 and gross impact results for demand in Table 3-21.

Table 3-20. 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	19,883	1.04	0.45	0.06
Appliance Recycling	1,231	1.08	0.17	0.02

²³ Guidehouse, *Phase IV Evaluation Plan, Energy Efficiency and Conservation Portfolio*, revised April 13, 2023.

²⁴ Guidehouse, *PY14 Residential and IE Impact Sample Design Memo 03-16-23*, dated March 16, 2023.

Component	PYRTD MWh/yr	Energy Realization Rate	Sample CV or Error Ratio	Relative Precision at 85% C.L.
Long-Term Savings	255	1.04	-	0.88
Program Total¹	21,369	1.04	0.46	0.07 [90% C.L.]

¹ The Multifamily IE 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 3-21. 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	2.04	1.06	0.52	0.07
Appliance Recycling	0.30	1.05	0.14	0.02
Long-Term Savings	0.01	1.04	-	0.79
Program Total¹	2.35	1.06	0.52	0.08 [90% C.L.]

¹ The Multifamily IE 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 shown in Table 3-22 and Table 3-23. The tracking database analysis is conducted annually while the verification ratio may be historical based upon the evaluation plan.²⁵ The tracking database ratio and the verification ratio together represent the overall energy or demand realization rate.

Table 3-22. Income-Eligible Energy Ratios

Program and Component	Energy Tracking Database Ratio	Energy Verification Ratio	Energy Realization Rate
Single-Family	0.97	1.07	1.04
Appliance Recycling	1.04	1.03	1.08
Long-Term Savings	1.02	1.02	1.04
Income-Eligible Total	0.97	1.07	1.04

Source: Guidehouse analysis

Table 3-23. Income-Eligible Demand Ratios

Program and Component	Demand Tracking Database Ratio	Demand Verification Ratio	Demand Realization Rate
Single-Family	0.98	1.08	1.06
Appliance Recycling	1.03	1.02	1.05
Long-Term Savings	1.01	1.03	1.04
Income-Eligible Total	0.99	1.07	1.06

Source: Guidehouse analysis

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

²⁵ Guidehouse, *Phase IV Evaluation Plan, Energy Efficiency and Conservation Portfolio*, revised April 13, 2023.

- **Tracking Database Analysis:** Guidehouse adjusted savings across a variety of measures, including air source heat pumps, insulation, ENERGY STAR lighting, ENERGY STAR room air conditioners, refrigerator recycling, and air sealing. The adjustment that had the largest impact on savings was a correction to the baseline wattage for decorative LED bulbs. These updates resulted in an energy tracking database ratio of 0.97 and a demand tracking database ratio of 0.99 for the Income-Eligible EE program.
- **Appliance Recycling Survey:** This survey found that the reporting data on number and type of recycled appliances was accurate. Customers had positive feedback about the program and expressed a desire for more types of electronics (TVs, computers) and appliances to be eligible for the program. This resulted in an energy verification ratio of 1.03 and a demand verification ratio of 1.02 for the Appliance Recycling component.
- **Single-Family and Long-Term Savings Survey:** This survey found that some customers did not have all the reported low-flow faucet aerators, low-flow showerheads, power strips, and ENERGY STAR light bulbs installed. Customers mostly stated that the reason for this is that they just have not installed the measures yet, or that they did not have time to install the measure. However, the CSP was claiming conservative savings for this program by applying the deemed ISR from the TRM, even though these measures were directly installed. When savings were calculated without these deemed ISRs, this increased the verified savings. This resulted in an energy verification ratio of 1.07 for the Single-Family component.

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.²⁶

3.2.3.1 High Impact Measure Research

Guidehouse did not evaluate HIMs for the Income-Eligible EE Program in PY14.

3.2.4 Verified Savings Estimates

In Table 3-24, the realization rates and NTG ratios 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 PY14.

Table 3-24. PY14 and P4TD Savings Summary

Savings Type	Energy (MWh/yr)	Demand (MW/yr)
PYRTD	21,369	2.35
PYVTD Gross	22,221	2.50
PYVTD Net	22,221	2.50
RTD	37,338	4.16
VTD Gross	33,532	3.75
VTD Net	33,532	3.75

Source: Guidehouse analysis

²⁶ SWE. Evaluation Framework for Pennsylvania Act 129 Phase IV Energy Efficiency and Conservation Programs. July 16, 2021. https://www.puc.pa.gov/media/1584/swe-phaseiv_evaluation_framework071621.pdf.

3.2.5 Process Evaluation

The PY14 process evaluation of the Income-Eligible EE Program included PECO program manager and CSP staff interviews and a participant survey regarding some components. This section summarizes the evaluation methods, data collection techniques, sample design, and key results related to the surveys.

3.2.5.1 Methodology

The team interviewed the PECO program managers and CSP staff to understand the goals of the program in PY14, identify significant implementation changes, and identify areas of strength and areas of improvement. Guidehouse also conducted several surveys, as Table 3-25 outlines.

Table 3-25. Income-Eligible EE Program Process Activities by Component

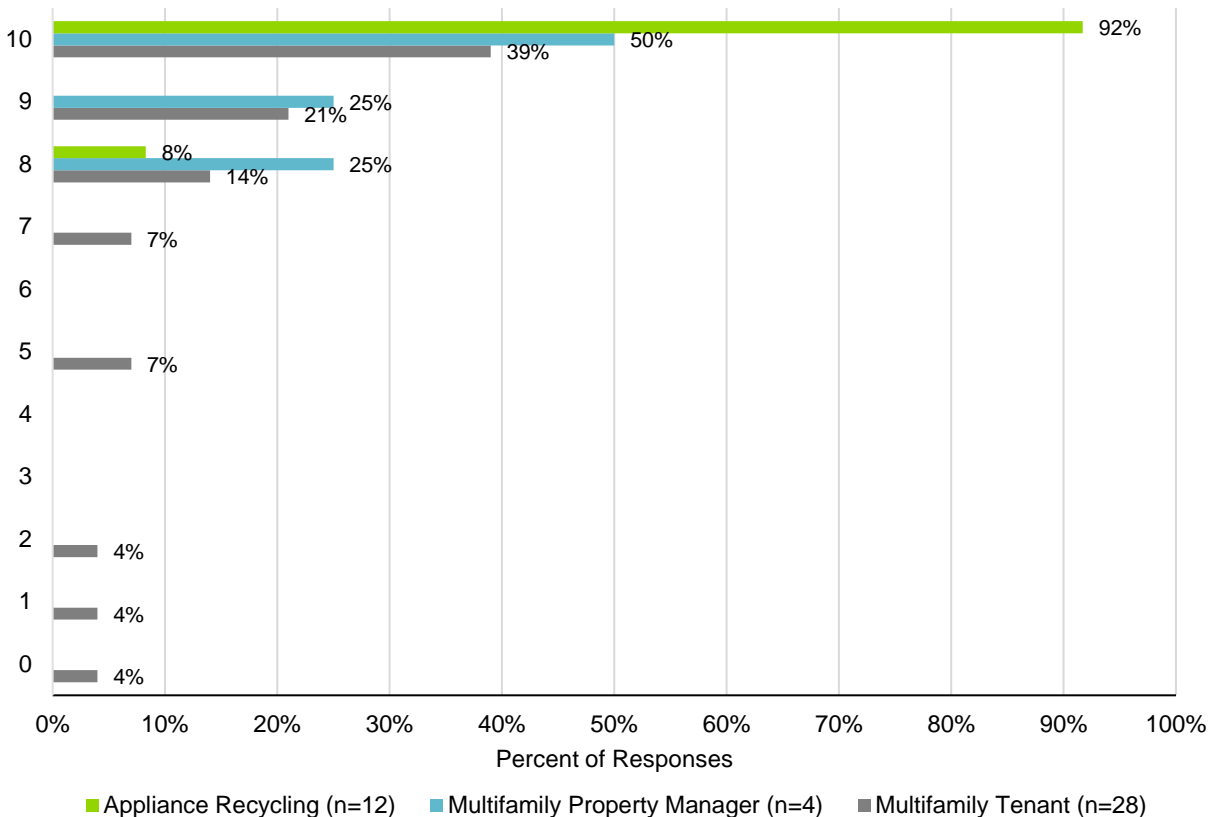
Component	PM/CSP Interview	Survey	Survey Recipient	Additional Survey Topics
Appliance Recycling	√	√	Participant	Impact
Multifamily – Property Managers	√	√	Participant – Property Managers	
Multifamily – Tenants	√	√	Participant – Tenants	
Single-Family	√			
Long-Term Savings	√			

Source: Guidehouse analysis

Guidehouse conducted the Residential EE Program and Income-Eligible EE Program process evaluation together. See additional details on methodology in Section 3.1.5.1.

3.2.5.2 Key Findings from Process Evaluation

As Figure 3-6. shows, respondents were overall satisfied with PECO's Income-Eligible EE Program. Most respondents listed their satisfaction as an 8 out of 10 or above, using a scale where 0 is "extremely dissatisfied" and 10 is "extremely satisfied". Respondents most frequently reported they were extremely satisfied with the Appliance Recycling component (92%), followed by Multifamily Property Manager (50%), and then Multifamily Tenant (39%).

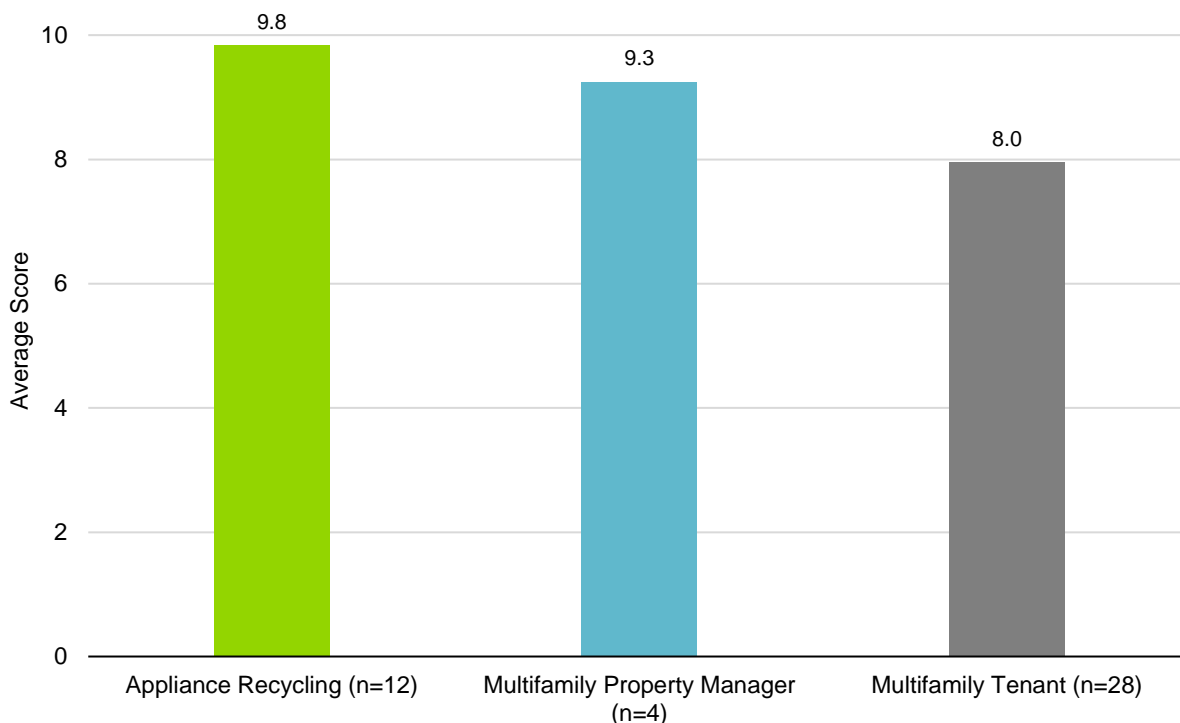
Figure 3-6. Income-Eligible EE Program Overall Satisfaction by Component


Respondents received the following question: “How would you rate your satisfaction with PECO’s [Component Name] overall?”

Guidehouse excluded “don’t know” responses from analysis.

Source: Guidehouse analysis

Mean satisfaction scores for all components reflect high levels of satisfaction as Figure 3-7 shows. All scores are an 8 out of 10 or above, using a scale where 0 is “extremely dissatisfied” and 10 is “extremely satisfied”. The mean satisfaction across all components of the Income-Eligible EE Program evaluated in PY14 is 8.6 out of 10.

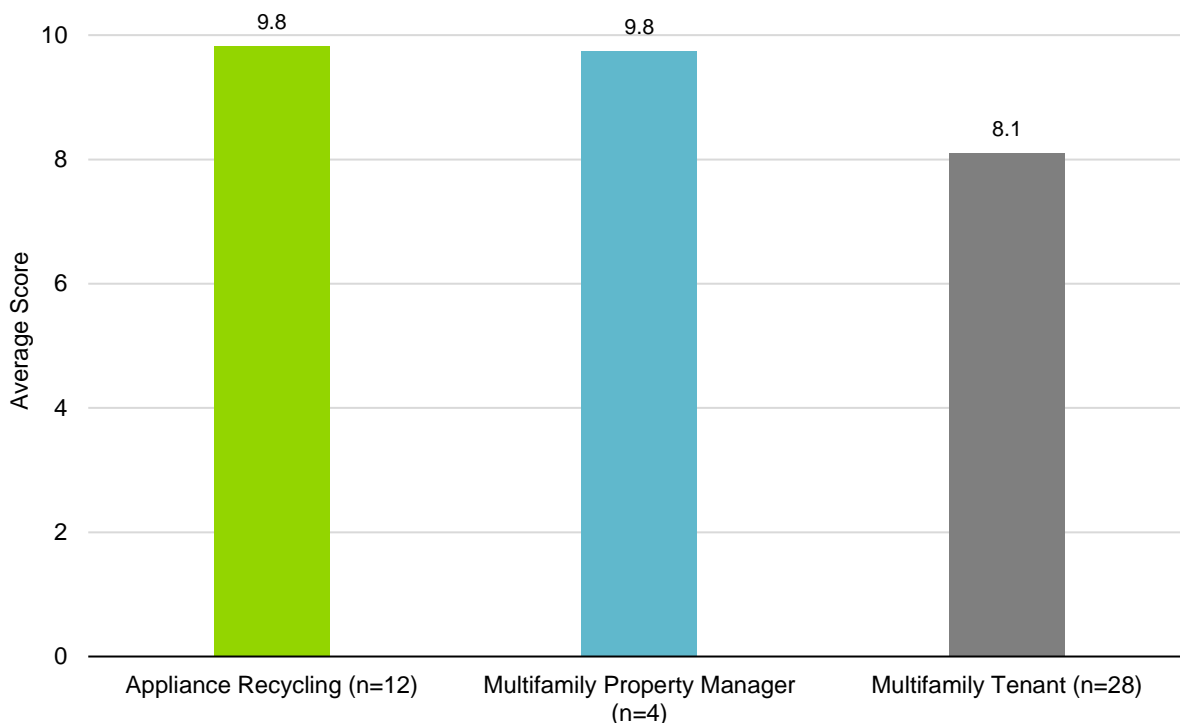
Figure 3-7. Income-Eligible EE Program Mean Satisfaction by Component


Respondents received the following question: “How would you rate your satisfaction with PECO’s [Component Name] overall?”

Guidehouse excluded “don’t know” responses from analysis.

Source: Guidehouse analysis

The mean likelihood to recommend PECO’s Income-Eligible EE Program is high as Figure 3-8. , with all scores being an 8 out of 10 or above using a scale where 0 is “not at all likely” and 10 is “extremely likely”. The mean likelihood to recommend across all components of the Income-Eligible EE Program evaluated in PY14 is 8.7 out of 10.

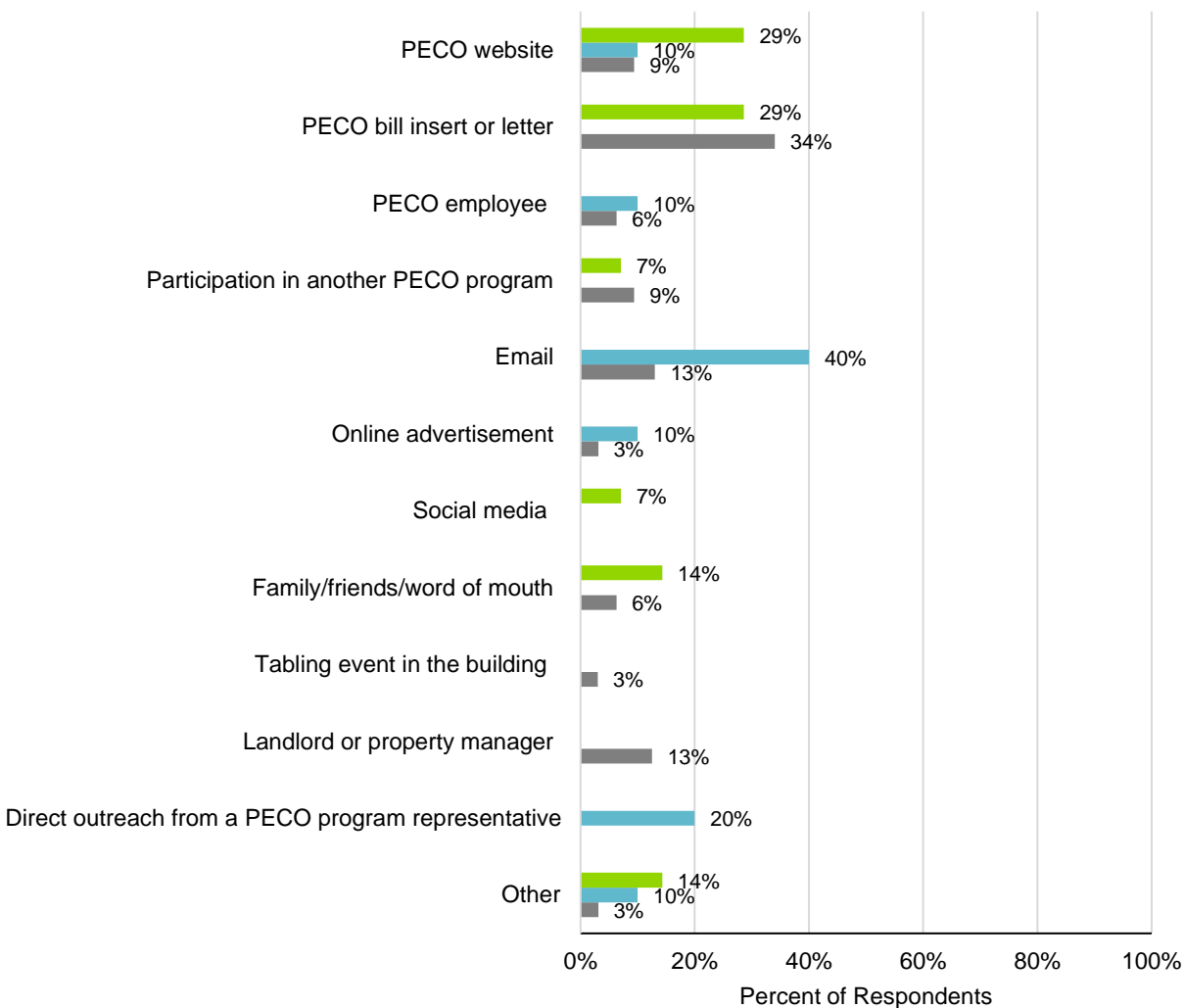
Figure 3-8. Income-Eligible EE Program Mean Likelihood to Recommend by Component


Respondents received the following question: “How likely are you to recommend PECO’s [Component Name] to others?”

Guidehouse excluded “don’t know” responses from analysis.

Source: Guidehouse analysis

Figure 3-9 indicates that for most components, there is not one specific driver to respondents learning about the Income-Eligible EE Program. The most common information source for each component was email for Multifamily Property Managers (44%), PECO bill insert or letter for Multifamily Tenants (34%) and Appliance Recycling (29%), and the PECO Website (29%) for Appliance Recycling respondents.

Figure 3-9. Sources of Income-Eligible EE Program Awareness


■ Appliance Recycling (n=12) ■ Multifamily Property Manager (n=10) ■ Multifamily Tenant (n=32)

Respondents received the following question: “How did you learn about PECO’s [Component Name]? Select all that apply.”

Guidehouse excluded “don’t know” responses from analysis.

Source: Guidehouse analysis

3.2.6 Program Finances and Cost-Effectiveness Reporting

A detailed breakdown of program finances and cost-effectiveness is presented in Table 3-26. TRC benefits in Table 3-26 were calculated using gross verified impacts. NPV PY14 costs and benefits are expressed in 2022 dollars; Phase IV totals are in nominal dollars.

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

Row	Cost Category*	PYTD (\$1,000)	P4TD (\$1,000)
1	IMCs	\$5,300	\$9,454
2	Rebates to Participants and Trade Allies	\$5,986	\$10,139

Row	Cost Category*	PYTD (\$1,000)		P4TD (\$1,000)	
3	Upstream/Midstream Incentives	\$0		\$0	
4	Material Cost for Self-Install Programs (EE&C Kits)	\$1,785		\$3,302	
5	Direct Installation Program Materials and Labor	\$0		\$12	
6	Participant Costs (row 1 minus the sum of rows 2 through 5)	-\$2,471		-\$3,999	
		EDC	CSP	EDC	CSP
7	Program Design	\$0	\$0	\$0	\$0
8	Administration and Management	\$2,110	\$0	\$3,688	\$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)	\$2,110		\$3,688	
14	Total NPV TRC Costs (sum of rows 1 and 13)	\$7,411		\$13,142	
15	Total NPV Lifetime Electric Energy Benefits	\$7,616		\$11,023	
16	Total NPV Lifetime Electric Capacity Benefits	\$4,547		\$6,815	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	\$1,757		\$2,825	
18	Total NPV Lifetime Fossil Fuel Impacts	-\$622		-\$864	
19	Total NPV Lifetime Water Impacts	\$14,005		\$29,200	
20	Total NPV TRC Benefits (sum of rows 15 through 19)	\$27,302		\$48,999	
21	TRC Benefit-Cost Ratio (row 20 divided by row 14)	3.68		3.73	

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

Source: Guidehouse analysis

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

3.2.7 Status of Recommendations

The impact and process evaluation activities in PY14 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 Evaluation Recommendations

Component	Evaluation Activity	Finding	Recommendation	EDC Status
Multifamily Income-Eligible	Impact	Guidehouse conducted onsite verification for Multifamily kits in PY14. The field team found a low installation rate for measures including low-flow faucet aerators, low-flow showerheads, power strips, and ENERGY STAR light bulbs. Customers most often cited that they did not know how to install the items or were too busy to install the items.	Due to the low installation rate, Guidehouse recommends discontinuing the distribution of Multifamily kits.	Implemented
Multifamily Income-Eligible, Single-Family Income-Eligible	Impact	Guidehouse evaluated education measures in PY14 (wash clothes in cold water, take shorter showers, and adjust thermostat). The tracking database used a placeholder value of 1 kWh for each measure. Guidehouse developed savings based on a predetermined possible savings value, then developed an in-service rate based on survey responses. Guidehouse's research determined that savings fluctuate between measure and demographic, therefore savings were developed for each component. Guidehouse will share these savings values with the CSP to use as deemed values.	Because the PY14 evaluation was used as a research opportunity to calculate a program-specific ISR, the CSP should use the calculated savings from PY14 and apply it to the same education measures in PY15.	In Progress

Source: Guidehouse analysis

3.3 Residential HER Program

The objective of the Residential Home Energy Report (HER) Program for market-rate customers is to reduce a home's 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. The HER program is implemented by Oracle as a randomized control trial (RCT). HERs and the online content use social norms and usage summaries to compare a customer's household energy use to the average energy use of other households like theirs. 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.²⁷ During PY14, approximately 417,000 households received HERs across four active residential cohorts, with reports paused for seven 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 PY14 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
PY14 # Participants	417,562	417,562
PYRTD MWh/yr	34,048	34,048
PYRTD MW/yr	5.54	5.54
PY14 Incentives (\$1,000)	-	-

Source: Guidehouse analysis

3.3.2 Gross Impact Evaluation

Guidehouse evaluated savings for the four active residential HER cohorts in PY14. Using a lagged dependent variable (LDV) model, the evaluation team estimated monthly energy savings separately for each cohort. Modeled energy savings are reduced through a double-counting (uplift) analysis on other EE program participation and through the application of persistence from past program years, which is also done by cohort. This 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 account for uplift and persistence reductions. Refer to 4.2Appendix B for the full impact evaluation detail. Evaluation results are presented in Table 3-29 and Table 3-30.

²⁷ 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 PY14, seven residential cohorts active in Phase III were not sent reports and thus do not claim savings.

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	34,048	0.99	-	-

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	5.54	1.23	-	-

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 2022 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).
- Approximately 89% of the population of active residential HER recipients are only in their second active year. After a full year of exposure to HERs in PY13, measured energy savings are likely to increase in subsequent program years. Additionally, the peak demand analysis, which focuses on the summer months, is likely to yield more reliable demand savings estimates after one full year of exposure.
- Notably, the demand regression coefficients for three of the four residential cohorts are jointly statistically significant in PY14. For the one cohort with no statistically significant demand savings, it is likely due to differences in customer characteristics and/or HER delivery method compared to the other cohorts.

Refer to 4.2Appendix 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.²⁸

3.3.4 Verified Savings Estimates

In Table 3-31, the realization rates and NTG ratios 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 PY14.

Table 3-31. PY14 and P4TD Savings Summary

Savings Type	Energy (MWh/yr)	Demand (MW/yr)
PYRTD	34,048	5.54

²⁸ SWE. *Evaluation Framework for Pennsylvania Act 129 Phase IV Energy Efficiency and Conservation Programs*. July 16, 2021. https://www.puc.pa.gov/media/1584/swe-phaseiv_evaluation_framework071621.pdf.

Savings Type	Energy (MWh/yr)	Demand (MW/yr)
PYVTD Gross	33,821	6.83
PYVTD Net	33,821	6.83
RTD	57,837	9.41
VTD Gross	57,602	10.93
VTD Net	57,602	10.93

Source: Guidehouse analysis

3.3.5 Process Evaluation

As described in the Phase IV Evaluation Plan²⁹ approved by the SWE, Guidehouse did not conduct in-depth process evaluation activities for the Residential HER Program in PY14. Instead, the team 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

A detailed breakdown of program finances and cost-effectiveness is presented in Table 3-32. TRC benefits were calculated using gross verified impacts. NPV PY14 costs and benefits are expressed in 2022 dollars; Phase IV totals are in nominal 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	\$2,590	\$0	\$4,008	\$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)	\$2,590		\$4,008	
14	Total NPV TRC Costs (sum of rows 1 and 13)	\$2,590		\$4,008	
15	Total NPV Lifetime Electric Energy Benefits	\$2,365		\$3,548	
16	Total NPV Lifetime Electric Capacity Benefits	\$3,153		\$4,378	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	\$0		\$0	
18	Total NPV Lifetime Fossil Fuel Impacts	\$0		\$0	
19	Total NPV Lifetime Water Impacts	\$0		\$0	

²⁹ Guidehouse, *Phase IV Evaluation Plan, Energy Efficiency and Conservation Portfolio*, revised April 13, 2023.

Row	Cost Category*	PYTD (\$1,000)	P4TD (\$1,000)
20	Total NPV TRC Benefits (sum of rows 15 through 19)	\$5,517	\$7,927
21	TRC Benefit-Cost Ratio (row 20 divided by row 14)	2.13	1.98

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

Source: Guidehouse analysis

Program financials and cost-effectiveness on a net savings basis are the same values as 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 IE HER Program objective is to reduce a home’s 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. The IE HER program is implemented by Oracle as an RCT. HERs and the online content use social norms and usage summaries to compare a customer’s household energy use to the average energy use of other households like theirs. 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 towards 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 PY14, approximately 19,000 households received HERs for the one active IE cohort.

3.4.1 Participation and Reported Savings by Customer Segment

Table 3-33 presents the participation counts, reported energy and demand savings, and incentive payments for IE HER Program in PY14 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
PY14 # Participants	19,173	19,173
PYRTD MWh/yr	1,246	1,246
PYRTD MW/yr	0.20	0.20
PY14 Incentives (\$1,000)	-	-

Source: Guidehouse analysis

3.4.2 Gross Impact Evaluation

Guidehouse evaluated savings for the one IE HER cohort. The evaluation follows the same approach as the Residential HER Program, as described in Section 3.3.2. Refer to 4.2Appendix B for the full impact evaluation detail. Evaluation results are presented in Table 3-34 and Table 3-35.

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

	PYRTD MWh/yr	Energy Realization Rate	Sample C _y or Error Ratio	Relative Precision at 85% C.L.
Program Total	1,246	0.89	-	-

Source: Guidehouse analysis

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

	PYRTD MW/yr	Demand Realization Rate	Sample C _y or Error Ratio	Relative Precision at 85% C.L.
Program Total	0.20	0.82	-	-

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 2022 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).
- Approximately 4% of the population of active HER recipients are in the IE cohort, and all are only in their second active year. After a full year of exposure to HERs in PY13, measured energy savings are likely to increase in subsequent program years. Additionally, the peak demand analysis, which focuses on the summer months, is likely to yield more reliable demand savings estimates after one full year of exposure. However, due to the small group size and other potential influences on usage, most monthly energy savings estimates and all monthly demand savings estimates are not statistically significant.
- IE HER customers may differ from their residential HER counterparts. This 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.

Refer to 4.2Appendix B for the full impact evaluation detail.

3.4.3 Net Impact Evaluation

Guidehouse does not assess net impacts for the IE HER Program as per guidance from the SWE's Evaluation Framework.³⁰

3.4.4 Verified Savings Estimates

In Table 3-36, the realization rates and NTG ratios determined by Guidehouse are applied to the reported energy and demand savings estimates to calculate the verified savings estimates for the IE HER Program in PY14.

Table 3-36. PY14 and P4TD Savings Summary

Savings Type	Energy (MWh/yr)	Demand (MW/yr)
PYRTD	1,246	0.20
PYVTD Gross	1,108	0.17
PYVTD Net	1,108	0.17
RTD	2,039	0.33
VTD Gross	1,903	0.05
VTD Net	1,903	0.05

Source: Guidehouse analysis

³⁰ SWE. *Evaluation Framework for Pennsylvania Act 129 Phase IV Energy Efficiency and Conservation Programs*. July 16, 2021. https://www.puc.pa.gov/media/1584/swe-phaseiv_evaluation_framework071621.pdf.

3.4.5 Process Evaluation

As described in the Phase IV Evaluation Plan³¹ approved by the SWE, Guidehouse did not conduct in-depth process evaluation activities for the Income-Eligible HER Program in PY14. Instead, the team 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

A detailed breakdown of program finances and cost-effectiveness is presented in Table 3-37. TRC benefits in Table 3-37 were calculated using gross verified impacts. NPV PY14 costs and benefits are expressed in 2022 dollars; Phase IV totals are in nominal 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
7	Program Design	\$0	\$0
8	Administration and Management	\$102	\$0
9	Marketing	\$0	\$0
10	Program Delivery	\$0	\$0
11	EDC Evaluation Costs	\$0	\$0
12	SWE Audit Costs	\$0	\$0
13	Program Overhead Costs (sum of rows 7 through 12)	\$102	\$162
14	Total NPV TRC Costs (sum of rows 1 and 13)	\$102	\$162
15	Total NPV Lifetime Electric Energy Benefits	\$77	\$101
16	Total NPV Lifetime Electric Capacity Benefits	\$77	\$55
17	Total NPV Lifetime Operation and Maintenance (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)	\$155	\$156
21	TRC Benefit-Cost Ratio (row 20 divided by row 14)	1.52	0.96

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

Source: Guidehouse analysis

³¹ Guidehouse, *Phase IV Evaluation Plan, Energy Efficiency and Conservation Portfolio*, revised April 13, 2023.

Program financials and cost-effectiveness on a net savings basis are the same as the values in Table 3-37 because verified net savings equal the verified gross savings for the IE HER Program.

3.4.7 Status of Recommendations

Guidehouse makes no recommendations for the Residential 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 retrocommissioning, variable frequency drives (VFDs), refrigeration, and building automation systems, among others. The Non-Residential EE Program is implemented by DNV and is made up of four components:

- **Downstream:** The Downstream component, including Combined Heat and Power (CHP) includes both custom measures and prescriptive measures described by the TRM.³² Baselines may be established as existing equipment (in situ), code minimum efficiency, or by using custom comparisons for custom projects. Downstream projects typically involve working directly with customers or with their contractors on potential projects and filling out an application for program incentives.
- **Midstream “Instant Discounts”:**³³ The Midstream component involves working directly with distributors to incentivize efficient equipment by reducing the sale price at the point of sale (POS) for customers. Midstream measures are all prescriptive, with baselines predefined by the TRM and IMP documents. Midstream 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), and a lighting lookback pathway (which reviews distributor transaction data, identifies program-qualifying projects that did not receive an incentive, and issues incentives to both the purchaser and the distributor). In Phase IV, the majority of Midstream participation goes through the POS pathway.
- **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, targeting customers at the time of building design, before construction or major renovations. Implementing energy conservation measures at the time of construction or renovation is often the most time 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 modern energy efficiency codes. Baselines for New Construction projects are established by city, county, and state energy efficiency codes.

³² PA PUC, *Technical Reference Manual, State of Pennsylvania Act 129 Energy Efficiency and Conservation Program*, dated February 2021, <https://www.puc.pa.gov/filing-resources/issues-laws-regulations/act-129/technical-reference-manual/>.

³³ “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 component. The name of PECO’s Midstream component was changed in Phase IV to “Instant Discounts”. These two terms, Midstream and Instant Discounts, are used interchangeably throughout this report.

3.5.1 Participation and Reported Savings by Customer Segment

Table 3-38 presents the participation counts, reported energy and demand savings, and incentive payments for the Non-Residential EE Program in PY14 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
PY14 # Participants ¹	4,141	870	399	212	8	5,630
PYRTD MWh/yr	93,294	70,428	8,646	12,993	2,027	187,388
PYRTD MW/yr	19.09	12.97	1.84	2.48	-	36.38
PY14 Incentives (\$1,000)	18,812	10,801	1,991	2,018	364	33,987

¹Participant counts include pilot participants.

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 Plan³⁴ for PY14. In PY14, 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, Midstream, and Small Business Direct Install components. The tracking database analysis included analysis of prescriptive TRM- and IMP-based measures to confirm data completeness, confirm that reported savings algorithm assumptions aligned with TRM and IMP standards, and confirm that all values fell within expected ranges. The output is the adjusted database savings. The tracking database ratio is calculated by dividing the adjusted database savings by the reported savings.

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

- **Downstream:** The evaluation team conducted project-specific verification activities for a sample of 37 projects from the Downstream component in PY14.
- **Midstream:** The evaluation team conducted project-specific verification activities for a sample of 76 projects from the Midstream component in PY14.
- **Small Business Direct Install:** The evaluation team conducted project-specific verification activities for a sample of 27 projects from the Small Business Direct Install component in PY14.
- **New Construction:** The evaluation team applied a combination of tracking database analysis results and PY13 verification ratio to the PY14 reported savings.

All samples were designed and implemented to meet the targets set in Guidehouse's sample design memo.³⁵ Additional detail of the impact evaluation completed in PY14 can be found in

³⁴ Guidehouse, *Phase IV Evaluation Plan, Energy Efficiency and Conservation Portfolio*, revised April 13, 2023.

³⁵ PECO, *PY14 NonResidential Impact Sample Design Memo 12-08-22*, dated December 08, 2022.

4.2Appendix E. The PY14 evaluation realization rates and statistical relative precision for energy and demand are shown in Table 3-39 and Table 3-40, respectively.

Table 3-39. 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	74,992	0.93	0.36	0.09
Midstream	96,446	1.06	0.74	0.12
Small Business Direct Install	8,826	0.98	0.19	0.06
New Construction	7,124	1.03	0.17	0.08
Program Total	187,388	1.01	0.61	0.09 [90% C.L.]

Note: Guidehouse conducted tracking database analysis for all components and primary data collection and analysis for the Downstream, Midstream, and Small Business Direct Install components in PY14. Guidehouse applied the verification ratio from PY13 to the PY14 adjusted database savings for the New Construction component.

Source: Guidehouse analysis

Table 3-40. 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	13.73	0.91	0.50	0.12
Midstream	19.69	1.05	0.54	0.09
Small Business Direct Install	1.75	0.93	0.27	0.08
New Construction	1.22	1.14	0.31	0.20
Program Total	36.38	0.99	0.54	0.08 [90% C.L.]

Note: Guidehouse conducted tracking database analysis for all components and primary data collection and analysis for the Downstream, Midstream, and Small Business Direct Install components in PY14. Guidehouse applied the verification ratio from PY13 to the PY14 adjusted database savings for the New Construction component.

Source: Guidehouse analysis

The introduction to Section 3 describes the two-step evaluation method, which results in the ratios shown in Table 3-41 and Table 3-42. The tracking database analysis is conducted annually while the verification ratio may be historical based upon the evaluation plan.³⁶ The tracking database ratio and the verification ratio together represent the overall energy or demand realization rate.

Table 3-41. Non-Residential Energy Ratios

Program and Component	Energy Tracking Database Ratio	Energy Verification Ratio	Energy Realization Rate
Downstream	1.00	0.93	0.93
Midstream	0.93	1.14	1.06
Small Business Direct Install	1.00	0.98	0.98
New Construction ¹	1.00	1.03	1.03
Non-Residential Total	0.96	1.04	1.01

¹ The New Construction verification ratio is from the PY13 analysis.

Source: Guidehouse analysis

³⁶ Guidehouse, *Phase IV Evaluation Plan, Energy Efficiency and Conservation Portfolio*, revised April 13, 2023.

Table 3-42. Non-Residential Demand Ratios

Program and Component	Demand Tracking Database Ratio	Demand Verification Ratio	Demand Realization Rate
Downstream	1.00	0.91	0.91
Midstream	0.94	1.12	1.05
Small Business Direct Install	1.00	0.94	0.93
New Construction ¹	1.00	1.14	1.14
Non-Residential Total	0.96	1.03	0.99

¹ The New Construction verification ratio is from the PY13 analysis.

Source: Guidehouse analysis

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

3.5.2.1 Downstream

As illustrated by the ratios in Table 3-41 and Table 3-42, the Downstream realization rates were predominantly driven by the site-specific verification activities rather than the tracking database analysis. The site-specific verification activities most commonly resulted in updating TRM-deemed parameters to site-specific values. The Guidehouse team made changes to lighting control types, HVAC types, and HOU for lighting measures, based on site-specific data collected from customer interviews and site-specific trend data. Twenty-seven of the 37 sampled Downstream projects were lighting projects. These changes and updates of input parameters affected 10 of these 27 lighting projects. Updates to HOU were the most influential change for eight of these 10 projects, with three causing an increase in energy savings and five causing a decrease in energy savings. Guidehouse updated the CFs for six of these 10 projects, with five projects experiencing increased CFs and demand savings and one very large project experiencing a significant decrease in the CF and demand savings. At the component level these updates decreased both energy and demand savings, resulting in overall realization rates less than one.

The team also re-calculated demand savings for one extremely large project to account for specific timing of the measure savings and associated demand impacts, resulting in an increase in demand savings for this site. Reported peak demand savings were calculated as annual energy savings divided by annual HOU to estimate average demand savings. The Guidehouse team focused on demand savings specifically during peak hours to calculate peak demand savings.

Guidehouse's tracking data analysis identified multiple minor discrepancies that had minimal impact on component-level savings and realization rates. The tracking database analysis revealed that three of six Downstream ENERGY STAR Ductless Mini-Split Heat Pumps had calculated the baseline EER incorrectly; correcting the baseline EER calculation increased savings. Savings were also calculated incorrectly for ENERGY STAR Certified Connected Thermostats; according to the algorithm presented in TRM measure 2.2.11, the duct system efficiency should be included in the denominator but reported savings calculations included a direct multiplication, placing it in the numerator. Electric Chiller peak demand savings should be calculated using "full load" efficiencies according to the TRM's Table 3-31 and its footnote 19, but reported savings were using the IPLV part-load efficiencies. For LED Refrigerated Case Lighting, Guidehouse's tracking database analysis identified that reported peak demand savings

were originally using a CF of 0.92 instead of the TRM-deemed 0.99. This was an early finding that Guidehouse reported to PECO and the implementing contractor was able to fix partway through the year. Lastly, for Evaporator Fan Electronically Commutated Motors (ECMs or EC Motors), 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.

3.5.2.2 Midstream

The Midstream component is built to streamline and simplify participation for customers. As such, minimal information is collected at the POS for the purchased EE 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, the evaluation team 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. Of 76 sampled Midstream projects, updated HOU were the most significant change to energy savings for 24, updated lighting control types caused the most significant change to energy savings for 13, and updated heating or cooling types for four. For demand savings, updated CFs caused the most significant change for 20, updated lighting control types caused the most significant change for 10, and updated heating or cooling types for 12.

Similarly, the implementer assumes all fixtures and lamps purchased through the Midstream component are to be placed in comfort cooled spaces due to limited data collection. Lamps placed in comfort cooled spaces are awarded extra savings due to a reduction in waste heat that would otherwise have to be removed by the cooling system. However, some portion of lamps purchased through the Midstream component are installed in exterior areas or other unconditioned spaces and therefore do not receive additional savings for the reduction in waste heat during evaluation. This change causes a 16% reduction in savings for all affected equipment installed in exterior or unconditioned locations. As only a small fraction of lamps and fixtures are installed in these unconditioned spaces, this has a much smaller impact on the overall savings for the Midstream component.

Additionally, there is a typo in the Phase IV TRM measure specific to Midstream lighting (TRM Measure number 3.1.7) and its corresponding IMP.³⁷ Correcting this typo caused a 6.7% reduction in energy and demand savings for all lighting measures where savings were calculated using the algorithm from the TRM measure number 3.1.7. Further detail is provided in Section 3.5.7.

Guidehouse identified both the space cooling type issue and the TRM typo correction issue through tracking database analysis and confirmed them with engineering evaluations of sampled projects. For the Midstream component overall, the increases to HOU and CFs and their corresponding increases to energy and demand savings outweighed the other decreases to savings, resulting in realization rates greater than one.

³⁷ This issue is known to the SWE and is documented in the TRM issues tracker “2021 TRM Questions & Comments.xlsx” on line 48 of the tab “2021 TRM Questions.”

3.5.2.3 Small Business Direct Install

Small Business Direct Install realization rates were predominantly driven by updating TRM-deemed parameters to site-specific values. The Guidehouse team made changes to lighting control types, HVAC types, and HOU for lighting measures, based on site-specific data collected from customer interviews and site-specific trend data. Twenty-five of the 27 sampled SBDI projects were lighting projects. These changes and updates of input parameters affected eight of these 25 lighting projects. Updates to HOU were the most influential change for all eight, with five causing an increase in energy savings and three causing a decrease in energy savings. Guidehouse updated the CFs for five projects, with all five projects experiencing decreased CFs. At the component level, these updates decreased both energy and demand savings, resulting in overall realization rates less than one.

Guidehouse's tracking database analysis also identified multiple minor discrepancies that had minimal impact on component-level savings and realization rates. Reported savings were calculated incorrectly for ENERGY STAR Certified Connected Thermostats; according to the algorithm presented in TRM measure 2.2.11, the duct system efficiency should be included in the denominator but reported savings calculations included a direct multiplication, placing it in the numerator. For LED Refrigerated Case Lighting, Guidehouse's tracking database analysis identified that reported peak demand savings were originally using a CF of 0.92 instead of the TRM-deemed 0.99. This was an early finding that Guidehouse reported to PECO and the implementing contractor was able to fix partway through the year.

3.5.2.4 New Construction

Guidehouse's tracking database analysis identified minor discrepancies that had minimal impact on component-level savings and realization rates. The tracking database analysis revealed that two of the projects claiming savings from ENERGY STAR Ductless Mini-Split Heat Pumps had underestimated the baseline EER and HSPF. Fixing this issue decreased the energy savings for those two projects. The tracking database analysis had a negligible impact on the realization rate for the New Construction component.

For the PY14 analysis, Guidehouse applied the historical energy verification ratio of 1.03 from and historical demand verification ratio of 1.14 from the PY13 evaluation.

3.5.3 Net Impact Evaluation

As described in the Phase IV Evaluation Plan for PY14 and in Table 3-2, Guidehouse conducted NTG research for the Non-Residential Downstream and New Construction components, both known to customers as elements of PECO's Ways to Save program. The evaluation team used the NTG values established in PY13 for the Midstream component and values established in Phase III for the Small Business Direct Install component. Table 3-43 summarizes all program component level NTGR applied to the Non-Residential EE program.

3.5.3.1 Methodology

Guidehouse followed the SWE's Evaluation Framework³⁸ for conducting NTG research and analysis for the Non-Residential EE program. The SWE guidance included detail on gathering

³⁸ SWE. *Evaluation Framework for Pennsylvania Act 129 Phase IV Energy Efficiency and Conservation Programs*. July 16, 2021. https://www.puc.pa.gov/media/1584/swe-phaseiv_evaluation_framework071621.pdf.

feedback from participants in the Non-Residential Downstream and New Construction components of the program using self-reported customer surveys. These surveys were part of the process evaluation survey efforts detailed in Section 3.5.5 and were approved by the SWE prior to fielding.

In PY14, Guidehouse decided to remove the Don't Know (DK) option from the intention question battery (also known as “the counterfactual scenario”) for all PECO NTG research. This change aligns with other portfolios Guidehouse evaluates across the country that have also removed the DK option from the counterfactual scenario. The DK option allows respondents an easy way out of the counterfactual question and not force them to consider what they would have done in absence of the program.

The following describes the general methodology for estimating the Non-Residential EE program NTG ratio (NTGR) including definitions of free ridership (FR), spillover (SO), and market effects (ME) and how each is used to calculate the final NTGR. See Appendix G for further detail on the methodology and algorithms used to estimate component-level NTGRs in PY14.

- **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. When scored, each metric results in a value ranging from zero to 0.5, and a combined total free ridership score from zero to one.
- **Spillover:** The self-reported spillover (SO) battery collects data on additional program eligible projects conducted at participating non-residential facilities that did not receive a program incentive. 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. The Guidehouse team divides the total spillover savings by the total gross savings for the sample to arrive at the SO result.
- **Market Effects:** Guidehouse did not conduct market effects research in PY14. Future market effects research could include interviews with Trade Allies working in the PECO territory as well as surveys of non-residential customers who have not participated in any PECO program offerings, otherwise known as non-participants. These research efforts can help triangulate self-reported survey results but are often costly and burdensome to PECO customers.

Guidehouse estimated the final NTG ratio (NTGR) score using Equation 3-2:

Equation 3-2. NTG Ratio Equation

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

Where:

<i>Free Ridership</i>	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
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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

Market Effects include savings not already captured by spillover; some examples of these effects include increased availability of efficient technologies through retail channels, reduced prices for efficient models, build-out of efficient model lines, and an increase in the ratio of efficient to inefficient goods sold or practices undertaken in the market; Guidehouse did not conduct Market Effects research in PY14.

3.5.3.2 NTG Results

Guidehouse completed surveys with 34 Downstream component participants and four New Construction component participants (131% and 24% survey target achievement rate respectively) in PY14. Participants provided feedback on their intentions to conduct energy efficiency projects without the incentives from PECO, as well as the influence the program had on their decision to conduct the project when they did. Table 3-43 shows the NTG results of the Non-Residential EE Program components.

Table 3-43. Non-Residential EE Program Net Impact Evaluation Results

Component	PYVTD	Free Ridership	Spillover	NTG Ratio	Relative Precision (@ 85% CL)
Downstream	68,406	0.29	0.01	0.72	0.16

Source: Guidehouse analysis

- **Downstream:** Guidehouse targeted 26 completed surveys and achieved 34 for the Downstream component in PY14. Results show free ridership dropped nearly 20 percent between PY11 (0.48) and PY14 (0.29).
- **New Construction:** Guidehouse only received four responses to the New Construction NTG survey in PY14 and is not confident the results represent the decisions of the component population. With approval from the SWE, Guidehouse will not report the PY14 results but rather continue the New Construction survey in PY15 to gather additional NTG feedback and improve precision in the results.

3.5.3.3 High Impact Measure Research

As described in the Phase IV Evaluation Plan for PY14, Guidehouse used the Non-Residential Downstream NTG survey to collect feedback on the High Impact Measures (HIMs) and estimated NTG for the top two energy saving measures for the Non-Residential program in PY14. Table 3-44 includes the NTGR and relative precision estimates for these HIMs.

Table 3-44. Non-Residential EE Program HIM Results¹

HIM	Percentage of Program Savings ²	Free Ridership	Spillover	NTG Ratio
Lighting Improvements (Downstream)	67%	0.24	0.01	0.77

HIM	Percentage of Program Savings ²	Free Ridership	Spillover	NTG Ratio
Custom Projects (Downstream)	19%	0.26	0.03	0.77

¹ Guidehouse only estimated NTG results for two HIMs in PY14 for the Non-Residential EE Program due to the limited amount of survey responses for the Non-Residential New Construction component. Guidehouse will gather additional NTG feedback for the New Construction component in PY15 and estimate additional HIM NTG results at that time.

² Program savings includes Downstream and New Construction gross savings. These two components are the only two considered “downstream” for the Non-Residential EE Program and thus qualifying for HIM research.

Source: Guidehouse analysis

- Lighting improvements continue to be the driving measure for the Non-Residential EE Program, accounting for approximately 67% of Downstream gross savings. The NTG result of 0.77 for the lighting improvements HIM is higher than expected and is primarily due to the drop in free ridership from PY11 of 0.48.
- The two HIMs evaluated in PY14 account for approximately 86% of Downstream savings. Due to the lack of NTG feedback collected in PY14, Guidehouse will repeat the data collection process in PY15 for Non-Residential New Construction participants to improve HIM results and meet the 3-5 HIM threshold.

3.5.4 Verified Savings Estimates

In Table 3-45, realization rates and NTG ratios determined by Guidehouse are applied to the reported energy and demand savings estimates to calculate the verified savings estimates for the Non-Residential EE Program in PY14.

Table 3-45. PY14 and P4TD Savings Summary

Savings Type	Energy (MWh/yr)	Demand (MW/yr)
PYRTD	187,388	36.38
PYVTD Gross	188,075	36.18
PYVTD Net	131,352	25.26
RTD	343,303	66.16
VTD Gross	354,515	65.60
VTD Net	237,858	44.35

Source: Guidehouse analysis

3.5.5 Process Evaluation

The PY14 process evaluation of the Non-Residential EE Program included PECO program manager and CSP staff interviews and a survey for participants of some components. This section summarizes the evaluation methods, data collection techniques, sample design, and key results related to the surveys.

3.5.5.1 Methodology

The team interviewed the PECO program managers and CSP staff to understand the goals of the program in PY14, identify significant implementation changes, and identify areas of strength and areas of improvement. Guidehouse also conducted three surveys, as Table 3-46 outlines. The surveys assessed customer satisfaction, likeliness to recommend the program to others (also known as net promoter score), and program awareness. Some surveys were fielded in conjunction with NTG and impact evaluation surveys to reduce burden on the participant base.

Table 3-46. Non-Residential EE Program Process Activities by Component

Component	PM/CSP Interview	Survey	Survey Recipient	Additional Survey Topics
Midstream	√		N/A	N/A
Small Business Direct Install	√	√	Participant	None
Downstream	√	√	Participant	NTG
New Construction	√	√	Participant	NTG

Source: Guidehouse analysis

Guidehouse fielded the surveys to sampled participants via an online survey. Guidehouse developed the survey instrument according to SWE requirements and had the SWE review and approve in advance of fielding. The evaluation team defined the survey population based on customer activity data from eTRACK+.

As Table 3-47 presents, Guidehouse created target completes for each component based on eTRACK+ participation data. Sample design memos were reviewed and approved by the SWE prior to survey fielding. For the process evaluation, Guidehouse used only survey completes³⁹ for analysis, because the process questions were spread across multiple sections in the survey. This differs from the net impact evaluation, which used any survey responses that included responses to all NTG questions. All NTG questions were included together in a single section.

Table 3-47. Non-Residential Sample Targets and Completes

Component	Stratum	Number Contacted	Target Completes	Actual Completes	Response Rate	Percentage Achieved
Downstream	Large	48	4	4	8%	100%
	Medium	67	6	1	1%	17%
	Small	263	10	18	7%	180%
	Very Small	130	6 (Process only)	11	8%	183%
	Total	508	26	34	7%	131%
New Construction	Participants	47	Census attempt (target 17)	4	9%	24%
Small Business Direct Install (Process only)	Participants	324	Census attempt (target 23)	28	9%	122%

Source: Guidehouse analysis

Guidehouse anticipated that some components may not meet their target completes and took extra steps to bolster response rates and survey completes. These steps were taken in addition

³⁹ Completes are defined as a survey that includes responses for all questions until the final two sections of the survey, which are demographics and wrap-up questions.

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 electronic gift card (e-gift card) through the Tango platform.
- Phone calls: Guidehouse called participants from low-response strata who had not yet completed the survey to ask if they could complete the survey by a given date. The caller also offered to complete the survey over the phone if that was easier for the participant. Participants who indicated they did not wish to complete the survey did not receive a second or third phone call, if applicable.
- PECO reminder: Guidehouse provided PECO an email template and a list of customers (name and email only) from low-response strata who had not yet completed the survey. PECO sent an email encouraging respondents to complete the survey by a given date.

The implementation of these efforts by each component is summarized in Table 3-48.

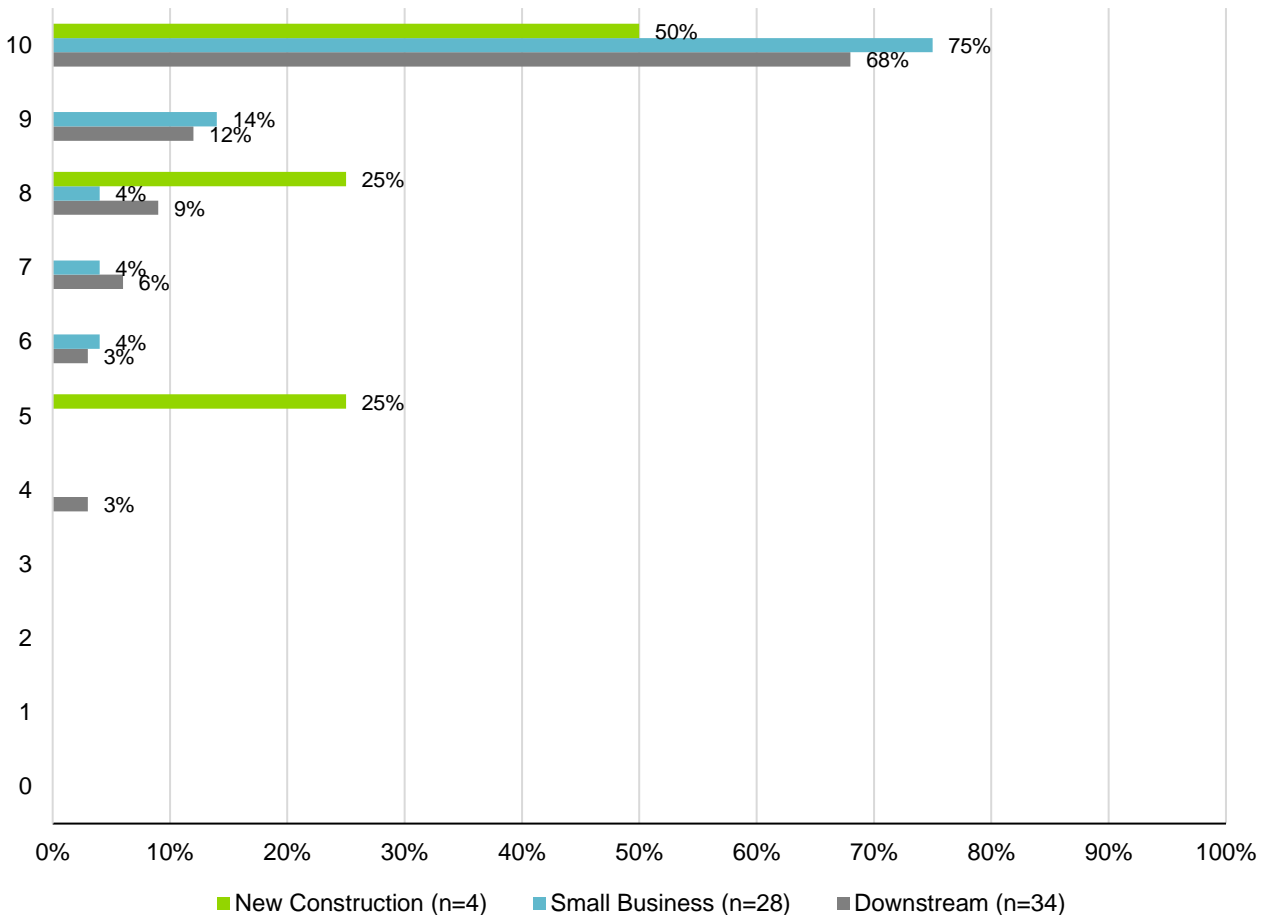
Table 3-48. Non-Residential Residential Survey Approach

Component	Percentage of Total Target Achieved	Incentive Offered	Phone Calls	PECO Reminder
Downstream Rebates	131%	\$100	Up to one phone call for low response stratum	Yes
Non-Residential New Construction	24%	\$100	Up to three phone calls per participant	Yes
Small Business Direct Install	122%	\$50	Up to one phone call per participant	Yes

Source: Guidehouse analysis

3.5.5.2 Key Findings from Process Evaluation

As Figure 3-10 shows, respondents were overall satisfied with PECO's Non-Residential EE Program. Most respondents listed their satisfaction as a 10 out of 10, using a scale where 0 is "extremely dissatisfied" and 10 is "extremely satisfied". Most respondents were extremely satisfied with Small Business Direct Install (75%), Downstream (68%), and New Construction (50%) components.

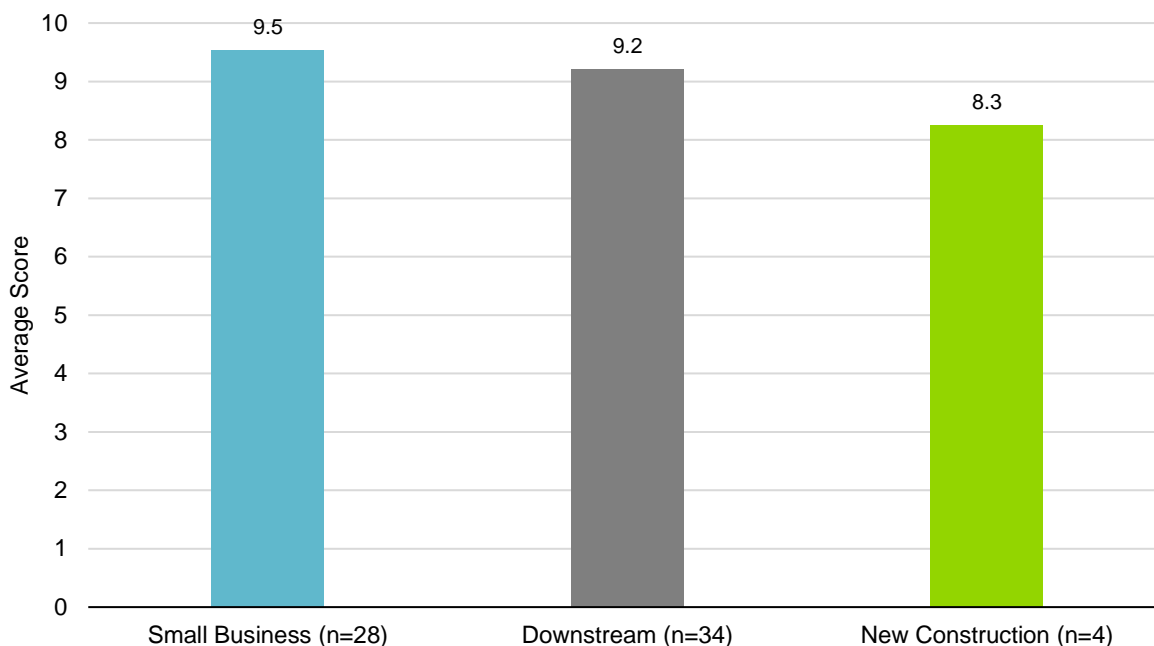
Figure 3-10. Non-Residential EE Program Overall Satisfaction by Component


Respondents received the following question: “How would you rate your satisfaction with PECO’s [Component Name] overall?”

Guidehouse excluded “don’t know” responses from analysis.

Source: Guidehouse analysis

Mean satisfaction scores for all components reflect high levels of satisfaction as Figure 3-11 shows. All scores are an 8 out of 10 or above, using a scale where 0 is “extremely dissatisfied” and 10 is “extremely satisfied”. The mean satisfaction across all components of the Non-Residential EE Program evaluated in PY14 is 9.3 out of 10.

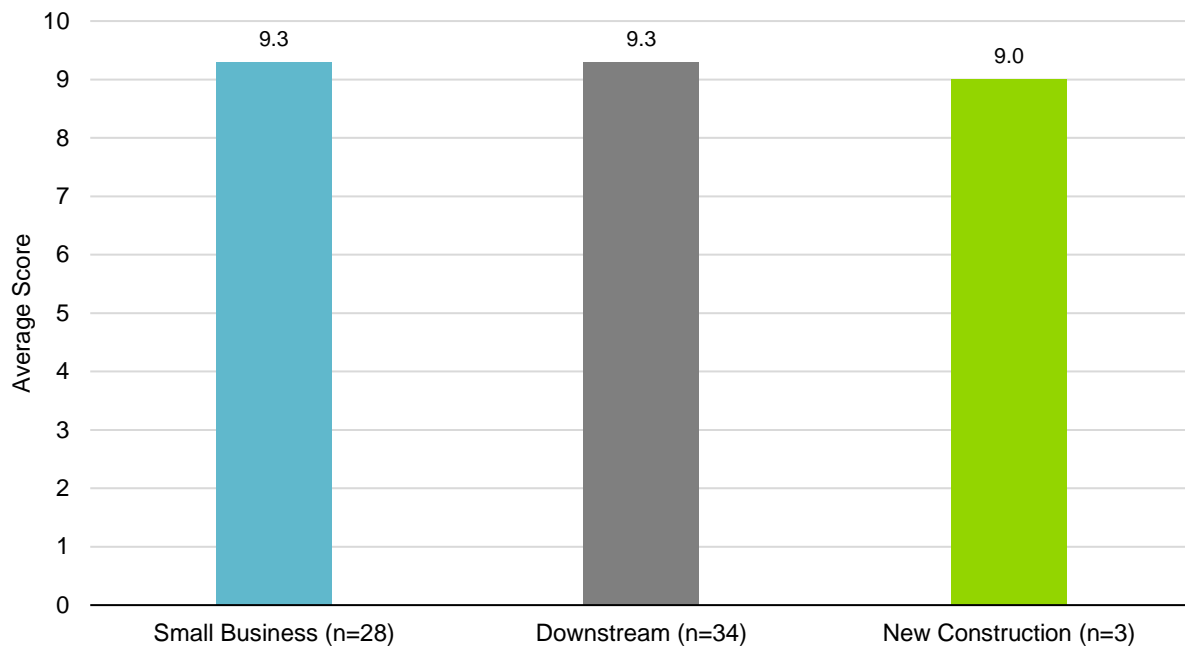
Figure 3-11. Non-Residential EE Program Mean Satisfaction by Component


Respondents received the following question: “How would you rate your satisfaction with PECO’s [Component Name] overall?”

Guidehouse excluded “don’t know” responses from analysis.

Source: Guidehouse analysis

The mean likelihood to recommend PECO’s Non-Residential EE Program as high is shown in Figure 3-12 with all scores being a 9 out of 10 or above, using a scale where 0 is “not at all likely” and 10 is “extremely likely”. The mean likelihood to recommend across all components of the Non-Residential EE Program evaluated in PY14 is 9.3 out of 10.

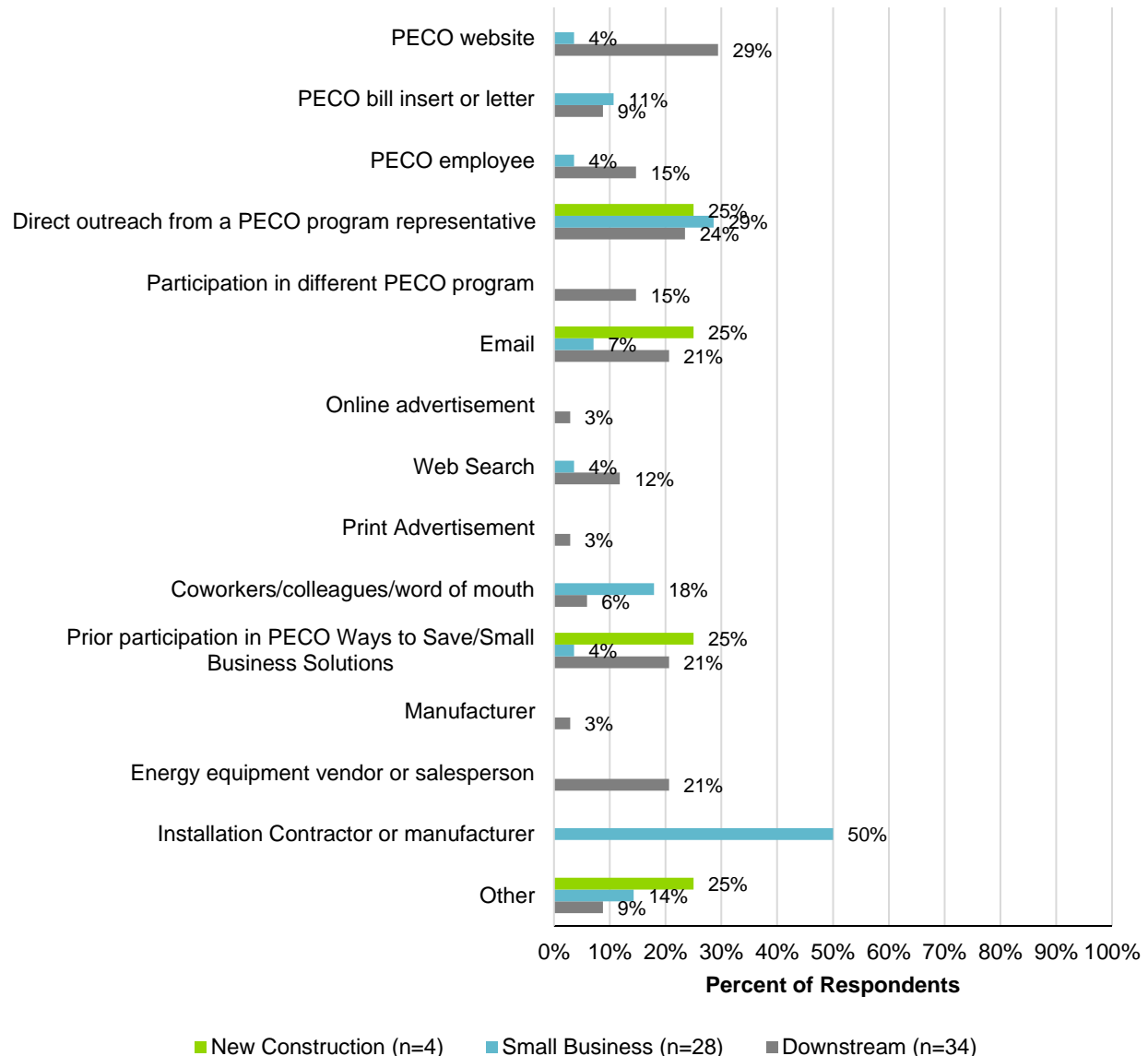
Figure 3-12. Non-Residential EE Program Mean Likelihood to Recommend by Component


Respondents received the following question: “How likely are you to recommend PECO’s [Component Name] to others?”

Guidehouse excluded “don’t know” responses from analysis.

Source: Guidehouse analysis

Figure 3-13 indicates that for most components, there is not one single way that respondents learn about the Non-Residential EE Program. The most common information source for each component is the PECO website for Downstream (29%), installation contractor or manufacturer for Small Business (50%), and direct outreach from a PECO representative for New Construction (29%).

Figure 3-13. Sources of Non-Residential EE Program Awareness


Respondents received the following question: “How did you learn about PECO’s [Component Name]? Select all that apply.”

Guidehouse excluded “don’t know” responses from analysis.

Source: Guidehouse analysis

Detailed findings are presented by component in Appendix G.

3.5.6 Program Finances and Cost-Effectiveness Reporting

A detailed breakdown of program finances and cost-effectiveness is presented in Table 3-49. TRC benefits in Table 3-49 were calculated using gross verified impacts. NPV PY14 costs and benefits are expressed in 2022 dollars; Phase IV totals are in nominal dollars.

Table 3-49. Summary of Program Finances – Gross Verified

Row	Cost Category*	PYTD (\$1,000)		P4TD (\$1,000)	
1	IMCs	\$107,235		\$187,352	
2	Rebates to Participants and Trade Allies	\$12,122		\$21,871	
3	Upstream/Midstream Incentives	\$17,785		\$23,361	
4	Material Cost for Self-Install Programs (EE&C Kits)	\$0		\$0	
5	Direct Installation Program Materials and Labor	\$4,080		\$4,921	
6	Participant Costs (row 1 minus the sum of rows 2 through 5)	\$73,249		\$137,200	
		EDC	CSP	EDC	CSP
7	Program Design	\$0	\$0	\$0	\$0
8	Administration and Management	\$9,976	\$0	\$20,110	\$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)	\$9,976		\$20,110	
14	Total NPV TRC Costs (sum of rows 1 and 13)	\$117,211		\$207,462	
15	Total NPV Lifetime Electric Energy Benefits	\$49,616		\$100,968	
16	Total NPV Lifetime Electric Capacity Benefits	\$43,309		\$77,355	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	\$10,387		\$15,209	
18	Total NPV Lifetime Fossil Fuel Impacts	-\$5,214		-\$16,341	
19	Total NPV Lifetime Water Impacts	\$0		\$0	
20	Total NPV TRC Benefits (sum of rows 15 through 19)	\$98,098		\$177,191	
21	TRC Benefit-Cost Ratio (row 20 divided by row 14)	0.84		0.85	

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

Source: Guidehouse analysis

Table 3-50 presents program financials and cost-effectiveness on a net savings basis. Guidehouse conducted primary NTGR data collection and analysis for the Non-Residential Downstream component in PY14. For the other program components Guidehouse applied NTGRs from the most recent analysis year. The NTGRs 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, O&M, interactive effects, and secondary fossil fuel impacts. In addition, the NTGRs are applied to the IMC, therefore the IMC are different on a net savings basis compared to the gross savings basis.

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

Row	Cost Category*	PYTD (\$1,000)		P4TD (\$1,000)	
1	IMCs	\$74,863		\$126,138	
2	Rebates to Participants and Trade Allies	\$12,122		\$21,871	
3	Upstream/Midstream Incentives	\$17,785		\$23,361	
4	Material Cost for Self-Install Programs (EE&C Kits)	\$0		\$0	
5	Direct Installation Program Materials and Labor	\$4,080		\$4,921	

Row	Cost Category*	PYTD (\$1,000)		P4TD (\$1,000)	
6	Participant Costs (row 1 minus the sum of rows 2 through 5)	\$40,877		\$75,985	
		EDC	CSP	EDC	CSP
7	Program Design	\$0	\$0	\$0	\$0
8	Administration and Management	\$9,976	\$0	\$20,110	\$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)	\$9,976		\$20,110	
14	Total NPV TRC Costs (sum of rows 1 and 13)	\$84,839		\$146,248	
15	Total NPV Lifetime Electric Energy Benefits	\$34,638		\$67,503	
16	Total NPV Lifetime Electric Capacity Benefits	\$30,235		\$52,024	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	\$7,251		\$10,337	
18	Total NPV Lifetime Fossil Fuel Impacts	-\$3,640		-\$10,761	
19	Total NPV Lifetime Water Impacts	\$0		\$0	
20	Total NPV TRC Benefits (sum of rows 15 through 19)	\$68,485		\$119,104	
21	TRC Benefit-Cost Ratio (row 20 divided by row 14)	0.81		0.81	

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

Source: Guidehouse analysis

3.5.7 Status of Recommendations

The impact and process evaluation activities in PY14 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 3-51. Summary of Evaluation Recommendations

Component	Evaluation Activity	Finding	Recommendation	EDC Status
Downstream	Impact	ENERGY STAR Ductless Mini-Split Heat Pumps: Three of six Downstream instances of this measure are calculating baseline efficiency incorrectly. These instances use a PTAC or PTHP replacement baseline. According to TRM measure 3.2.4 and the corresponding IMP, the baseline efficiency EER for a PTAC replacement measure is calculated as $EER = 10.9 - (0.213 \times \text{Capacity}/1000)$. Per footnotes 27 and 28 in the TRM, the maximum value for the capacity variable in the calculation is 15,000Btu/h. This equates to an efficiency of 7.705 EER. The three measures in question are larger than the 15,000 Btu/h limit, but the reported savings used an EER value of 9.822 for the baseline unit. Correcting this discrepancy increased the savings for these three measures. The remaining three Downstream instances calculated the baseline EER correctly. (Affected Projects: PRJ-05125, 05135, and 05135-2023.)	Review and update the baseline efficiency input value for ENERGY STAR Ductless Mini-Split Heat Pumps.	In Process
Downstream	Impact	Electric Chillers: Reported savings calculations 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 discrepancy decreased the demand savings for affected chiller measures.	Use full load efficiency to calculate peak demand savings for water cooled chillers.	In Process
Midstream	Impact	All Midstream lighting projects characterize the installation space type as comfort cooled; however, some of the installations are in outdoor spaces. For these exterior fixtures, this characterization incorrectly applies a 0.192 rather than 0 value for the interactive demand factor.	DNV should ensure that it does not apply the interactive factor for comfort cooled spaces to the exterior fixture types if DNV already identify fixtures as interior or exterior types. If exterior fixture types have not been identified, Guidehouse recommends identifying fixture types that are more likely to be exterior than interior and having those lamp-types default to non-	In Process

Component	Evaluation Activity	Finding	Recommendation	EDC Status
			comfort cooled and receive no additional savings from interactive factors.	
Midstream	Impact	There is a typo in the Phase IV TRM measure specific to Midstream lighting (TRM measure 3.1.7) and its corresponding IMP. This issue is known to the SWE and the correction is documented in the TRM issues tracker “2021 TRM Questions & Comments.xlsx” on line 48 of the tab “2021 TRM Questions” but has not yet been corrected in the algorithms used to calculate reported savings. Correcting this typo caused a 6.7% reduction in energy and demand savings for all lighting measures where savings were originally calculated using the algorithm from the TRM measure 3.1.7.	Correct the algorithm as noted. (Note: Guidehouse shared this Finding and Recommendation with PECO as part of the PY13 report, and again as a preliminary finding during the course of the PY14 evaluation. PECO shared the finding and recommendation with DNV, and DNV reported that it had made the updates. However, as of the final PY14 Q4 data, this finding has not yet been corrected)	Implemented
Downstream, Midstream, and SBDI	Impact	ENERGY STAR Certified Connected Thermostats: According to TRM measure 2.2.11 and the corresponding IMP, the algorithm for heating energy savings for this measure is: Capacity * EFLH / (Efficiency * duct system efficiency) * heating energy savings factor. The duct system efficiency is set at 0.8. Reported savings calculations appear to be multiplying the duct system efficiency in the numerator rather than the denominator of the equation. This error might have occurred by omitting the parentheses. Correcting this issue increased savings for the measure. The cooling portion of the savings were calculated correctly.	Review and update savings algorithms and ensure parentheses are implemented correctly.	In Process
Downstream, Midstream, and SBDI	Impact	LED Refrigeration Case Lighting: The Phase IV TRM (TRM measure 3.1.6, Table 3-19) lists the CF value for LED refrigeration case lighting as 0.99. Reported savings calculations use 0.92. Correcting this discrepancy slightly increased demand savings. Note: Guidehouse shared this finding as an early finding with PECO and DNV. DNV corrected the issue for all projects with CY2023 dates. This finding only affects CY2022 projects.	This finding has already been reviewed and corrected. No further corrections are required.	Implemented
Downstream, Midstream, and SBDI	Impact	Evaporator Fan EC Motors for Reach-In Cases: Reported savings and eTRACK+ data provide two values associated with the efficiency of the EC motors installed in this measure. The horsepower is documented as 0.0862 and the input wattage is .05 kW. Per section 3.5.2 of the TRM the input wattage should be calculated using the following equation: $\text{HP}_{ee} \times 0.746 / \eta_{ee} \times \text{LF}$, where η_{ee} is the efficiency of the motor (70%) and LF is the Load Factor (0.9). In using the horsepower provided by the tracking data, the input wattage is 0.0826 rather than the reported 0.05. Calculating the input wattage from the listed horsepower decreased the savings.	Ensure that the horsepower and input wattage (kW) agree and align with the TRM's prescribed methodology for calculating one from the other.	In Process

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 PY14. The columns in Table 4-1 are adapted from the Direct Program Cost categories in the Commission's EE&C Plan template⁴⁰ for Phase IV. Non-incentives include EDC Materials, Labor, and Administration costs (including costs associated with an EDC's own 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.⁴¹

Table 4-1. PY14 Program and Portfolio Total Finances (\$1,000)

Program	Incentives	Non-Incentives	Total Cost
Residential	\$7,971	\$6,652	\$14,624
Income-Eligible	\$7,771	\$2,110	\$9,882
Residential HER	\$0	\$2,590	\$2,590
Income-Eligible HER	\$0	\$102	\$102
Non-Residential	\$33,987	\$9,976	\$43,962
Common Portfolio Costs¹			\$11,140
Portfolio Total	\$49,729	\$21,430	\$82,299
SWE Costs²	N/A	N/A	N/A
Portfolio Total	\$49,729	\$21,430	\$82,299

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	\$13,696	\$11,615	\$25,312
Income-Eligible	\$11,924	\$3,688	\$15,613
Residential HER	\$0	\$4,008	\$4,008
Income-Eligible HER	\$0	\$162	\$162
Non-Residential	\$50,303	\$20,110	\$70,412
Common Portfolio Costs¹			\$21,613
Portfolio Total	\$75,923	\$39,583	\$137,119
SWE Costs²	N/A	N/A	N/A

⁴⁰ PA PUC, *State of Pennsylvania Act 129 Energy Efficiency Conservation Plan Template*, September 9, 2020, <https://www.puc.pa.gov/pcdocs/1676672.docx>.

⁴¹ The cost recovery of program expenses through riders generally happens promptly so that costs are being recovered from ratepayers in the same dollars that they are incurred.

Program	Incentives	Non-Incentives	Total Cost
Portfolio Total	\$75,923	\$39,583	\$137,119

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

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 ensure 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. Readers should be mindful of the differences between Table 4-3 and Section 2.2. 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	PY14 Spending (\$1,000)	P4TD Spending (\$1,000)
Residential	R, RH, and CAP	\$31,542	\$54,801
Small C&I	GS	\$28,993	\$42,410
Large C&I	PD, HT, and EP	\$21,317	\$39,233
Municipal	SLE, AL, and TLCL	\$447	\$676
Portfolio Total	All	\$82,299	\$137,120

¹ See current rate class definitions at <https://www.peco.com/MyAccount/MyBillUsage/Pages/CurrentElectric.aspx>.

Source: PECO

Appendix A. Site Inspection Summary

Guidehouse's impact evaluation team completed 44 in-person Residential site inspections to collect and verify site-specific operation parameters and to verify equipment installation as reported for the Multifamily component. Utilivate performed all onsite visits, and their findings are shown in Table A-1. The kit measures were evaluated at individual units, while the high impact building strata measures were evaluated at the building level.

Table A-1. PY14 Residential Multifamily Site Visit Summary

Stratum	Completed Site Visits	Onsite Tasks	Summary of Findings, Updates, and Impacts
Residential and Income-Eligible Multifamily – Kits	48	Verify installation of kit measures, including quantity of measures installed (nightlights, advanced power strips, ENERGY STAR lighting, low flow shower heads, low flow faucet aerators) and any issues with installation. Onsite team also interviewed team about education measures.	The site visits resulted in adjustments to the calculated savings from the program database review, based on the actual count of installed measures found onsite. This is further discussed in Section 3.1.2.
Residential and Income-Eligible Multifamily – High Impact	12	Verified direct install and audit measures in a representative sample of apartment units in each building when applicable, and verified installation of building common area lighting upgrades, such as interior hallway or lobby lighting, and exterior lighting (such as parking lot lighting). Direct install and audit measure verification included confirming if measures were still installed, and confirming count of measures installed, as well as gathering any information about issues with installations.	The site visits resulted in adjustments to the calculated savings from the program database review, based on the actual count of installed measures found onsite. This is further discussed in Section 3.1.2.

Source: Guidehouse analysis

Guidehouse's impact evaluation team completed eight in-person Non-Residential site inspections to collect and verify site-specific operation parameters and to verify equipment installation as reported. The InCA and EcoMetric teams performed all onsite visits, and their findings are shown in Table A-2.

Table A-2. PY14 Non-Residential Site Visit Summary

Component	Update from Onsite	Type of Project	Onsite Tasks	Summary of Findings, Updates, and Impacts
Midstream	Yes	Lighting	Verify fixture type and quantity, location, and control type(s); install lighting loggers to record HOU	The site visit resulted in an adjustment to the claimed HOU, identified via observations of space type inconsistencies and metering results. The ex-ante assumption of space conditioning type was also changed to “Unconditioned,” as all fixtures were in a parking garage. These changes resulted in modest reductions in energy and demand savings.
Downstream	Yes	Custom	Verify system component scheduling via BAS and acquire trend data	The investigation of the BAS required an adjustment to HOU for multiple system components. The project engineer also confirmed that no incentivized components or controls were in operation during times of peak load, so zero demand savings were verified.
Downstream	Yes	Custom	Confirm supply-air temperature reset controls operation, as well as HVAC and lighting scheduling	The site visit confirmed HOU via gathered interval data, which helped inform calculation adjustments and engineering calculations.
Downstream	No	Custom	Verify project fan installation and speed. Gather additional trend data.	The project engineer was able to verify the reduced fan speed but was unable to collect updated trend data due to a customer server issue. Changes to savings stem from calculation adjustments, including to the baseline period.
Downstream	Yes	Lighting	Verify fixture type and quantity, space conditioning, and control type(s); install lighting loggers to record HOU	Reported savings calculations used pre-pandemic operational hours to establish HOU. Onsite interviews with key personnel and logging showed that operation has not returned to pre-pandemic usage, causing a reduction in energy savings. The evaluation team also reduced demand savings after analyzing the existing logging data. The evaluation team used CF values that were calculated based on the observed operation of sampled fixtures during the peak period, reducing overall savings.
Downstream	No	Custom	Confirm the size of pump and fan motors, and respective VFDs installed. Observe operating conditions and record speed.	The project engineer determined that the incentivized equipment represents a vast majority of the equipment on the electric meter, so an IPMVP Option A regression comparison of meter data was chosen as the most appropriate and comprehensive approach. This resulted in a decrease in energy savings but a slight increase in demand savings.
Downstream	No	Lighting	Confirm the installation and functionality of a sample of installed streetlights	The project engineer verified the street light installation and operation via site visit.
Downstream	Yes	Lighting	Verify lighting occupancy sensor control operation	The project engineer determined that the trend data used in the original savings calculations was gathered at a separate but similar facility owned by the same company. The evaluation team performed a regression analysis on billing data, resulting in a reduction to energy and demand savings.

Source: Guidehouse analysis

Appendix B. HER Impact Evaluation Detail

This appendix details the full HER Program 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 7% of total portfolio energy savings and 14% of total portfolio demand savings. The HER programs are implemented by Oracle.

B.1 Billing Data Management

Guidehouse used monthly billing data from Oracle to perform the energy savings analysis. The evaluation team applied the following preliminary data management steps on the billing data prior to carrying out 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 later of (a) the start of the current program year (May 1, 2022) 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.⁴²
- 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,⁴³ defined as monthly observations outside median monthly usage by wave plus or minus ten 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.⁴⁴ The evaluation team 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.

⁴² PA SWE. "Section 6.1.4 Data Management." *Evaluation Framework for Pennsylvania Act 129 Phase IV Energy Efficiency and Conservation Programs*, July 16, 2021. https://www.puc.pa.gov/media/1584/swe-phaseiv_evaluation_framework071621.pdf.

⁴³ PA SWE. "Section 6.1.4.1 Outlier Detection and Removal." *Evaluation Framework for Pennsylvania Act 129 Phase IV Energy Efficiency and Conservation Programs*, July 16, 2021. https://www.puc.pa.gov/media/1584/swe-phaseiv_evaluation_framework071621.pdf.

⁴⁴ PA SWE. "Section 6.1.5 Model Specification." *Evaluation Framework for Pennsylvania Act 129 Phase IV Energy Efficiency and Conservation Programs*, July 16, 2021. https://www.puc.pa.gov/media/1584/swe-phaseiv_evaluation_framework071621.pdf.

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 $\pm 0.5\%$ at the 95% confidence level (two-tailed), but individual cohorts may have a wider margin of error.⁴⁵ The precisions in Table B-2. reflect the error of the individual regression analysis estimates using a two-tailed 95% confidence level.

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

Month	Wave 3		Wave 7 Dual Fuel		Wave 7 Has Email		Wave 7 Income-Eligible		Wave 7 No Email	
	ATE	Std. Err.	ATE	Std. Err.	ATE	Std. Err.	ATE	Std. Err.	ATE	Std. Err.
2022-Jun	-0.925	0.172	-0.257	0.061	-0.277	0.072	-0.043	0.101	-0.163	0.063
2022-Jul	-0.962	0.197	-0.324	0.072	-0.329	0.086	-0.153	0.122	-0.224	0.077
2022-Aug	-0.961	0.193	-0.406	0.071	-0.336	0.086	-0.206	0.123	-0.243	0.076
2022-Sep	-0.871	0.147	-0.260	0.053	-0.313	0.065	-0.144	0.092	-0.181	0.056
2022-Oct	-0.795	0.121	-0.139	0.042	-0.187	0.055	-0.121	0.087	-0.138	0.052
2022-Nov	-0.948	0.145	-0.164	0.048	-0.203	0.073	-0.077	0.119	-0.185	0.071
2022-Dec	-1.240	0.186	-0.150	0.057	-0.143	0.091	-0.156	0.151	-0.219	0.092
2023-Jan	-1.299	0.184	-0.163	0.056	-0.233	0.091	-0.140	0.153	-0.206	0.091
2023-Feb	-1.155	0.175	-0.156	0.054	-0.228	0.087	-0.305	0.145	-0.238	0.087
2023-Mar	-1.079	0.156	-0.173	0.050	-0.253	0.076	-0.283	0.129	-0.162	0.075
2023-Apr	-0.881	0.129	-0.209	0.046	-0.236	0.057	-0.226	0.093	-0.095	0.053
2023-May	-0.834	0.140	-0.227	0.049	-0.219	0.059	-0.252	0.083	-0.123	0.049

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

Month	Wave 3		Wave 7 Dual Fuel		Wave 7 Has Email		Wave 7 Income-Eligible		Wave 7 No Email	
	% Savings	Abs. Prec.	% Savings	Abs. Prec.	% Savings	Abs. Prec.	% Savings	Abs. Prec.	% Savings	Abs. Prec.
2022-Jun	1.90%	0.69%	0.97%	0.45%	1.22%	0.62%	0.19%	0.86%	0.79%	0.59%
2022-Jul	1.58%	0.64%	0.93%	0.40%	1.12%	0.58%	0.51%	0.80%	0.82%	0.55%

⁴⁵ PA SWE. "Section 6.1.1.1 Group Sizes." *Evaluation Framework for Pennsylvania Act 129 Phase IV Energy Efficiency and Conservation Programs*, July 16, 2021. https://www.puc.pa.gov/media/1584/swe-phaseiv_evaluation_framework071621.pdf.

Month	Wave 3	Wave 7 Dual Fuel		Wave 7 Has Email		Wave 7 Income-Eligible			Wave 7 No Email	
	% Savings	Abs. Prec.	% Savings	Abs. Prec.	% Savings	Abs. Prec.	% Savings	Abs. Prec.	% Savings	Abs. Prec.
2022-Aug	1.63%	0.64%	1.20%	0.41%	1.17%	0.58%	0.69%	0.81%	0.91%	0.56%
2022-Sep	2.02%	0.67%	1.11%	0.44%	1.52%	0.61%	0.67%	0.84%	0.95%	0.58%
2022-Oct	2.43%	0.72%	0.86%	0.51%	1.22%	0.71%	0.74%	1.04%	0.94%	0.69%
2022-Nov	2.52%	0.75%	0.94%	0.53%	1.11%	0.78%	0.39%	1.20%	1.05%	0.79%
2022-Dec	2.74%	0.81%	0.75%	0.56%	0.65%	0.82%	0.67%	1.27%	1.04%	0.85%
2023-Jan	2.97%	0.82%	0.85%	0.58%	1.09%	0.83%	0.61%	1.29%	1.00%	0.87%
2023-Feb	2.88%	0.85%	0.88%	0.60%	1.15%	0.86%	1.40%	1.30%	1.24%	0.89%
2023-Mar	2.94%	0.83%	1.03%	0.58%	1.38%	0.82%	1.40%	1.26%	0.92%	0.84%
2023-Apr	2.74%	0.79%	1.32%	0.57%	1.53%	0.73%	1.35%	1.08%	0.65%	0.72%
2023-May	2.50%	0.82%	1.34%	0.57%	1.42%	0.74%	1.55%	1.00%	0.88%	0.68%

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.⁴⁶ Guidehouse multiplied the total number of active recipients by the number of days in the month and 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 3	Wave 7 Dual Fuel	Wave 7 Has Email	Wave 7 IE	Wave 7 No Email	Program Total
2022-Jun	47,197	94,641	195,485	19,143	80,021	436,487
2022-Jul	46,962	93,663	192,282	18,903	79,175	430,985
2022-Aug	46,759	92,783	189,176	18,682	78,396	425,796
2022-Sep	46,515	91,901	186,411	18,471	77,584	420,882
2022-Oct	46,316	91,150	184,112	18,248	76,839	416,665
2022-Nov	46,154	90,536	182,061	18,015	76,110	412,876
2022-Dec	46,025	89,979	180,152	17,783	75,413	409,352
2023-Jan	45,916	89,529	178,737	17,616	74,905	406,703
2023-Feb	45,804	89,055	177,212	17,457	74,427	403,955
2023-Mar	45,725	88,701	176,054	17,334	73,997	401,811
2023-Apr	45,626	88,286	174,547	17,150	73,504	399,113
2023-May	45,504	87,808	173,005	16,983	72,973	396,273

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 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.⁴⁷ 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

⁴⁶ PA SWE. "Section 6.1.1.2 Opt-Outs and Account Closures." *Evaluation Framework for Pennsylvania Act 129 Phase IV Energy Efficiency and Conservation Programs*, July 16, 2021. https://www.puc.pa.gov/media/1584/swe-phaseiv_evaluation_framework071621.pdf.

⁴⁷ PA SWE. "Section 6.1.8 Dual Participation Analysis." *Evaluation Framework for Pennsylvania Act 129 Phase IV Energy Efficiency and Conservation Programs*, July 16, 2021. https://www.puc.pa.gov/media/1584/swe-phaseiv_evaluation_framework071621.pdf.

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, the evaluation team used an assumed percentage reduction factor for each recipient cohort to account for upstream dual participation. This factor determines total upstream reduction based on the estimate of energy savings less downstream double-counted savings. Percentage upstream reduction values for each wave are shown in Table B-4.

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 7
3	2.25%	-
4 and beyond	3.00%	Wave 3

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 3	885	477	1,362
Wave 7 – Dual Fuel	268	105	374
Wave 7 – Has Email	187	244	432
Wave 7 – Income-Eligible	11	17	28
Wave 7 – No Email	149	74	222

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,⁴⁸ Guidehouse performed a persistence analysis to estimate first-year savings (FYS) for all cohorts in their third or later year of activity.

The calculations for persistence reductions follow the algorithms in the 2021 Pennsylvania TRM, Volume 2, Section 2.7.3.⁴⁹ Guidehouse used the default decay rate of 31.3% to calculate monthly persistence based on Average Treatment Effect (ATE) from prior program years and

⁴⁸ PA SWE. "Section 6.1.9 Incremental Annual Accounting and Measure Life." *Evaluation Framework for Pennsylvania Act 129 Phase IV Energy Efficiency and Conservation Programs*, July 16, 2021. https://www.puc.pa.gov/media/1584/swe-phaseiv_evaluation_framework071621.pdf.

⁴⁹ PA PUC. "Section 2.7.3 Home Energy Reports." *Technical Reference Manual, Volume 2; State of Pennsylvania Act 129 Energy Efficiency and Conservation Program*. February 2021. <https://www.puc.pa.gov/filing-resources/issues-laws-regulations/act-129/technical-reference-manual/>.

proportionate to estimated savings net-of-uplift from the current program year. Table B-6. contains the monthly persistence reductions for all active cohorts.

Table B-6. HER Persistence (MWh)

Month	Wave 3	Wave 7 Dual Fuel	Wave 7 Has Email	Wave 7 IE	Wave 7 No Email	Program Total
2022-Jun	738	0	0	0	0	738
2022-Jul	789	0	0	0	0	789
2022-Aug	784	0	0	0	0	784
2022-Sep	679	0	0	0	0	679
2022-Oct	632	0	0	0	0	632
2022-Nov	738	0	0	0	0	738
2022-Dec	1,003	0	0	0	0	1,003
2023-Jan	1,048	0	0	0	0	1,048
2023-Feb	832	0	0	0	0	832
2023-Mar	856	0	0	0	0	856
2023-Apr	665	0	0	0	0	665
2023-May	644	0	0	0	0	644

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

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

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

Month	Wave 3	Wave 7 Dual Fuel	Wave 7 Has Email	Wave 7 IE	Wave 7 No Email	Program Total
2022-Jun	472	700	1,600	23	383	3,179
2022-Jul	505	911	1,926	87	537	3,965
2022-Aug	501	1,135	1,933	113	578	4,259
2022-Sep	434	690	1,714	74	404	3,316
2022-Oct	404	369	1,026	68	310	2,177
2022-Nov	472	419	1,074	41	404	2,410
2022-Dec	641	388	767	85	489	2,371
2023-Jan	670	419	1,246	75	453	2,862
2023-Feb	532	357	1,097	147	473	2,606
2023-Mar	548	443	1,332	150	349	2,821
2023-Apr	425	518	1,194	115	189	2,441
2023-May	412	579	1,144	131	258	2,523

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 6.1.6.⁵⁰ 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 2022.

The evaluation team 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 PY14.
- 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 together 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.

⁵⁰ PA SWE. "Section 6.1.6 Peak Demand Impacts." *Evaluation Framework for Pennsylvania Act 129 Phase IV Energy Efficiency and Conservation Programs*, July 16, 2021, https://www.puc.pa.gov/media/1584/swe-phaseiv_evaluation_framework071621.pdf.

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)

Month	Wave 3		Wave 7 Dual Fuel		Wave 7 Has Email		Wave 7 Inc. Eligible		Wave 7 No Email	
	Est.	Std. Err.	Est.	Std. Err.	Est.	Std. Err.	Est.	Std. Err.	Est.	Std. Err.
Jun-2022	-0.0404	0.0130	-0.0136	0.0068	-0.0155	0.0072	-0.0063	0.0082	-0.0066	0.0055
Jul-2022	-0.0374	0.0148	-0.0195	0.0081	-0.0187	0.0089	-0.0094	0.0104	-0.0085	0.0072
Aug-2022	-0.0397	0.0150	-0.0218	0.0082	-0.0203	0.0089	-0.0101	0.0101	-0.0074	0.0070

Source: Guidehouse analysis of hourly metering data

To account for uplift and persistence, the evaluation team applied the ratio of the First-Year Savings Average Treatment Effect (FYSATE) 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. 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)	FYS (MWh)	Demand Savings (MW)
Wave 3	16,785	1,362	15,424	9,408	6,016	0.663
Wave 7 – Dual Fuel	7,301	374	6,927	0	6,927	1.652
Wave 7 – Has Email	16,483	432	16,052	0	16,052	3.431
Wave 7 – Income-Eligible	1,136	28	1,108	0	1,108	0.155
Wave 7 – No Email	5,049	222	4,827	0	4,827	0.578

Source: Guidehouse analysis

Appendix C. PY14 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 PY14 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	5,518	8,559
Residential Total		5,518	8,559
Single-Family	Income-Eligible	20,631	30,775
Appliance Recycling	Income-Eligible	1,324	2,372
Long-Term Savings	Income-Eligible	266	385
Income-Eligible Total		22,221	33,532
Income-Eligible HER	Income-Eligible	1,108	1,903
Portfolio Total		28,847	43,994

Source: Guidehouse analysis

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

D.1 Program and Component Level Impacts Summary

A summary of energy impacts by program and component through PY14 is presented in Table D-1.

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	33,763	32,921	19,805	56,286	55,067	33,274
Appliance Recycling	9,114	9,798	5,185	17,594	18,786	9,960
In-Home Assessment	4,593	4,389	3,462	7,463	6,743	6,165
New Construction	2,471	2,488	1,368	4,540	4,584	3,297
Multifamily	2,854	1,708	1,691	5,121	3,945	3,645
Multifamily Income-Eligible	5,720	5,518	5,518	9,520	8,559	8,559
Residential Total	58,515	56,823	37,029	100,524	97,686	64,901
Single-Family	19,883	20,631	20,631	34,615	30,775	30,775
Appliance Recycling	1,231	1,324	1,324	2,326	2,372	2,372
Long-Term Savings	255	266	266	397	385	385
Income-Eligible Total	21,369	22,221	22,221	37,338	33,532	33,532
Residential HER	34,048	33,821	33,821	57,837	57,602	57,602
Income-Eligible HER	1,246	1,108	1,108	2,039	1,903	1,903
Downstream	74,992	69,399	49,870	186,713	186,281	123,094
Midstream	96,446	102,704	70,866	131,422	143,276	98,861
Small Business Direct Install	8,826	8,641	7,741	12,903	12,391	11,053
New Construction	7,124	7,331	2,876	12,264	12,567	4,850
Non-Residential Total	187,388	188,075	131,352	343,303	354,515	237,858
Portfolio Total	302,566	302,048	225,531	541,041	545,238	395,796

Source: Guidehouse analysis

A summary of the peak demand impacts by energy efficiency program and component through the current reporting period are presented in Table D-2.

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	5.85	5.94	3.84	9.77	10.07	6.56
Appliance Recycling	1.96	2.07	1.05	3.67	3.85	1.96
In-Home Assessment	0.54	0.51	0.41	0.91	0.81	0.75
New Construction	0.97	0.63	0.35	1.85	1.23	0.89

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	0.41	0.26	0.26	0.76	0.59	0.55
Multifamily Income-Eligible	0.60	0.57	0.57	1.02	0.89	0.89
Residential Total	10.34	9.99	6.47	17.98	17.43	11.60
Single-Family	2.04	2.17	2.17	3.59	3.18	3.18
Appliance Recycling	0.30	0.31	0.31	0.54	0.55	0.55
Long-Term Savings	0.01	0.01	0.01	0.02	0.02	0.02
Income-Eligible Total	2.35	2.50	2.50	4.16	3.75	3.75
Residential HER	5.54	6.83	6.83	9.41	10.93	10.93
Income-Eligible HER	0.20	0.17	0.17	0.33	0.05	0.05
Downstream	13.73	12.56	9.03	34.37	31.75	21.29
Midstream	19.69	20.60	14.21	27.11	29.05	20.05
Small Business Direct Install	1.75	1.63	1.48	2.42	2.30	2.07
New Construction	1.22	1.39	0.54	2.26	2.50	0.94
Non-Residential Total	36.38	36.18	25.26	66.16	65.60	44.35
Portfolio Total	54.81	55.66	41.22	98.05	97.77	70.68

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 2022 dollars.

Table D-3. PY14 Gross TRC Ratios by Program (\$1,000)¹

Program	TRC NPV Benefits	TRC NPV Costs	TRC Ratio	TRC Net Benefits (Benefits – Costs)
Residential	\$54,959	\$46,405	1.18	\$8,554
Income-Eligible	\$27,302	\$7,411	3.68	\$19,891
HER	\$5,517	\$2,590	2.13	\$2,928
Income-Eligible HER	\$155	\$102	1.52	\$53
Residential Subtotal	\$87,933	\$56,508	1.56	\$31,426
Non-Residential Subtotal	\$98,098	\$117,211	0.84	-\$19,113
Common Portfolio Costs		\$11,140		
Portfolio Total	\$186,032	\$184,858	1.01	\$1,173

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 PY14 cost-effectiveness using net verified savings to calculate benefits.

Table D-4. PY14 Net TRC Ratios by Program (\$1,000)¹

Program	TRC NPV Benefits	TRC NPV Costs	TRC Ratio	TRC Net Benefits (Benefits – Costs)
Residential	\$35,794	\$32,543	1.10	\$3,251
Income-Eligible	\$27,302	\$7,411	3.68	\$19,891
HER	\$5,517	\$2,590	2.13	\$2,928

Program	TRC NPV Benefits	TRC NPV Costs	TRC Ratio	TRC Net Benefits (Benefits – Costs)
Income-Eligible HER	\$155	\$102	1.52	\$53
Residential Subtotal	\$68,768	\$42,646	1.61	\$26,123
Non-Residential Subtotal	\$68,485	\$84,839	0.81	-\$16,354
Common Portfolio Costs		\$11,140		
Portfolio Total	\$137,252	\$138,624	0.99	-\$1,371

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	\$95,127	\$84,589	1.12	\$10,538
Income-Eligible	\$48,999	\$13,142	3.73	\$35,857
HER	\$7,927	\$4,008	1.98	\$3,919
Income-Eligible HER	\$156	\$162	0.96	-\$6
Residential Subtotal	\$152,209	\$101,901	1.49	\$50,308
Non-Residential Subtotal	\$177,191	\$207,462	0.85	-\$30,272
Common Portfolio Costs		\$21,613		
Portfolio Total	\$329,399	\$330,975	1.00	-\$1,577

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	\$65,111	\$61,757	1.05	\$3,359
Income-Eligible	\$48,999	\$13,142	3.73	\$35,857
HER	\$7,927	\$4,008	1.98	\$3,919
Income-Eligible HER	\$156	\$162	0.96	-\$6
Residential Subtotal	\$122,193	\$79,069	1.55	\$43,129
Non-Residential Subtotal	\$119,104	\$146,248	0.81	-\$27,145
Common Portfolio Costs		\$21,613		
Portfolio Total	\$241,301	\$246,929	0.98	-\$5,628

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 High Impact Measure Net-to-Gross

Findings from NTG research are not used to adjust compliance savings in Pennsylvania. Instead, NTG research provides directional information for program planning purposes. Table D-7. presents NTG findings for high impact measures (HIMs) studied in PY14.⁵¹

Table D-7. High Impact Measure NTG

HIM	Free Ridership	Spillover	NTG Ratio
Residential – Ceiling/attic, wall, floor, and rim joist insulation (IHA)	0.55	0.25	0.70
Residential – Basement or crawl space wall insulation (IHA)	0.14	0.02	0.87
Residential – Air sealing (IHA)	0.58	0.93	1.35
Non-Residential – Lighting Improvements (Downstream)	0.24	0.01	0.77
Non-Residential – Custom Projects (Downstream)	0.26	0.03	0.77

Source: Guidehouse analysis

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

Table D-8. presents PY14 expenditures, by program, compared with the budget estimates set forth in the EE&C plan⁵² for PY14. All the dollars in Table D-8. are presented in 2022 nominal dollars.

Table D-8. Comparison of PY14 Expenditures to Phase IV EE&C Plan (\$1,000)

Program	PY14 Budget from EE&C Plan	PY14 Actual Expenditures	Ratio (Actual/Plan)
Residential	\$14,820	\$14,624	0.99
Income-Eligible	\$8,490	\$9,882	1.16
Residential HER	\$2,190	\$2,590	1.18
Income-Eligible HER	\$120	\$102	0.85
Non-Residential	\$49,230	\$43,962	0.89
Portfolio Total	\$74,860	\$71,159	0.95

Sources: Guidehouse analysis, PECO EE&C Plan

Table D-9. presents P4TD expenditures, by program, compared to the budget estimates set forth in the EE&C plan through PY14. Phase IV dollar totals in Table D-9. are presented in nominal dollars.

⁵¹ 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 identify 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.

⁵² PECO, *PECO Program Years 2021-2026 Act 129 – Phase IV Energy Efficiency and Conservation Plan*. Filed June 18, 2020, <https://www.puc.pa.gov/pdocs/1666981.docx>.

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

Program	Phase IV Budget from EE&C Plan through PY14	P4TD Actual Expenditures	Ratio (Actual/Plan)
Residential	\$29,270	\$25,313	0.86
Income-Eligible	\$16,980	\$15,613	0.92
Residential HER	\$4,040	\$4,008	0.99
Income-Eligible HER	\$200	\$162	0.81
Non-Residential	\$88,820	\$70,413	0.79
Portfolio Total	\$139,320	\$115,507	0.83

Sources: Guidehouse analysis, PECO EE&C Plan

Table D-10. compares PY14 verified gross program savings to the energy savings projections set forth in the EE&C plan.

Table D-10. Comparison of PY14 Actual Program Savings to EE&C Plan Projections

Program	EE&C Plan Projections for PY14 (MWh)	PY14 VTD Gross MWh Savings	Ratio (Actual/Plan)
Residential	45,513	56,823	1.25
Income-Eligible	17,140	22,221	1.30
Residential HER	25,447	33,821	1.33
Income-Eligible HER	1,413	1,108	0.78
Non-Residential	233,474	188,075	0.81
Portfolio Total	322,986	302,048	0.94

Sources: Guidehouse analysis, PECO EE&C Plan

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

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

Program	EE&C Plan Projections through PY14 (MWh)	VTD Gross MWh Savings	Ratio (Actual/Plan)
Residential	89,687	97,686	1.09
Income-Eligible	34,278	33,532	0.98
Residential HER	46,954	57,602	1.23
Income-Eligible HER	2,351	1,903	0.81
Non-Residential	408,337	354,515	0.87
Portfolio Total	581,605	545,238	0.94

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 PY14 for select Residential and IE EE 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 channels to receive product rebates: Downstream, Trade Ally and Distributor Network, Marketplace, and Point of Purchase. According to the Phase IV plan, this component is planned to account for 50% of Residential EE Program energy savings, 45% of Residential EE Program demand savings, 7% of total portfolio energy savings, and 5% of portfolio demand savings. The Phase IV Rebates and Marketplace component is implemented by CLEAResult.

E.1.1 Gross Impact Evaluation

Guidehouse conducted three activities to verify savings for this component: a tracking database analysis for all measures outlined in the PA TRM⁵³ and latest interim measure protocols (IMPs) using a combination of TRM default values and EDC-provided data, an online survey, and engineering desk reviews of sampled recipients of ENERGY STAR Certified Connected Thermostats. As part of the tracking database analysis, the team 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 savings⁵⁴.

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.

⁵³ PA PUC. *Technical Reference Manual; State of Pennsylvania Act 129 Energy Efficiency and Conservation Program & Act 213 Alternative Energy Portfolio Standards*. Dated August 2019, re-issued February 2021. <https://www.puc.pa.gov/filing-resources/issues-laws-regulations/act-129/technical-reference-manual/>

⁵⁴ Guidehouse, *Phase IV Evaluation Plan, Energy Efficiency and Conservation Portfolio*, revised April 13, 2023.

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 Pump	3.9%	0.95	0.99	TRM default values were used in place of missing data
Central AC	3.3%	0.95	0.97	Unable to replicate reported savings
ECM Circulation Fans	2.0%	1.05	1.06	Reduced energy demand factor needs adjustment
Air Source Heat Pump	1.6%	0.84	0.99	TRM default values were used in place of missing data

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

Source: Guidehouse analysis

Guidehouse conducted an online survey of sampled recipients in PY14 for the ENERGY STAR Certified Connected Thermostats, as described in Section 3.1.2. The surveys included specific questions the customer could answer based on common knowledge of the thermostat they received. Savings were recalculated based on the customer responses in the surveys. Findings from the survey are detailed in Section 3.1.2.

As Table E-2 presents, Guidehouse exceeded the sample response rate as a result of higher than expected survey participation for the ENERGY STAR Certified Connected Thermostats measure.

Table E-2. Rebates and Marketplace Sample Project Count

Channel	Target Count	Achieved Count
ENERGY STAR Certified Connected Thermostats	40	71

Source: Guidehouse analysis

For the downstream, marketplace, and trade ally channels the results of the tracking database analysis were combined with the PY13 verification ratios to determine final verified gross savings. This combined with the connected thermostat results led to the Rebates and Marketplace component overall realization rates.

E.1.2 Net Impact Evaluation

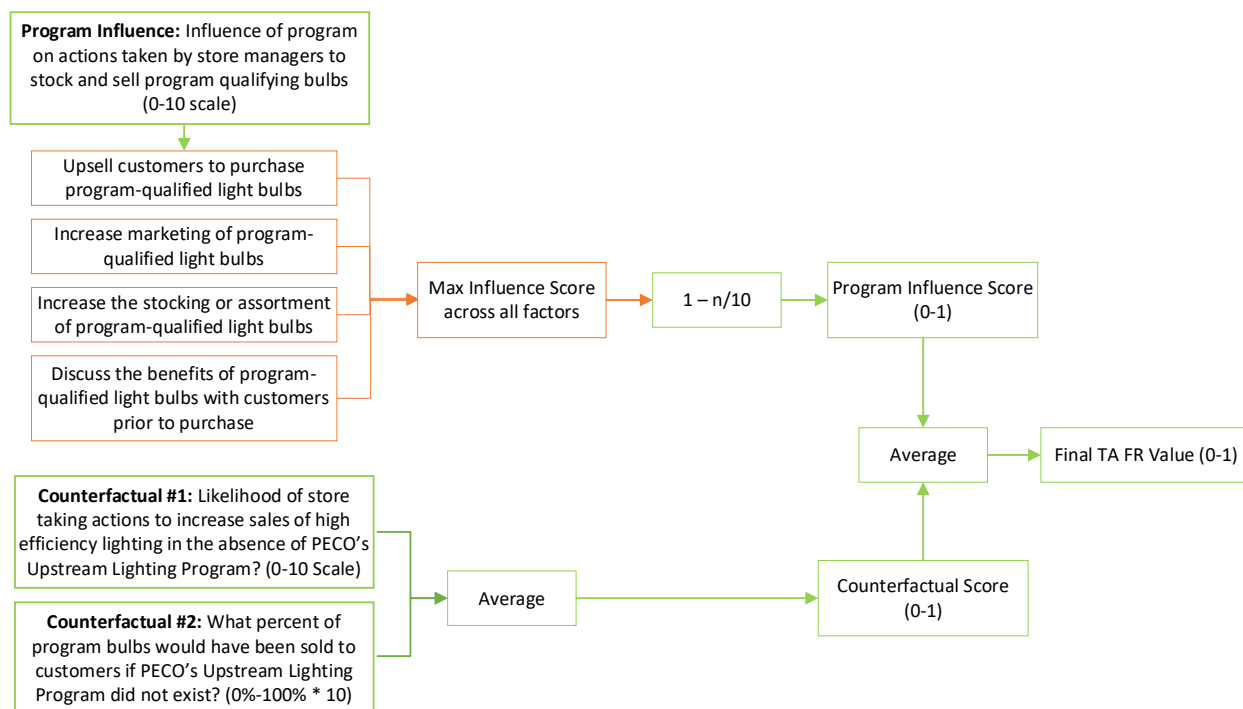
Guidehouse conducted NTG research for the Point of Purchase pathway, also known as Upstream Lighting, for the Rebates and Marketplace component in PY14. The team sent online surveys and followed up with phone calls with 37 retail store managers in the PECO territory who participated in the Upstream Lighting program in PY14. Only two store managers responded to the survey and provided NTG feedback despite the multiple outreach attempts and \$50 Tango gift card incentive for participating. See Section 3.1.5 for information on the PY14 surveying effort.

E.1.2.1 Free Ridership

Guidehouse followed the SWE’s Phase IV Evaluation Framework for Midstream and Upstream programs by asking retail store participants of the Upstream Lighting component about the impacts of the component on stocking and selling practices of qualifying light bulbs. NTG questions covered Influence of the component on upselling, marketing, and promoting qualifying bulbs, and probing about the counterfactual scenario or what sales of qualifying bulbs might have been in absence of the program.

Figure E-1 is a visual representation of the scoring of the NTG questions for the Upstream Lighting (Point of Purchase) pathway.

Figure E-1. Free Ridership Algorithm – Point of Purchase Pathway



Source: Guidehouse analysis

E.1.2.2 Participant Spillover

The Upstream Lighting NTG battery covers all sales of component qualifying bulbs and therefore already accounts for any possible spillover in the final NTG score.

Guidehouse only conducted NTG research for the Point of Purchase pathway, also known as Upstream Lighting, for the Rebates and Marketplace component in PY14. The team sent online surveys and followed up with phone calls with 37 retail store managers in the PECO territory who participated in the Upstream Lighting program in PY14. Only two respondents took the survey and provided NTG feedback despite the multiple outreach attempts and \$50 Tango gift card incentive for participating.

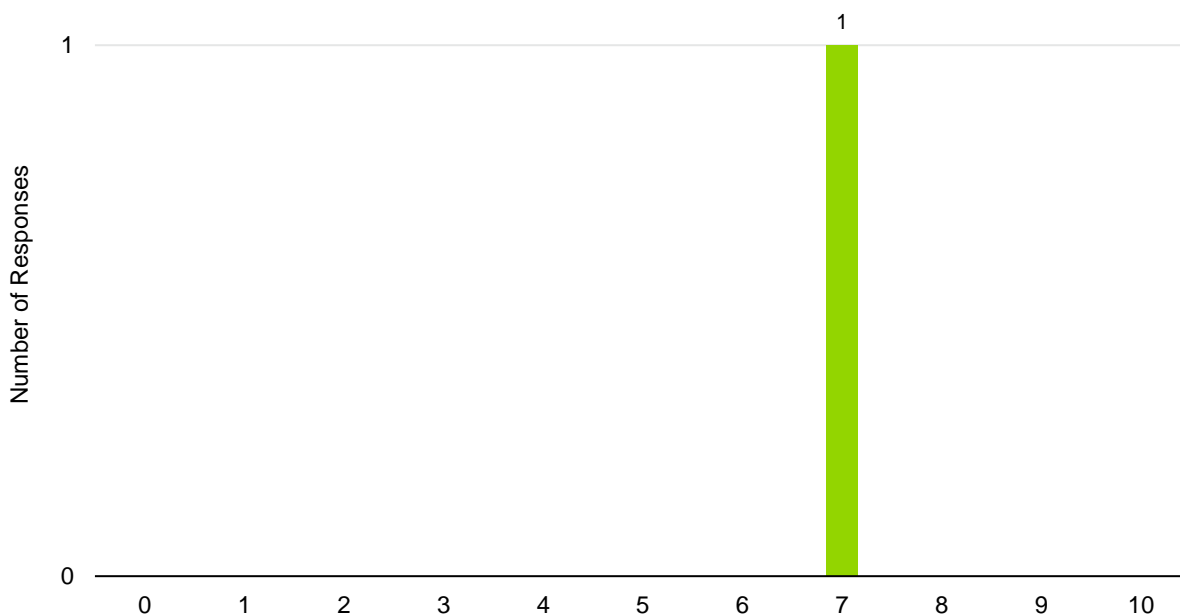
E.1.3 Process Evaluation

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 Retail LED Point of Purchase pathway of the Rebates and Marketplace component specifically.

Guidehouse contacted 35 retailers and two corporate contacts currently participating in PECO's Retail LED Instant Discounts pathway to conduct the process evaluation for this component. Retail contacts included store managers of retail store locations currently participating in the PECO's Retail LED Instant Discounts pathway. Corporate contacts included staff employed by the participating retailers' corporate offices. Two retail contacts replied to the survey resulting in a 5% response rate.

Several questions measured satisfaction levels for the PECO Retail LED Point of Purchase pathway overall. Respondents rated their satisfaction using a scale of 0 to 10 with 0 representing "extremely dissatisfied" and 10 representing "extremely satisfied." Respondents could also select "don't know;" Guidehouse excluded "don't know" responses from satisfaction analysis. The mean satisfaction for the pathway overall is 7.0 out of 10 (n=1). The survey only asked corporate contacts about their satisfaction with different aspects of the pathway; however, the two responses to the survey were from retail contacts, so the analysis does not include information about respondents' satisfaction with different aspects of the pathway. One respondent rated their likelihood to recommend the PECO Retail LED Point of Purchase pathway to others as 7.0 out of 10 (scale of 0 to 10, where 0 is "not at all likely" and 10 is "extremely likely"), as Figure E-2 shows. Guidehouse excluded one "don't know" response from analysis.

Figure E-2. Likelihood of Recommending PECO’s Retail LED Instant Discounts Pathway (n=1)

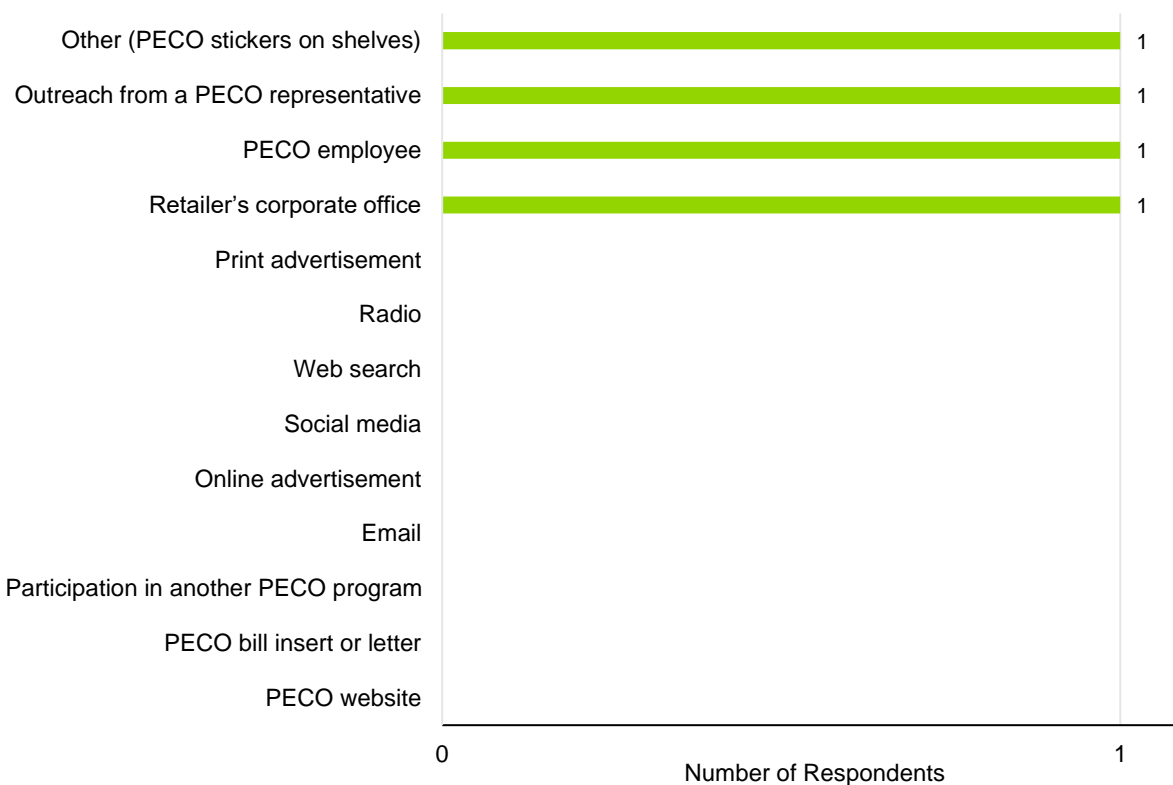


Respondents received the following question: “How likely are you to recommend the PECO’s Retail LED Instant Discounts program to others?”.

Note: The pathway is referred to throughout the survey as “PECO’s Retail LED Instant Discounts Program” as “program” is a more familiar term to customers than “pathway”.

Source: Guidehouse analysis

Respondents were asked how they learned about the PECO Retail LED Point of Purchase pathway. Respondents reported learning about the pathway through their retailer’s corporate office, a PECO employee, direct outreach from a PECO program representative, or through PECO stickers on shelves (Figure E-3).

Figure E-3. Awareness of PECO’s Retail LED Instant Discounts Pathway (n=2)


Respondents received the following question: “How did you learn about the PECO’s Retail LED Instant Discounts program? Select all that apply.”

Source: Guidehouse analysis

E.2 Appliance Recycling (Market-Rate and Income-Eligible)

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 plan, this component is planned to account for 18% of Residential EE Program energy savings, 17% of Residential EE Program demand savings, 10% of Income-Eligible EE Program energy savings, 14% of Income-Eligible EE Program demand savings, 3% of total portfolio energy savings, and 2% of total portfolio demand savings. The Appliance Recycling component is implemented by ARCA.

E.2.1 Gross Impact Evaluation

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-3 illustrates the factors that led to variation between the reported and adjusted database savings and impacted the observed realization rates reported in Sections 3.1.2 and 3.2.2.

Table E-3. Detailed Findings for Appliance Recycling

Measure	Percentage of Residential or IE Energy Savings ¹	Tracking Database Energy Ratio	Tracking Database Demand Ratio	Reason for Adjustment
Refrigerator Recycling	14.6%	1.05	1.05	TRM default values were used in place of missing data
Freezer Recycling	1.3%	1.06	1.06	TRM default values were used in place of missing data
Refrigerator Recycling (IE)	5.4%	1.04	1.04	TRM default values were used in place of missing data

¹ Percentage of Energy Savings is the percentage of total Residential Program or IE Program energy savings that each of these measures represent within their respective programs.

Source: Guidehouse analysis

Guidehouse conducted an online survey of sampled participants in PY14, as described in Section 3.1.2. The surveys included specific questions the customer could answer based on common knowledge of the appliances they recycled. The survey responses showed the condition of the appliances being recycled, including whether they were operational and how old they were, and how often the units were used. Savings were recalculated based on the customer responses in the surveys. 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-4. presents, Guidehouse stratified the sample by measure type, as described in the Sample Design Memo.⁵⁵ Overall, Guidehouse exceeded the sample response rate as a result of higher-than-expected survey participation for both refrigerator and freezer recycling. The mini refrigerator strata underachieved slightly.

Table E-4. Appliance Recycling Sample Project Count

Stratum	Target Count	Achieved Count
Refrigerator	28	106
Freezer	16	25
Room Air Conditioner	16	18
Mini Refrigerator	8	3
Total Sampled Projects	68	152

Source: Guidehouse analysis

E.2.2 Net Impact Evaluation

Guidehouse did not conduct NTG research for this component in PY14.

E.2.3 Process Evaluation

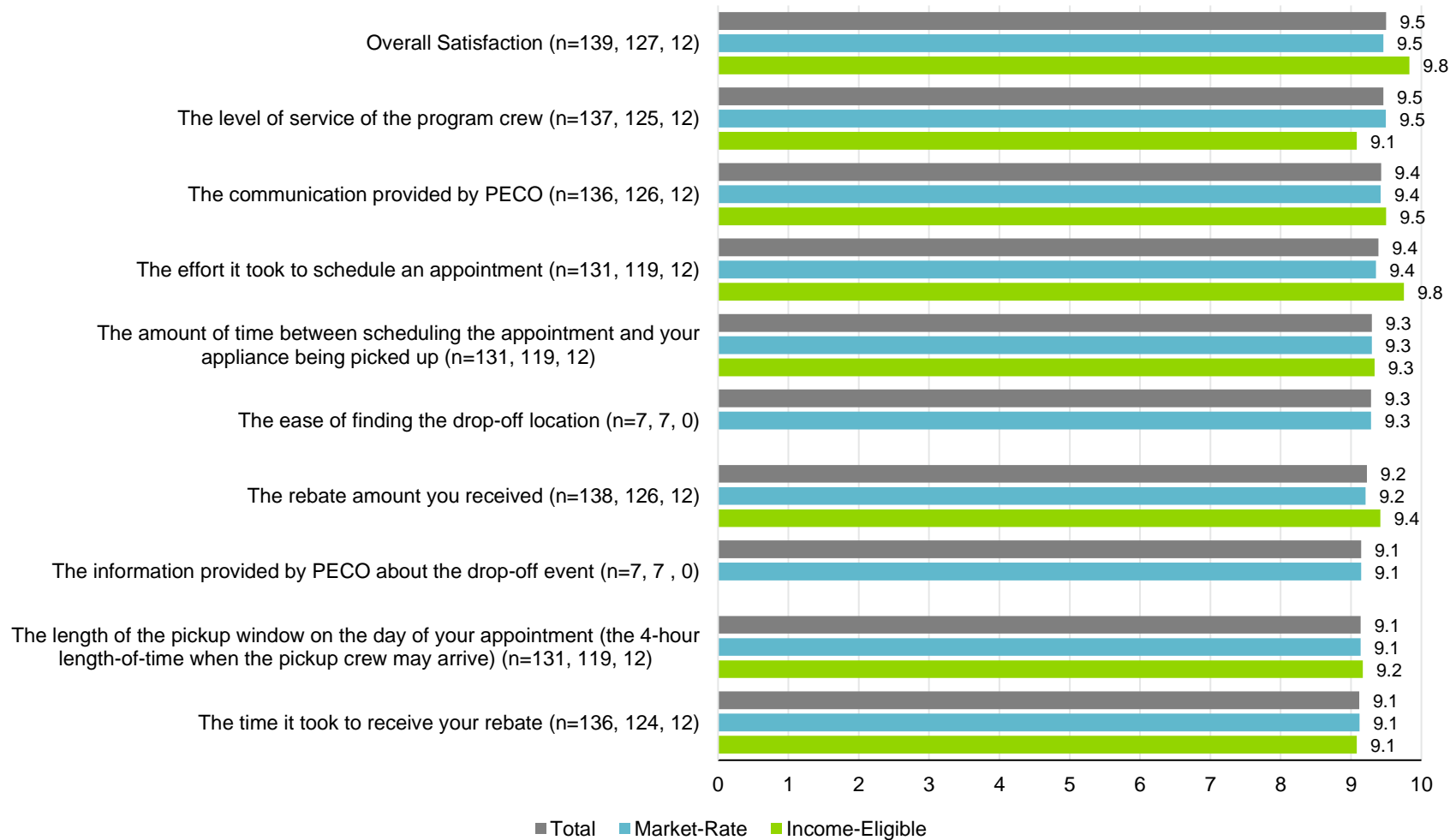
Residential EE Program and Income-Eligible EE Program process evaluation activities and findings are discussed in Section 3.1.5 and Section 3.2.5, respectively. This section describes additional insights from process evaluation activities conducted for the Appliance Recycling component specifically.

⁵⁵ PECO, PY14 Residential and IE Impact Sample Design Memo 03-16-23, dated March 16, 2023

Guidehouse contacted 2,100 customers who participated in the Appliance Recycling component during PY14 to conduct the process evaluation for this component. One hundred thirty-nine participants replied to the survey resulting in a 7% response rate.

Several questions measured respondent satisfaction levels with aspects of the Appliance Recycling component, as well as the Appliance Recycling component overall. Respondents rated their satisfaction using a scale of 0 to 10 with 0 representing “extremely dissatisfied” and 10 representing “extremely satisfied.” Respondents could also select “don’t know” or “not applicable;” Guidehouse excluded “don’t know” and “not applicable” responses from analysis. The mean satisfaction for the component overall is 9.5 out of 10 (9.5 for Market-Rate respondents; 9.8 for Income-Eligible respondents), as Figure E-4 shows.

Respondents also rated their satisfaction with nine aspects of the Appliance Recycling component, as Figure E-4 shows. The level of service of the program crew received the highest mean satisfaction of 9.5 out of 10 (Market-Rate: 9.5; Income-Eligible: 9.1), followed by the communication provided by PECO with a score of 9.4 (Market-Rate: 9.4; Income-Eligible: 9.5) and the effort it took to schedule an appointment with a score of 9.4 (Market-Rate: 9.4; Income-Eligible: 9.8).

Figure E-4. Appliance Recycling Component Satisfaction


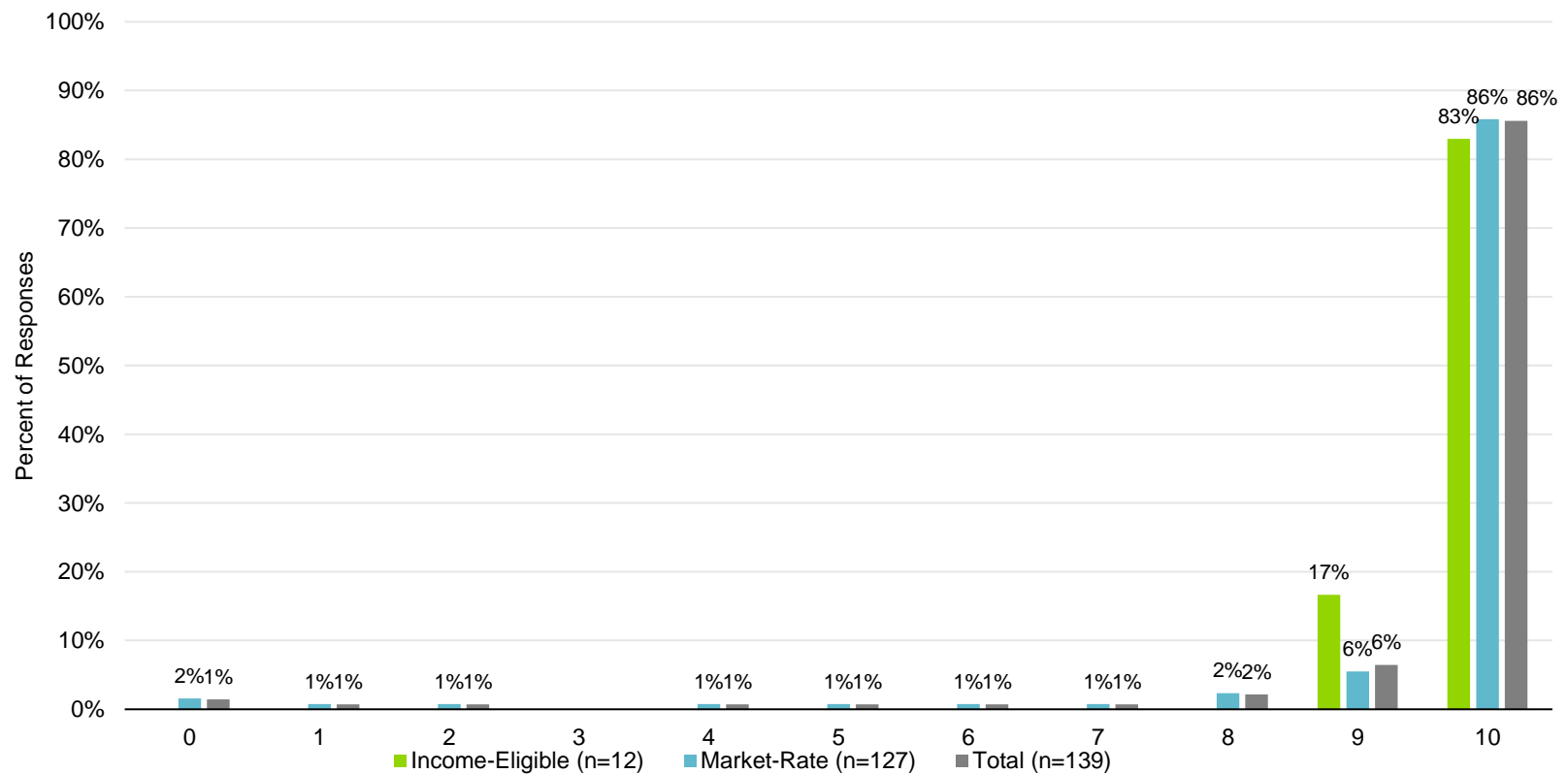
Respondents received the following questions: “How would you rate your satisfaction with the Appliance Recycling program overall?” and “How would you rate your satisfaction with the following aspects of the Appliance Recycling program?”.

Note: The component is referred to as the “Appliance Recycling program” throughout the survey as “program” is a more familiar term to customers than “component.”

Source: Guidehouse analysis

On average, respondents rated their likelihood to recommend the Appliance Recycling component to others as 9.5 out of 10 (Market-Rate: 9.5; Income-Eligible: 9.8) on a scale of 0 to 10, where 0 is “not at all likely” and 10 is “extremely likely” (Figure E-5). Guidehouse excluded “don’t know” responses from analysis. Eighty-six percent of respondents indicated they are extremely likely to recommend the component. Only two respondents indicated they were not at all likely to recommend the component.

Figure E-5. Likelihood of Recommending the Appliance Recycling Component

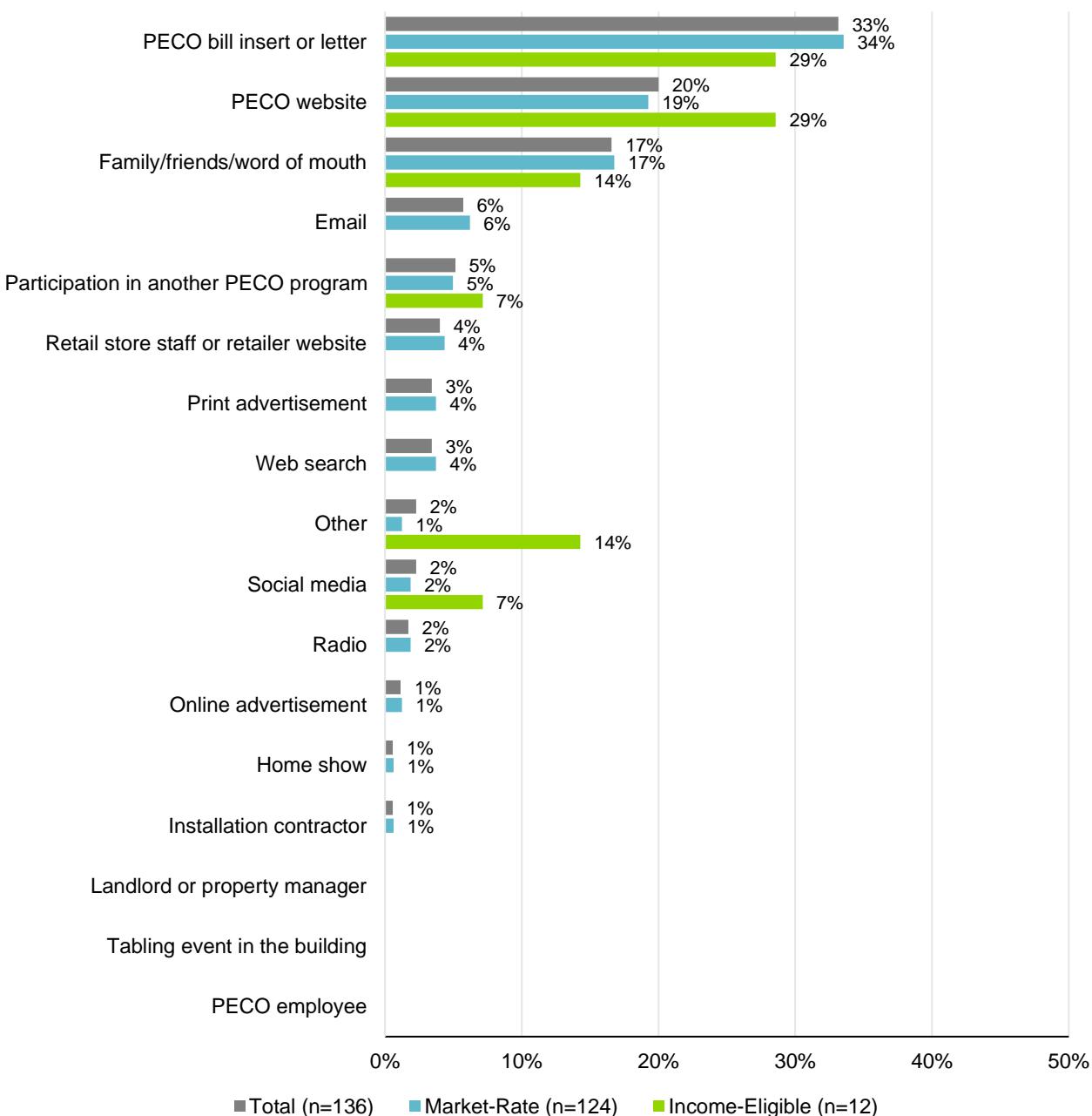


Respondents received the following question: “How likely are you to recommend the Appliance Recycling program to others?”.

Source: Guidehouse analysis

Respondents were asked how they learned about the Appliance Recycling component. They most frequently learned about the Appliance Recycling component through a PECO bill insert or letter (33%), the PECO website (20%), family/friend/word of mouth (17%), and through email (6%) (Figure E-6). Guidehouse excluded “don’t know” responses from analysis.

Figure E-6. Appliance Recycling Component Awareness



Respondents received the following question: “How did you learn about the Appliance Recycling program? Select all that apply.” Also, Guidehouse removed any instance that respondents reported they learned about the Appliance Recycling component as “don’t know” or “n/a”.

Source: Guidehouse analysis

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 Evaluation Plan,⁵⁶ this component is planned to account for 15% of Residential EE Program energy savings, 12% of Residential EE Program demand savings, 2% of total portfolio energy savings, and 1% of portfolio demand savings. The In-Home Assessment component is implemented by CLEAResult.

E.3.1 Gross Impact Evaluation

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-5. 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.

Table E-5. Detailed Findings for In-Home Assessment

Measure	Percentage of Residential Energy Savings ¹	Tracking Database Energy Ratio	Tracking Database Demand Ratio	Reason for Adjustment
ENERGY STAR Lighting	4.5%	0.96	1.00	TRM default values were used in place of missing data
Insulation	0.3%	0.96	1.01	Unable to recreate reported savings from the information provided

Note: Realization Rate for ENERGY STAR Lighting (Specialty) is a weighted average of the affected bulbs.

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

Source: Guidehouse analysis

Guidehouse conducted an online survey of sampled recipients in PY14, 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 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 3.1.2. These results were combined with the results of the tracking database analysis to determine final verified gross savings.

As Table E-6. presents, Guidehouse stratified based on project size, as described in the Sample Design Memo.⁵⁷ Overall, Guidehouse exceeded the sample response rate as a result of higher than expected survey participation across all strata.

⁵⁶ Guidehouse, *Phase IV Evaluation Plan, Energy Efficiency and Conservation Portfolio*, revised April 13, 2023.

⁵⁷ PECO, *PY14 Residential and IE Impact Sample Design Memo 03-16-23*, dated March 16, 2023

Table E-6. In-Home Assessment Sample Project Count

Stratum	Target Count	Achieved Count
High impact	8	35
Medium impact	10	101
Low impact	12	30
Very low impact	0	19
Total Sampled Projects¹	30	185

¹Guidehouse did not specifically target CPP project participation for our evaluation of IHA.

Source: Guidehouse analysis

E.3.2 Net Impact Evaluation

Guidehouse estimated NTG for the IHA component in PY14 by conducting online surveys with market-rate participants following two component pathways: direct install (DI) and rebated measures (REB). As explained in Section 3.1.3.1, the team followed the guidance from the SWE for creating the IHA NTG survey guide and conducting NTG research as defined in the Phase IV Evaluation Framework.

E.3.2.1 Free Ridership

The SWE's Phase IV Evaluation Framework for Residential programs includes two metrics for estimating free ridership: intention and influence. This direction comes directly from the Energy Trust of Oregon's (ETO) Common Methods for conducting NTG research.

E.3.2.1.1 Intention for the Direct Install Pathway

Intention is assessed through a few brief questions used to determine how the directly installed equipment likely would have differed if the respondent had not received the program assistance. "Program assistance" for DI equipment includes the availability of the free equipment and the energy advisor's recommendations.

The offered response options captured the following general outcomes had program assistance not been available:

- Within the last year, I still would have installed all the same energy efficient equipment, just not through the In-Home Assessment program.
- Within the last year, I would have installed some but not all of the energy efficient equipment, just not through the In-Home Assessment program.
- Without the program, I would most likely not have installed any of the equipment that was installed through the program, at least not within the last year.

The first outcome (likely not installed any equipment) indicates no free ridership and thus results in a score of 0.0. The second option indicates some free ridership, but not total free ridership. The third outcome (would have installed all of the same equipment) indicates total free ridership (a score of 0.5 for the intention component). Table E-7 shows the questions and scoring for the IHA DI pathway.

Table E-7. Intention Scoring for the Residential IHA Component – DI

Measure	Question / Response	Intention Score
Direct Install	Within the last year, you still would have installed all the <i>same</i> energy efficient equipment, just not through the Home Assessment Program	0.500
	Within the last year, you would have installed <i>some</i> but not <i>all</i> of the energy efficient equipment, just not through the Home Assessment Program	0.250
	Without the program, you would most likely <i>not</i> have installed <i>any</i> of the equipment that was installed through the program, at least not within the last year.	0.000

Source: Guidehouse analysis

E.3.2.1.2 Intention for the Rebated Measure Pathway

Intention is assessed through a few brief questions used to determine how the rebated equipment likely would have differed if the respondent had not received the component assistance.

The offered response options captured the following general outcomes had the component rebate not been available:

- A. Not installed a new rebated measure
- B. Installed a rebated measure that was less energy efficient than the one you installed
- C. Installed a rebated measure of the same energy efficiency
- D. Installed a more energy efficient rebated measure

Option A (likely not installed any equipment) indicates no free ridership and thus results in a score of 0.0. Option B indicates some free ridership, but not total free ridership. Options C and D (would have installed the same or more efficient equipment) indicates total free ridership (a score of 0.5 for the intention component). Table E-8 shows the questions and scoring for the IHA REB pathway.

Table E-8. Intention Scoring for the Residential IHA Component – REB

Measure	Question / Response	Intention Score
Rebated Measures	Not installed the equipment	0.000
	Installed less energy efficient equipment	0.250
	Installed equipment with the same energy efficiency	0.500
	Installed more energy efficient equipment	0.500

Source: Guidehouse analysis

E.3.2.1.3 Influence

Component influence is assessed by asking the respondent how influential – from 0 (not at all influential) to 10 (extremely influential) – various component elements were on the decision to participate in the component.

Elements randomized and asked of IHA direct install participants include:

- The energy savings you anticipated from having the efficient equipment installed
- The information provided by the energy advisor
- The fact that the energy efficient equipment directly installed in your home was installed at no additional cost

Elements randomized and asked of IHA rebated measure participants include:

- Component incentive
- Recommendation from PECO staff
- IHA component marketing materials
- Recommendation from an In-Home Assessment auditor

The component's influence score is equal to the maximum influence rating for any component element rather than, say, the mean influence rating. The rationale is that if any given component element had a great influence on the respondent's decision, then the component itself had a great influence, even if other elements had less influence. Scoring for the 0-10 scale deviated slightly from the SWE's recommended 1-5 scale; however, Guidehouse decided to keep all scale questions consistent across Process and NTG survey questions and therefore adjusted the scoring as Table E-9 shows.

Table E-9. Influence Scoring for the Residential IHA Component

Component Influence Rating	Influence Score
0 – Not at All Influential	0.500
1-2 ¹	0.438
3-4	0.375
5-6	0.250
7-8	0.125
9-10 – Extremely Influential	0.000
Don't Know	0.250

¹ Guidehouse shifted from a 1-5 scale in Phase III to a 0-10 scale in Phase IV and adjusted the scoring to align with other process question scales.

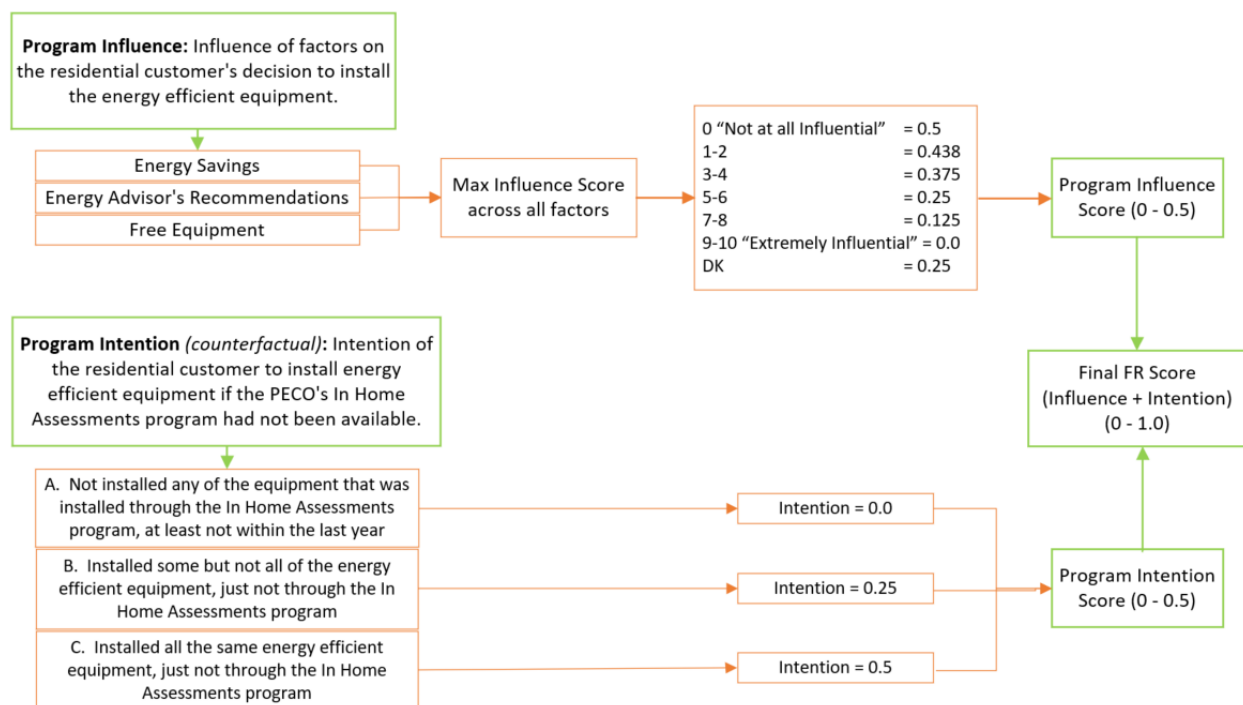
Source: Guidehouse analysis

E.3.2.2 Total Free Ridership Score

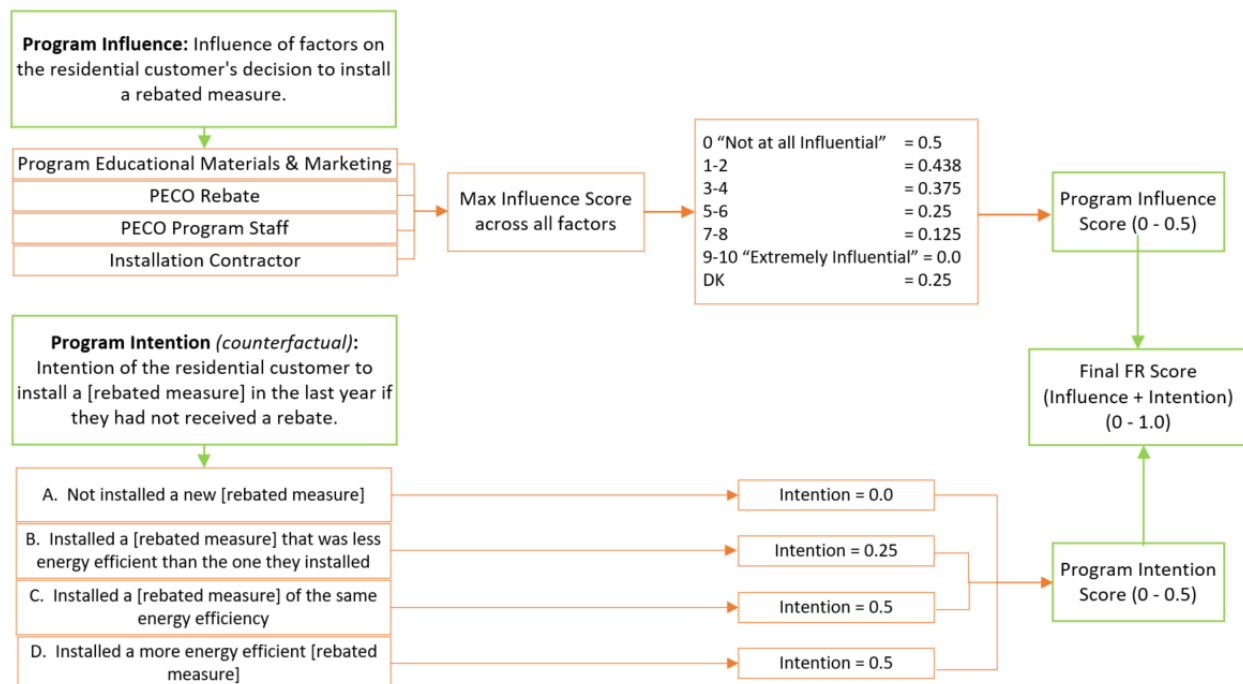
Total free ridership is the sum of the intention and influence components, resulting in a score ranging from zero to one.

E.3.2.3 Algorithm Diagram

The following diagram is a visual representation of the scoring of the free ridership questions.

Figure E-7. Free Ridership Algorithm – IHA Direct Install


Source: Guidehouse analysis

Figure E-8. Free Ridership Algorithm – IHA Rebated Measure


Source: Guidehouse analysis

E.3.2.4 Participant Spillover

The participant spillover battery of questions assesses, for each participant, the number and description of non-incented energy efficient equipment installed since component participation; and the component's influence on the participant's decision to install those technologies. This section summarizes the spillover approach for the IHA component in PY14.

The IHA survey assessed the purchase and installation of any energy efficient technologies, using the following questions:

- Since you participated in the PECO program, did you install any additional energy efficient equipment in your home that did not receive incentives through a PECO program?
- [IF YES:] Please describe the energy-efficiency equipment. [Probe for measure type, size, and quantity]

Guidehouse asked about and documented all additional, non-rebated equipment installed since component participation, whether eligible for component rebates, in the TRM but not eligible, or not in the TRM. The survey also asked respondents about the level of influence the prior component participation had on their decision to install the additional equipment.⁵⁸ The IHA component asked:

- On a 0 to 10 scale, with 0 meaning “not at all influential” and 10 meaning “extremely influential,” how influential was the PECO program on your decision to install the additional equipment in your home?

The influence rating is assigned a value that determines what proportion of the measure's savings are attributed to the component:

A rating of 8, 9, or 10 = 1.0 (full savings attributed to the component).

A rating of 3, 4, 5, 6, or 7 = 0.5 (half of the savings attributed to the component).

A rating of 0, 1, or 2 = 0 (no savings attributed to the component).

IHA respondents reported the installation of additional equipment including new HVAC equipment, water heating equipment, attic insulation, and additional LED bulbs without pursuing a PECO rebate for the upgrades. Guidehouse calculated estimates of energy savings per the TRM where applicable and 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 like-spillover equipment.

Guidehouse then estimated the attributable Equipment SO savings to the component as the product of the equipment savings, number of units, and influence score for each respondent:

$$\text{Equipment SO} = \text{Equipment Savings} * \text{Number of Units} * \text{Component Influence}$$

⁵⁸ Guidehouse only asked the influence question to participants once, even if they reported installing multiple additional equipment types without receiving incentives.

To extrapolate the reported attributable SO from each participant to the IHA population, Guidehouse:

- Totaled the savings associated with each component participant, to give the overall participant SO savings.

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

- 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 component.

$$\sum \text{Participant SO (population)} = (\sum \text{Participant SO (sample)}) / (\text{Sample } n)$$

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

$$\% \text{ Participant SO} = (\sum \text{Participant SO (population)}) / (\text{Component Savings})$$

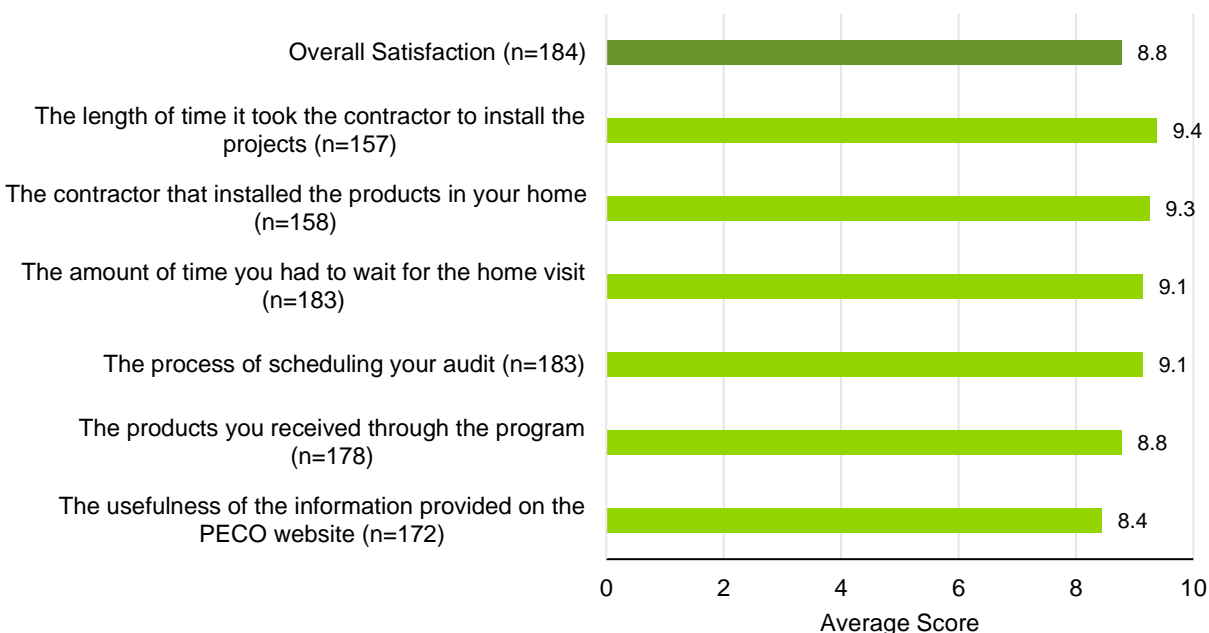
E.3.3 Process Evaluation

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 In-Home Assessment component specifically.

Guidehouse contacted 2,936 customers who participated in the In-Home Assessment component during PY14 to conduct the process evaluation for this component. One hundred eighty-four participants replied to the survey resulting in a 6% response rate.

Several questions measured respondent satisfaction levels with aspects of the In-Home Assessment component, as well as the In-Home Assessment component overall. Respondents rated their satisfaction using a scale of 0 to 10 with 0 representing “extremely dissatisfied” and 10 representing “extremely satisfied.” Respondents could also select “don’t know” or “not applicable;” Guidehouse excluded “don’t know” or “not applicable” responses from analysis. The mean satisfaction for the component overall is 8.8 out of 10, as shown in Figure E-9.

Respondents also rated their satisfaction with six aspects of the component, as Figure E-9 shows. The length of time it took the contractor to install the projects received the highest mean satisfaction score of 9.4. The usefulness of the information provided on the PECO website received the lowest score of 8.4.

Figure E-9. In-Home Assessment Component Satisfaction


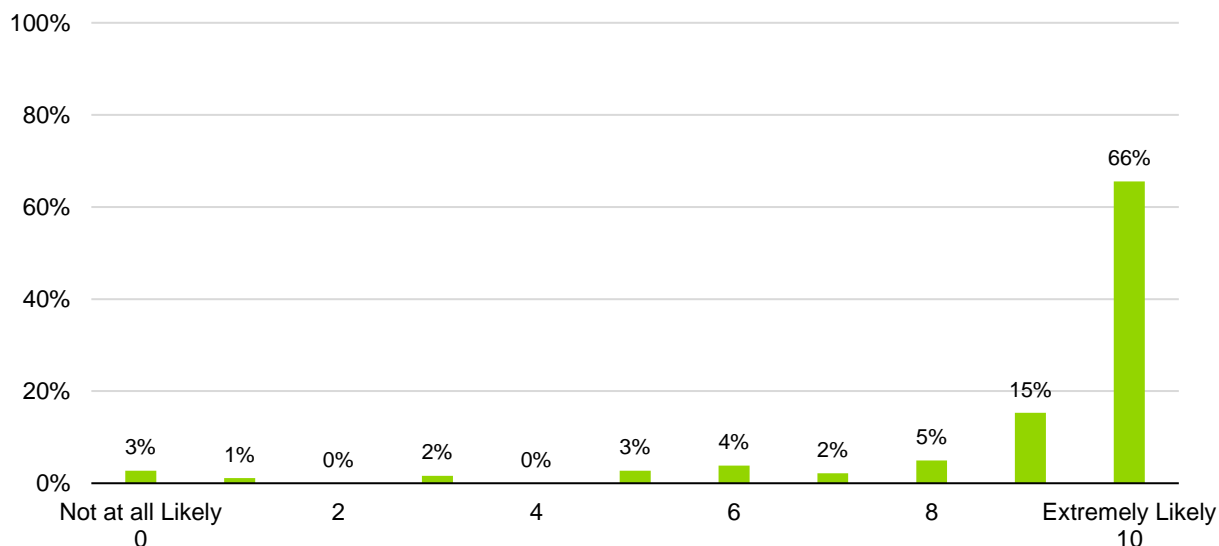
Respondents received the following questions: “How would you rate your satisfaction with PECO’s In-Home Assessment program overall?” and “How would you rate your satisfaction with the following aspects of PECO’s In-Home Assessment program?”.

Note: The component is referred to throughout the survey as “PECO’s In-Home Assessment program” as “program” is a more familiar term to customers than “component.”

Source: Guidehouse analysis

On average, respondents rated their likelihood to recommend the In-Home Assessment component to others as 8.9 out of 10 (scale of 0 to 10, where 0 is “not at all likely” and 10 is “extremely likely”), with 66% of respondents indicating they are extremely likely to recommend the component (Figure E-10). Guidehouse excluded “don’t know” responses from analysis.

Figure E-10. Likelihood of Recommending PECO's In-Home Assessment Component (n=183)

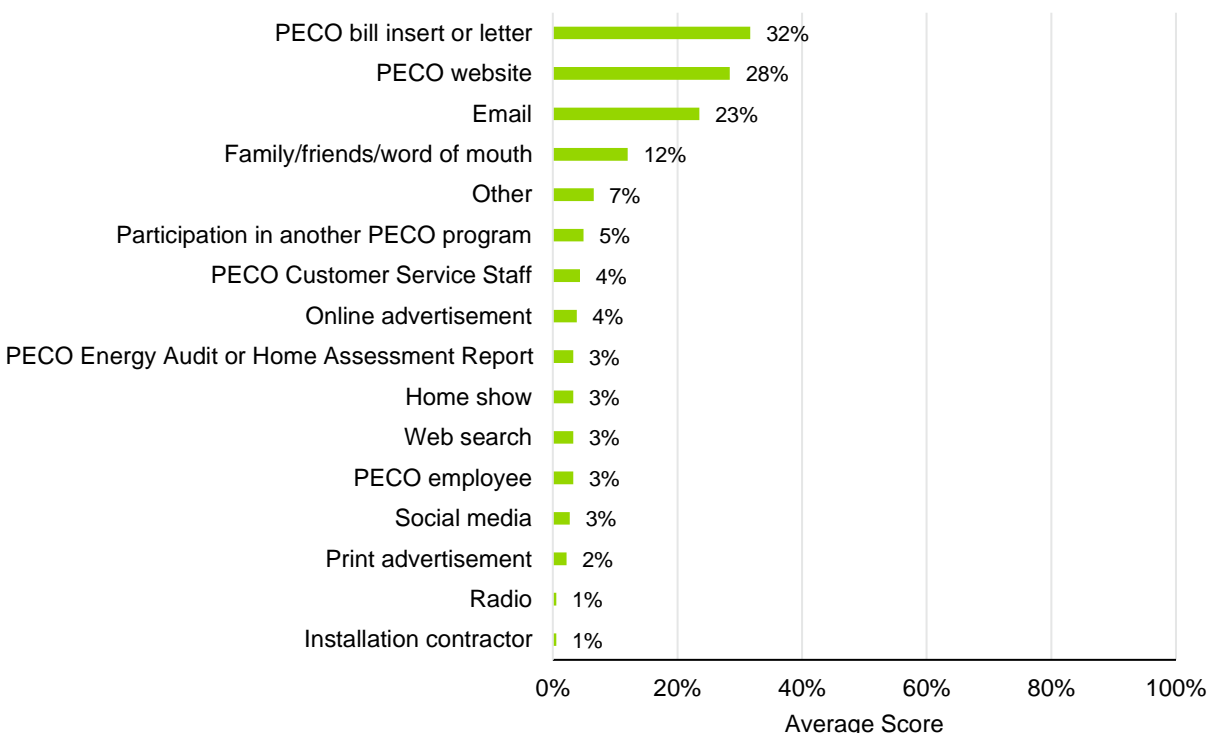


Respondents received the following question: “How likely are you to recommend PECO's In-Home Assessment program to others?”

Note: The component is referred to throughout the survey as “PECO's In-Home Assessment program” as “program” is a more familiar term to customers than “component.”

Source: Guidehouse analysis

Respondents were asked how they learned about the In-Home Assessment component. Most participants learned of the component through a bill insert or letter from PECO (32%) or the PECO website (28%). Other channels to component participation reported by respondents include presentations at community centers and libraries (3) and community news or notices (5) (Figure E-11). Guidehouse excluded “don't know” responses from analysis.

Figure E-11. Component Awareness of In-Home Assessment Participants (n=183)


Respondents received the following question: “How did you learn about PECO's In-Home Assessment program? Select all that apply.”

Note: The component is referred to throughout the survey as “PECO's In-Home Assessment program” as “program” is a more familiar term to customers than “component.”

Source: Guidehouse analysis

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 Evaluation Plan,⁵⁹ this component is planned to account for 7% of Residential EE Program energy savings, 20% of Residential EE Program demand savings, 1% of total portfolio energy savings, and 2% of total portfolio demand savings. The New Construction component is implemented by PSD.

E.4.1 Gross Impact Evaluation

In PY14 Guidehouse conducted a tracking database analysis for all measures outlined in the PA TRM and latest interim measure protocols (IMPs) using a combination of TRM default values and EDC-provided data.

As part of the tracking database analysis, the team verified algorithms used to estimate reported gross savings at the measure level and recalculated gross energy and demand savings

⁵⁹ Guidehouse, *Phase IV Evaluation Plan, Energy Efficiency and Conservation Portfolio*, revised April 13, 2023.

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 savings⁶⁰.

Guidehouse did not conduct additional component-specific verification activities in PY14, and instead applied the energy and demand verification ratios based on evaluation activities in PY13 to the result of the tracking database analysis to arrive at final PY14 gross impact results.

E.4.2 Net Impact Evaluation

Guidehouse estimated NTG for the RNC component in PY14 by conducting online surveys with residential home builders participating in the RNC component. As presented in Section 3.1.3.1, the team followed the guidance from the SWE for creating the NTG survey guide and conducting NTG research as defined in the Phase IV Evaluation Framework.

E.4.2.1 Free Ridership

The SWE's Phase IV Evaluation Framework for residential downstream programs, such as the RNC component, includes two metrics for estimating free ridership: intention and influence.

E.4.2.1.1 Intention

In the case of the New Construction component, intention is assessed through a few brief questions used to determine how the construction upgrade likely would have differed if the respondent had not received the program assistance. The initial question asks the respondent to identify of a limited set of options that best describe what most likely would have occurred without the program assistance. The offered response options capture the following outcomes:

- A. Would have canceled or postponed the new construction project beyond the current program cycle (typically at least one year).
- B. Would have built fewer ENERGY STAR® or Code Plus homes during the current year.
- C. Would have built exactly the same number of homes but at a lower energy rating during the current year.
- D. Would have built exactly the same number of ENERGY STAR® or Code Plus homes during the current year.

Option A (canceled or postponed beyond the component cycle) indicates zero free ridership and thus results in a score of 0. Options B and C indicate, in most cases, partial free ridership (a score ranging from 0 to 0.375 for the intention component). The level of free ridership depends on the level of savings that the respondent would have achieved without the component's assistance. Option D (built the exact same number of component qualified homes) indicates total free ridership (a score of 0.5 for the intention component).

⁶⁰ Guidehouse, *Phase IV Evaluation Plan, Energy Efficiency and Conservation Portfolio*, revised April 13, 2023.

Table E-10. Intention Scoring for the Residential New Construction Component

Question	Response	Intention Score
FR1. What would your organization have done without the PECO incentive?	A) Not built any homes to program qualifications	0.000
	B) Built fewer program qualified homes	-
	Small amount (1% to 33% fewer)	0.375
	Moderate amount (34% to 66% fewer)	0.250
	Large amount (67% to 99% fewer)	0.125
	C) Built same number of homes but at a lower efficiency level	-
	Built at code	0.000
	Built above code but lower than program qualifications	0.250
	Don't know	0.125 ¹
	D) Built exactly the same number of program qualified homes	-
	Paid the entire cost of certification?	-
	Yes	0.500
	No ²	0.250
	Don't know	0.375 ¹

¹ Represents the midpoint of possible values for the follow-up questions to the counterfactual scenario. Don't Know responses were removed from the main counterfactual or intention question but left in for the probing follow-up questions.

² Infrequent response

Source: Guidehouse analysis

E.4.2.1.2 Influence

Component influence is assessed by asking the respondent how influential – from 0 (not at all influential) to 10 (extremely influential) – various component elements were on the decision to participate in the component. Elements randomized and asked of RNC participants include:

- Component incentive
- Recommendation from PECO staff
- Component marketing materials
- Recommendation from a HERS rater

The component's influence score is equal to the maximum influence rating for any component element rather than, say, the mean influence rating. The rationale is that if any given component element had a great influence on the respondent's decision, then the component itself had a great influence, even if other elements had less influence. Scoring for the 0-10 scale deviated slightly from the SWE's recommended 1-5 scale, however Guidehouse decided to keep all scale questions consistent across Process and NTG survey questions and therefore adjusted the scoring as Table E-11 shows.

Table E-11. Influence Scoring for the Residential New Construction Component

Component Influence Rating	Influence Score
0 – Not at All Influential	0.500
1-2 ¹	0.438
3-4	0.375
5-6	0.250
7-8	0.125
9-10 – Extremely Influential	0.000
Don't Know	0.250

¹ Guidehouse shifted from a 1-5 scale in Phase III to a 0-10 scale in Phase IV and adjusted the scoring to align with other process question scales.

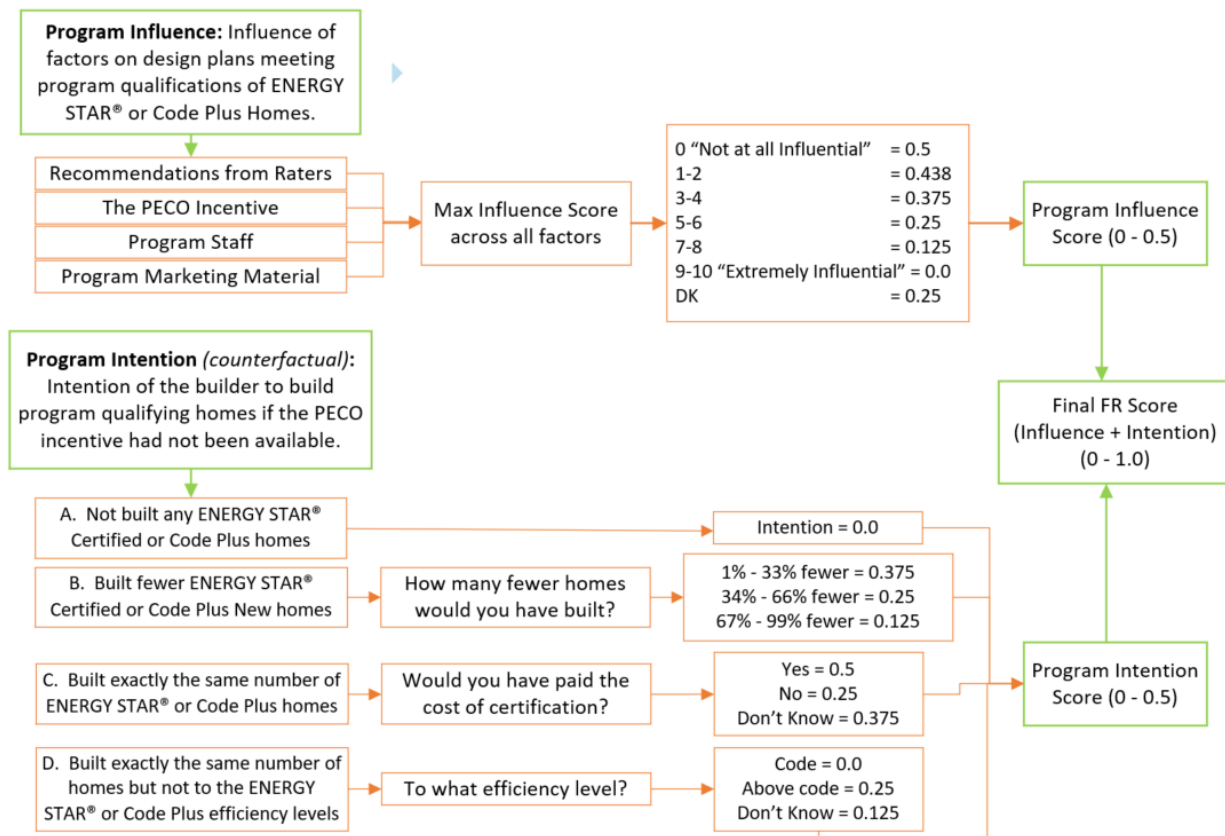
Source: Guidehouse analysis

E.4.2.2 Total Free Ridership Score

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

E.4.2.3 Algorithm Diagram

The following diagram is a visual representation of the scoring of the free ridership questions.

Figure E-12. Free Ridership Algorithm – Residential New Construction


Source: Guidehouse analysis

E.4.2.2 Participant Spillover

For the RNC component, the participant spillover approach assessed the following criteria for each builder:

- The percentage of homes built between June 2022-May 2023 in PECO's service area that met ENERGY STAR or Code Plus standards but did not receive an incentive.⁶¹
- The component's influence on the builder's decision to build code compliant homes without pursuing an incentive, scoring the results with possible values of 0, .5, and 1.

The influence rating from the builder is assigned a value that determines what proportion of the new homes' savings is attributed to the component:

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

Guidehouse also asked the reason(s) the builder did not receive an incentive for the additional new homes where applicable. None of the builders reported installing additional component-qualifying homes outside of the component so there was no attributable spillover.

E.4.4 Process Evaluation

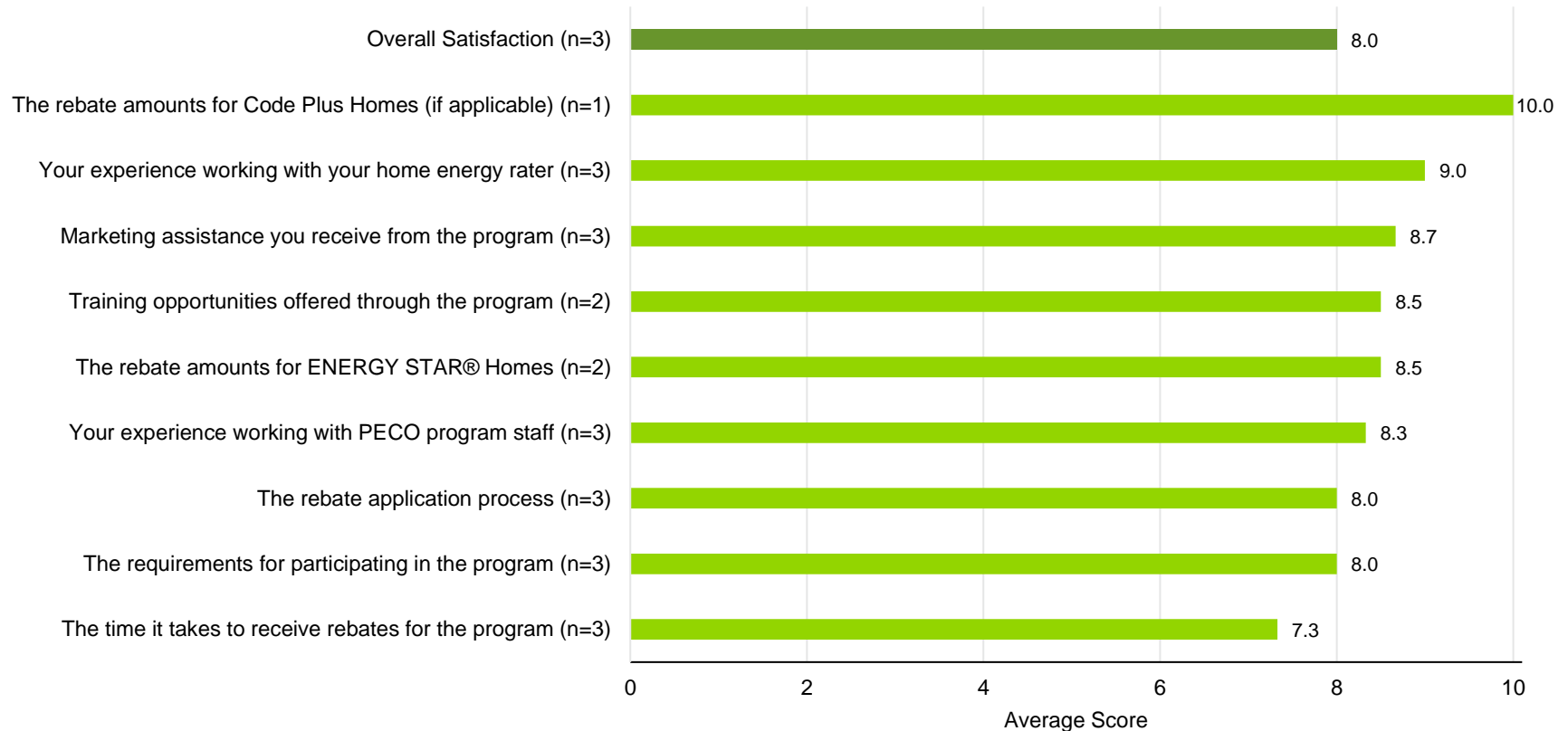
Residential EE Program process evaluation activities and findings are discussed in Section 3.1.5. This section describes additional insights from process evaluation activities conducted for the Residential New Construction component, known to participants as New Home Rebates, specifically.

Guidehouse contacted 24 builders who participated in the Residential New Construction component during PY14 to conduct the process evaluation for this component. Three participants replied to the survey resulting in a 13% response rate.

Several questions measured satisfaction levels with aspects of the Residential New Construction component, as well as the Residential New Construction component overall. Respondents rated their satisfaction using a scale of 0 to 10 with 0 representing "extremely dissatisfied" and 10 representing "extremely satisfied." Respondents could also select "don't know" or "not applicable;" Guidehouse excluded "don't know" or "not applicable" responses from analysis. The mean satisfaction for the component overall is 8.0 out of 10 (Figure E-13).

Respondents also rated their satisfaction with nine aspects of the component, shown in Figure E-13. The rebate amounts for Code Plus Homes received the highest mean satisfaction score of 10.0. The time it takes to receive rebates for the component received the lowest score of 7.3.

⁶¹ Guidehouse asked a direct question to builders in the survey regarding the percentage of homes built between June 2022 and May 2023 that met ENERGY STAR® or Code Plus standards (Question ACT2).

Figure E-13. Average New Home Rebates Component Satisfaction


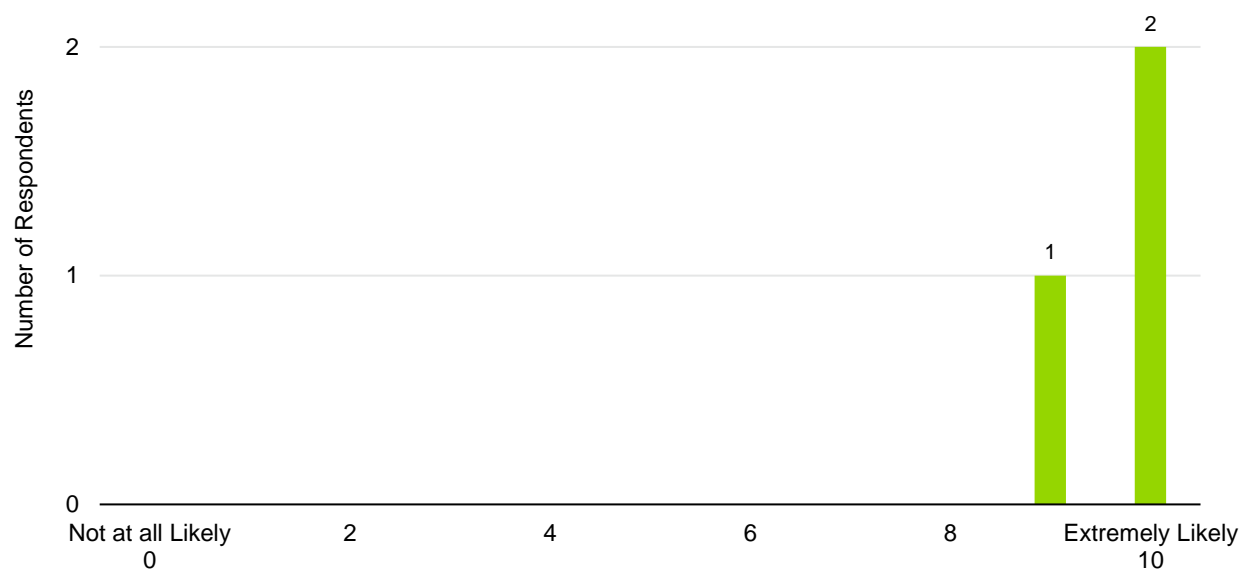
Respondents received the following questions: “How would you rate your satisfaction with PECO’s New Home Rebates program overall?” and “How would you rate your satisfaction with the following aspects of PECO’s New Home Rebates program?”.

Note: The component is referred to throughout the survey as “PECO’s New Home Rebates Program” as “program” is a more familiar term to builders than “component.”

Source: Guidehouse analysis

On average, respondents rated their likelihood to recommend the New Home Rebates component to others as 9.7 out of 10 (scale of 0 to 10, where 0 is “not at all likely” and 10 is “extremely likely”) (Figure E-14).

Figure E-14. Likelihood of Recommending PECO’s New Home Rebates Component (n=3)

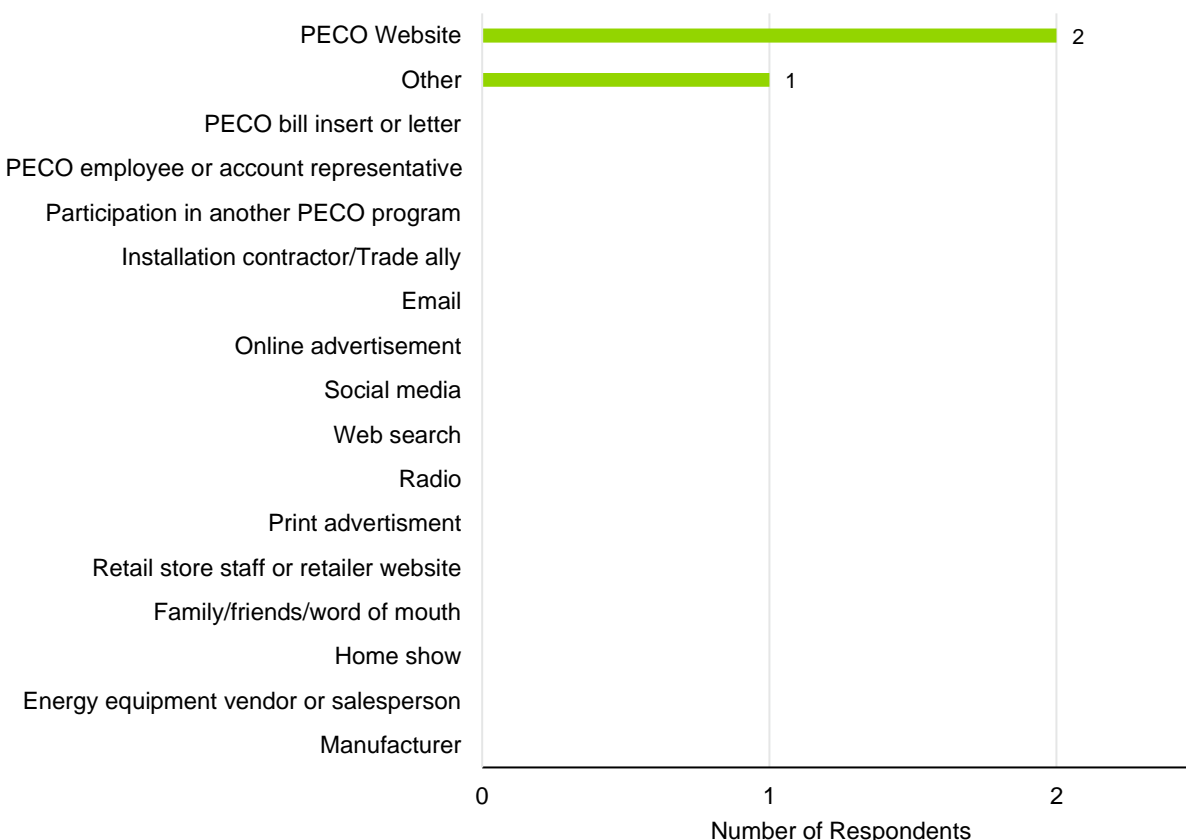


Respondents received the following question: “How likely are you to recommend PECO’s New Home Rebates program to others?”.

Note: The component is referred to throughout the survey as “PECO’s New Home Rebates Program” as “program” is a more familiar term to builders than “component.”

Source: Guidehouse analysis

Respondents were asked how they learned of the New Home Rebates component. Two out of three respondents indicated learning of the component through the PECO website, while the other respondent heard of the component from an energy rater (Figure E-15).

Figure E-15. Component Awareness of New Home Rebates Participants (n=3)


Respondents received the following question: “How did you learn about PECO’s New Home Rebates program? Select all that apply.”

Note: The component is referred to throughout the survey as “PECO’s New Home Rebates Program” as “program” is a more familiar term to builders than “component.”

Source: Guidehouse analysis

E.5 Multifamily (Market-Rate and Income-Eligible)

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 in 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 Evaluation Plan,⁶² this component is planned to account for 10% of Residential EE Program energy savings, 6% of Residential EE Program demand savings, 15% of Income-Eligible EE Program energy savings, 11% of Income-Eligible EE Program demand savings, 2% of total portfolio energy savings, and 1% of total portfolio demand savings. The Multifamily (for both the Residential and Income-Eligible Programs) component is implemented by CMC.

⁶² Guidehouse, *Phase IV Evaluation Plan, Energy Efficiency and Conservation Portfolio*, revised April 13, 2023.

E.5.1 Gross Impact Evaluation

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-12 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.

Table E-12. Detailed Findings for Multifamily

Measure	Percentage of Residential Energy Savings ¹	Tracking Database Energy Ratio	Tracking Database Demand Ratio	Reason for Adjustment
ENERGY STAR Lighting	2.8%	0.86	0.90	Baseline wattage was not using TRM deemed 45 lumens per watt

¹ Percentage of Energy Savings is the percentage of total Residential Program energy savings that each of these measures represent due to Multifamily IE being reported as part of the Residential Program in the tracking database. Note: Realization Rate for ENERGY STAR Lighting (Specialty) and ENERGY STAR Lighting (Standard) are weighted averages of the affected bulbs.

Source: Guidehouse analysis

Guidehouse conducted onsite evaluations of sampled recipients in PY14, as described in Section 3.1.2. The onsite verification included confirmation of the count and type of installed measures and gathered information on any issues with installation. Savings were recalculated based on the data gathered by the field team. Findings from the onsite verification 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-13. presents, Guidehouse stratified the sample by measure type, as described in the Sample Design Memo.⁶³ Overall, Guidehouse exceeded the sample response rate as a result of higher than expected survey participation for the Residential – High Impact Strata. The kit strata had lower participation due to high numbers of customers declining a site visit.

Table E-13. Multifamily Sample Project Count

Stratum	Target Count	Achieved Count
Income-Eligible – Kits	14	42
Residential – Kits	14	6
Income-Eligible – High impact (project savings ≥ 4 MWh)	10	6
Residential – High impact (project savings ≥ 20 MWh)	12	6
Very low impact (project savings < 20 MWh)	0	0
Total Sampled Projects	50	60

Source: Guidehouse analysis

⁶³ PECO, PY14 Residential and IE Impact Sample Design Memo 03-16-23, dated March 16, 2023

E.5.2 Net Impact Evaluation

Guidehouse estimated NTG in PY14 by conducting online surveys with Multifamily property managers participating in the Residential program. The team followed the guidance from the SWE for creating the NTG survey guide and conducting NTG research as defined in the Phase IV Evaluation Framework.

E.5.2.1 Free Ridership

The SWE's Phase IV Evaluation Framework for Residential programs includes two metrics for estimating free ridership: intention and influence. This direction comes directly from the Energy Trust of Oregon's (ETO) Common Methods for conducting NTG research.

E.5.2.1.1 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. Note that program assistance often includes more than just the incentive or rebate – it may also include audits, education, and technical assistance.

The offered response options captured the following general outcomes had program assistance not been available:

- A. Would have canceled or postponed the new construction project beyond the current program cycle (typically at least one year).
- B. Would have done something that would have produced savings, but not as much as those achieved through the upgrade or equipment replacement as implemented.
- C. Would have done the upgrade or equipment replacement as implemented.

Option A (likely not installed any equipment) indicates no free ridership and thus results in a score of 0.0. Option B indicates some free ridership, but not total free ridership. Option C (would have installed all of the same equipment) indicates total free ridership (a score of 0.5 for the intention component).

In PY14, Guidehouse decided to remove the Don't Know (DK) option from the Intention question battery for all PECO NTG research. This change aligns with other portfolios Guidehouse evaluates across the country that also removed the DK option from the counterfactual line of questioning. The justification for removing the DK option is that it allows survey participants a chance to get out of thinking about the intention of their decision to complete the energy efficient project in absence of the component. The question itself is introducing a counterfactual and non-existent reality that is unknown, allowing a "don't know" response is letting them off too easy. The intent of the question is to make the respondent consider what they would have done and provide a response. As discussed below, the assessment of the above factors will depend somewhat on the nature of the component, but the overall approach is guided by several considerations, as Table E-14 shows.

Table E-14. Intention Scoring for the Multifamily Component

Measure	Question / Response	Intention Score
Common Areas	Not completed the lighting project altogether	0.000
	Postponed the lighting project	0.000
	Reduced the scope of the lighting project (i.e., installed fewer or less efficient lighting fixtures)	-
	Small reduction in scope (reduced the number of fixtures by 1/3)	0.375
	Moderate reduction in scope (reduced the number of fixtures by half)	0.250
	Large reduction in scope (reduced the number of fixtures by ¾)	0.125
	Would have installed the same number of fixtures but with less efficient light bulbs	0.250
	Installed the same lighting equipment	0.500
	Not installed any equipment in residential units	0.000
	Postponed the installations in the residential units	0.000
Direct Install in Residential Space	Reduced the scope of the installations in the residential units (i.e., installed fewer or less efficient equipment)	-
	Small reduction in scope (reduced the amount of equipment by 1/3)	0.375
	Moderate reduction in scope (reduced the amount of equipment by half)	0.250
	Large reduction in scope (reduced the amount of equipment by ¾)	0.125
	Would have installed the same amount of equipment but with less efficient equipment	0.250
	Installed exactly the same equipment	0.500

Source: Guidehouse analysis

E.5.2.1.2 Influence

Component influence is assessed by asking the respondent how influential – from 0 (not at all influential) to 10 (extremely influential) – various component elements were on the decision to participate in the component.

Elements randomized and asked of Multifamily property managers directly installing equipment in Common Area space include:

- The component incentives for recommended measures
- The energy cost savings for you or your tenants
- PECO staff
- Component educational materials and marketing

- Energy assessment report
- Energy advisor

Elements randomized and asked of Multifamily property managers directly installing equipment in Residential space include:

- The free equipment
- The component incentives for recommended measures
- The energy cost savings for you or your tenants
- PECO staff
- Component educational materials and marketing
- Energy assessment report
- Energy advisor

The component's influence score is equal to the maximum influence rating for any component element rather than, say, the mean influence rating. The rationale is that if any given component element had a great influence on the respondent's decision, then the component itself had a great influence, even if other elements had less influence. Scoring for the 0-10 scale deviated slightly from the SWE's recommended 1-5 scale, however Guidehouse decided to keep all scale questions consistent across Process and NTG survey questions and therefore adjusted the scoring as Table E-15 shows.

Table E-15. Influence Scoring for the Multifamily Program

Component Influence Rating	Component Score
0 – Not at All Influential	0.500
1-2 ¹	0.438
3-4	0.375
5-6	0.250
7-8	0.125
9-10 – Extremely Influential	0.000
Don't Know	0.250

¹ Guidehouse shifted from a 1-5 scale in Phase III to a 0-10 scale in Phase IV and adjusted the scoring to align with other process question scales.

Source: Guidehouse analysis

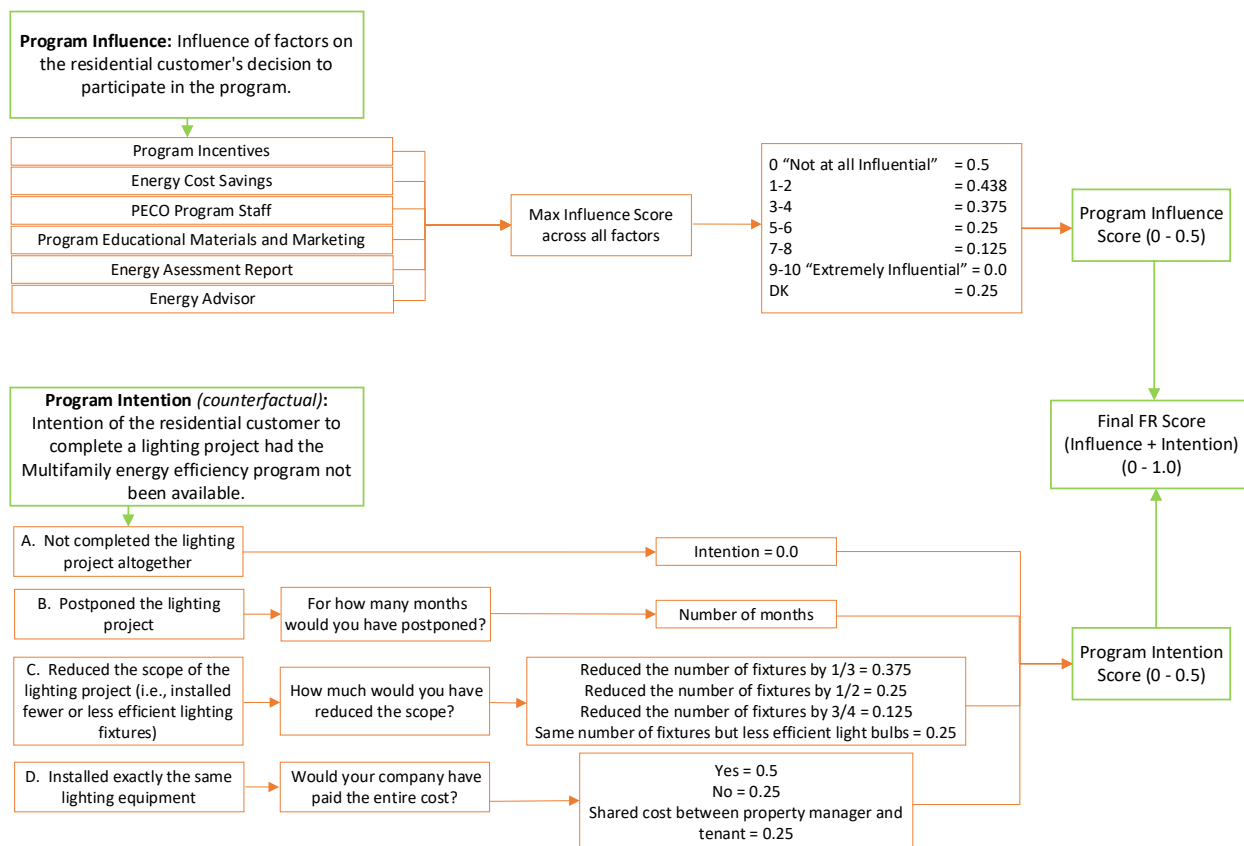
E.5.2.2 Total Free Ridership Score

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

E.5.2.3 Algorithm Diagram

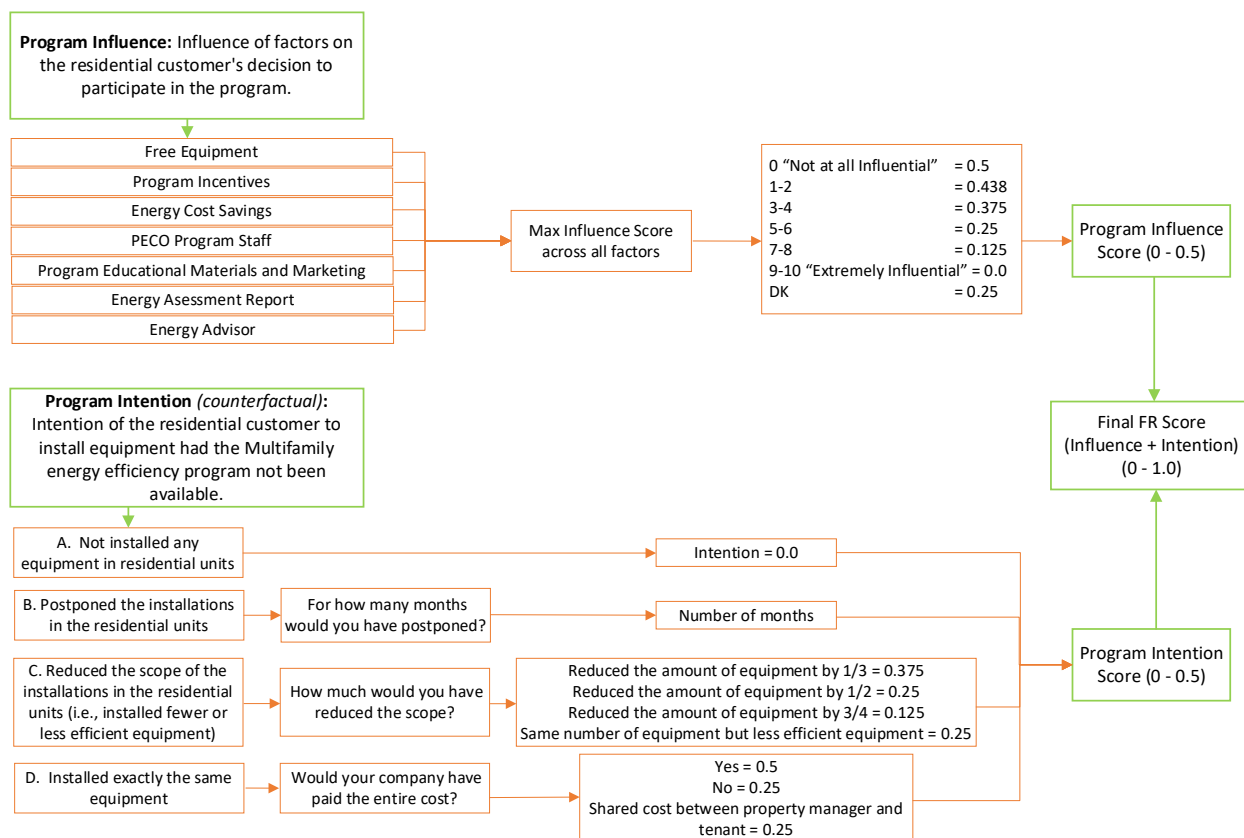
The following diagram is a visual representation of the scoring of the free ridership questions for Common Areas.

Figure E-16. Free Ridership Algorithm – Residential Multifamily Common Areas



Source: Guidehouse analysis

Figure E-17 is a visual representation of the scoring of the free ridership questions for equipment directly installed in Residential spaces.

Figure E-17. Free Ridership Algorithm – Residential Multifamily Residential Areas


Source: Guidehouse analysis

E.5.2.2 Participant Spillover

The participant spillover battery of questions assesses, for each participant, the number and description of non-incented energy efficient equipment installed since component participation; and the component's influence on the participant's decision to install those technologies. This section summarizes the spillover approach for the Multifamily component in PY14.

The NTG survey assessed the purchase and installation of any energy efficient technologies, using the following questions:

- Since you participated in the PECO program, did you install any additional energy efficient equipment in your home that did not receive incentives through a PECO program?
- [IF YES:] Please describe the energy-efficiency equipment. [Probe for measure type, size, and quantity]

Guidehouse asked about and document all additional, non-rebated equipment installed since component participation, whether eligible for component rebates, in the TRM but not eligible, or not in the TRM. The survey also asked respondents about the level of influence the prior

component participation had on their decision to install the additional equipment.⁶⁴ The Multifamily component asked:

- On a 0 to 10 scale, with 0 meaning “not at all influential” and 10 meaning “extremely influential,” how influential was the PECO program on your decision to install the additional equipment in your home?

Guidehouse only asked the influence question once to cover all the additional energy efficient equipment installed. The influence rating is assigned a value that determines what proportion of the measure’s savings are attributed to the component:

A rating of 8, 9, or 10 = 1.0 (full savings attributed to the component).

A rating of 3, 4, 5, 6, or 7 = 0.5 (half of the savings attributed to the component).

A rating of 0, 1, or 2 = 0 (no savings attributed to the component).

No multifamily respondents reported installing additional equipment outside of the Multifamily component and therefore Guidehouse did not estimate attributable spillover.

E.5.3 Process Evaluation

Residential EE Program and Income-Eligible EE Program process evaluation activities and findings are discussed in Section 3.1.5 and Section 3.2.5, respectively. This section describes additional insights from process evaluation activities conducted for the Multifamily component specifically.

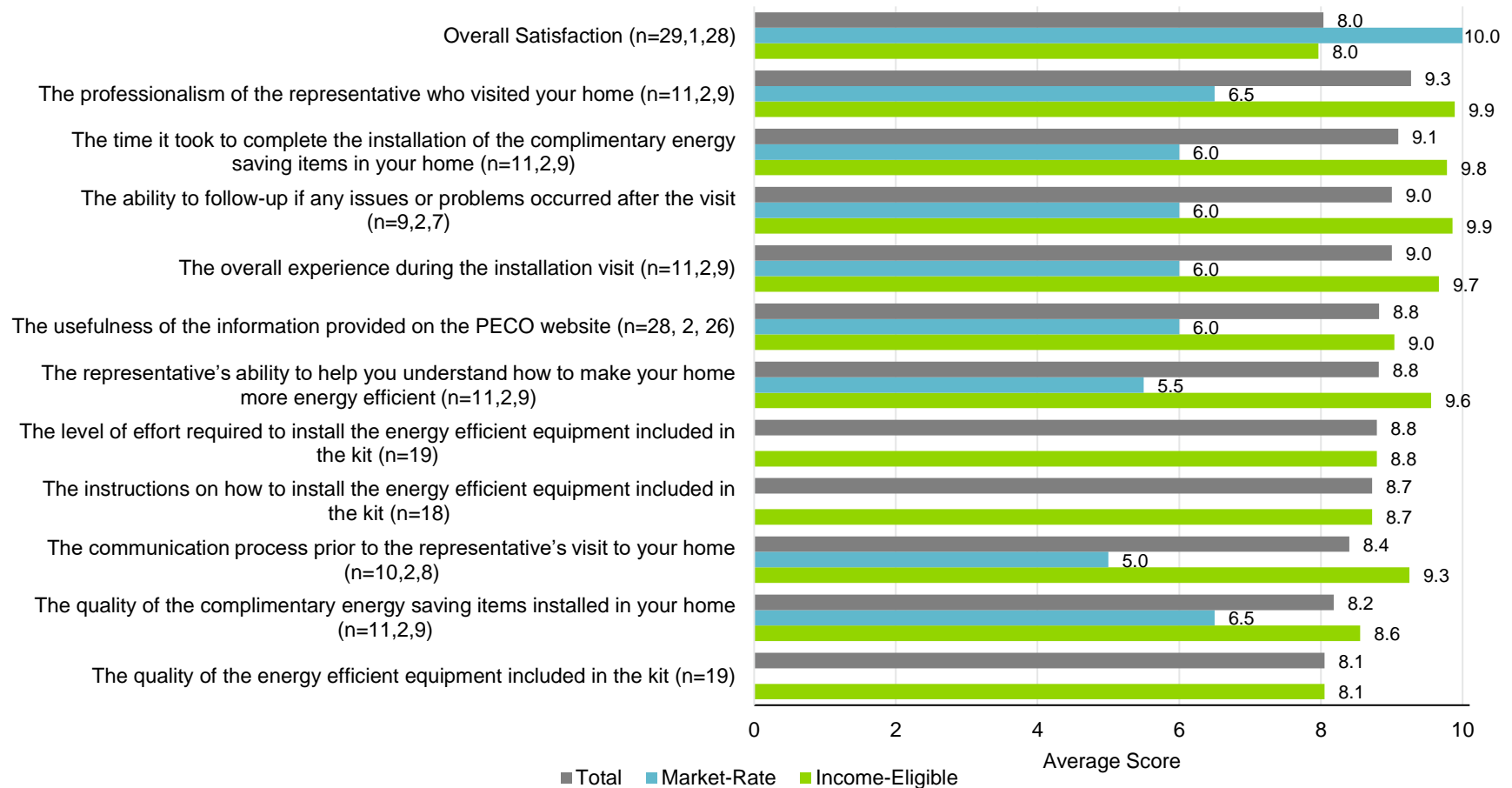
Guidehouse surveyed 598 tenants (Market-Rate: 50; Income-Eligible: 548) and 42 property managers who participated in the Multifamily component to ensure a representative sample of respondents. Tenants and property managers received different versions of the Multifamily survey due to their different methods of engagement with the component. The tenant survey included questions about direct install measures, kits, and rebated measures. Thirty tenants (Market-Rate: 2; Income-Eligible: 28) responded to the tenant survey resulting in a 5% response rate. Seven property managers responded to the property manager survey resulting in a 17% response rate. Guidehouse presents the results for the tenant survey first, followed by the property manager survey.

Several questions measured tenants’ satisfaction levels with aspects of the Multifamily component, as well as the component overall. Respondents rated their satisfaction using a scale of 0 to 10 with 0 representing “extremely dissatisfied” and 10 representing “extremely satisfied.” Respondents could also select “don’t know” or “not applicable;” Guidehouse excluded these responses from satisfaction analysis. The mean satisfaction for the component overall is 8.0 out of 10 (10.0 for Market-Rate respondents; 8.0 for Income-Eligible respondents), as shown in Figure E-18.

Tenants also rated their satisfaction with 11 aspects of the component, as Figure E-18 shows. The professionalism of the professional who visit the home received the highest mean satisfaction score of 9.3 (Market-Rate: 6.5; Income-Eligible: 9.9). The quality of the energy

⁶⁴ Guidehouse only asked the influence question to participants once, even if they reported installing multiple additional equipment types without receiving incentives.

efficient equipment included in the kit received the lowest score of 8.1 (Income-Eligible: 8.1; note: this aspect of the component only received responses from income-eligible customers).

Figure E-18. Multifamily Component Tenant Satisfaction


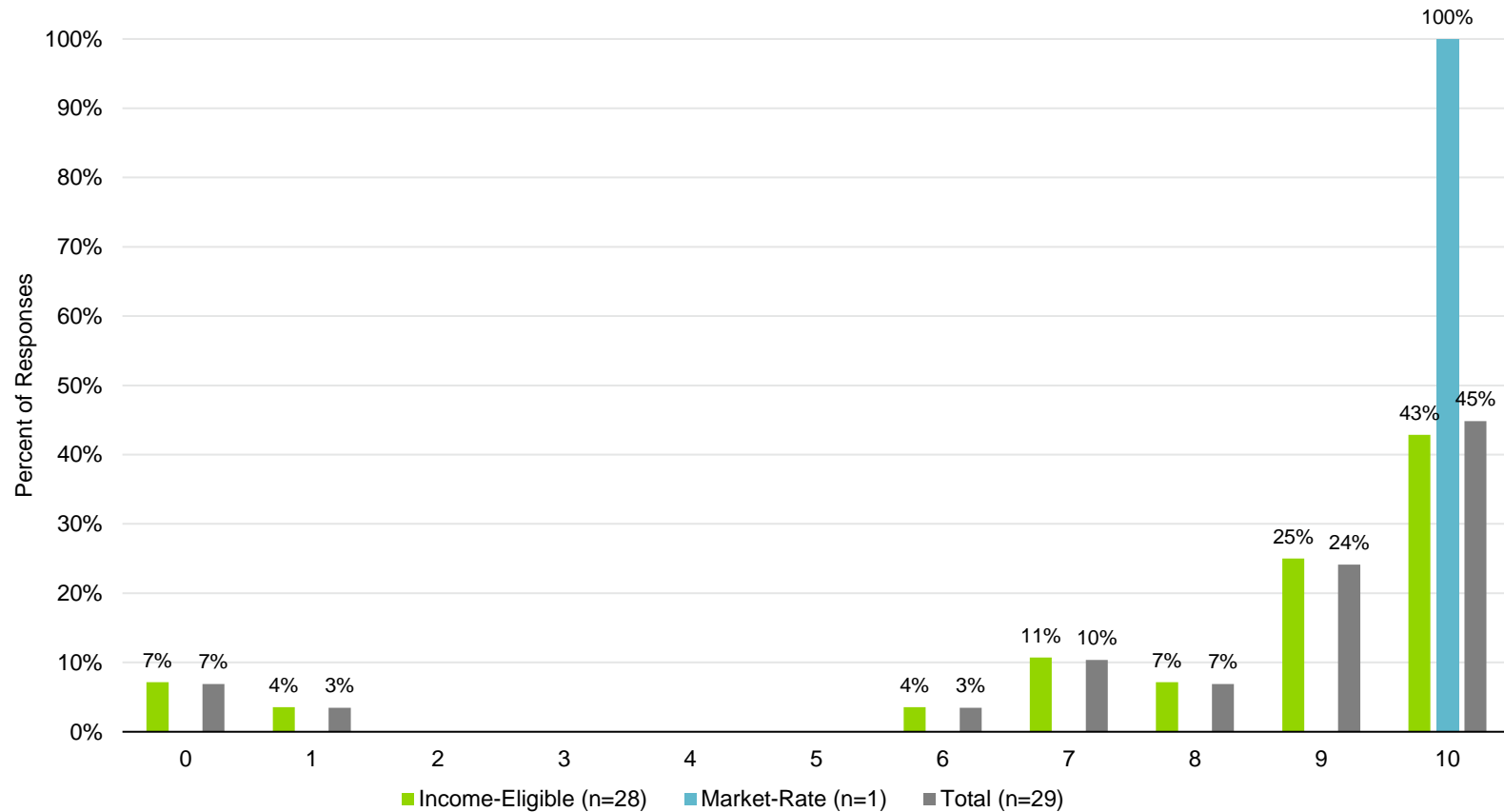
Respondents received the following questions: “How would you rate your satisfaction with the Multifamily energy efficiency program overall?” and “How would you rate your satisfaction with the following aspects of the Multifamily energy efficiency program?”.

Note: The component is referred to throughout the survey as the “Multifamily energy efficiency program” as “program” is a more familiar term to customers than “component.”

Source: Guidehouse analysis

On average, tenants rated their likelihood to recommend the Multifamily component to others as 8.2 out of 10 (Market-Rate: 10.0; Income-Eligible: 8.1; scale of 0 to 10, where 0 is “not at all likely” and 10 is “extremely likely”), with 45% of respondents indicating they are extremely likely to recommend the component (Figure E-19).

Figure E-19. Tenant Likelihood of Recommending the Multifamily Component (n=29)

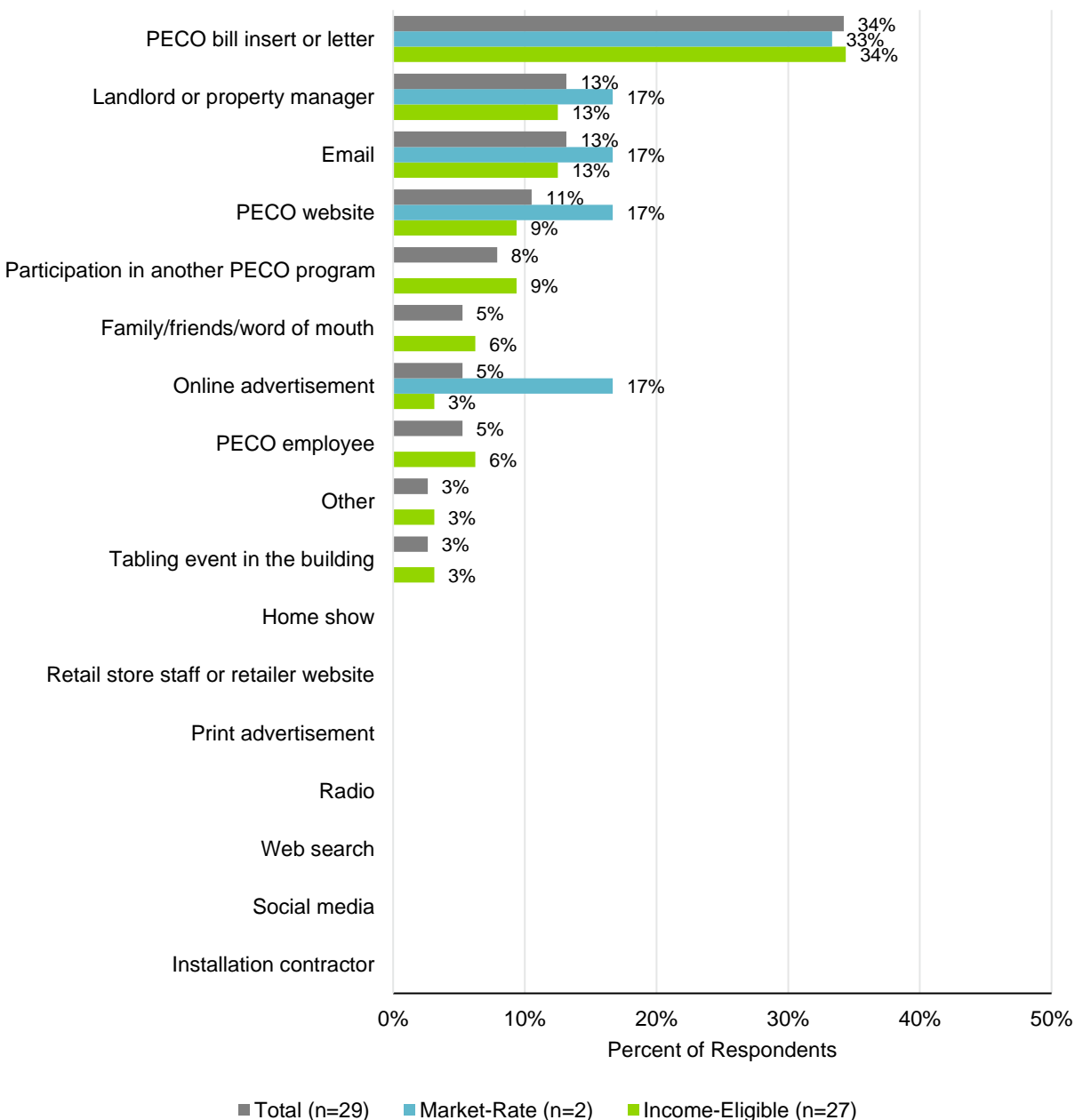


Respondents received the following question: “How likely are you to recommend the Multifamily energy efficiency program to others?”

Source: Guidehouse analysis

Tenants were asked how they learned about the Multifamily component. Most respondents learned of the component through a PECO bill insert or letter (34%) or landlord or property manager (13%). One respondent reported that they unexpectedly received the measures (Figure E-20).

Figure E-20. Multifamily Component Tenant Awareness



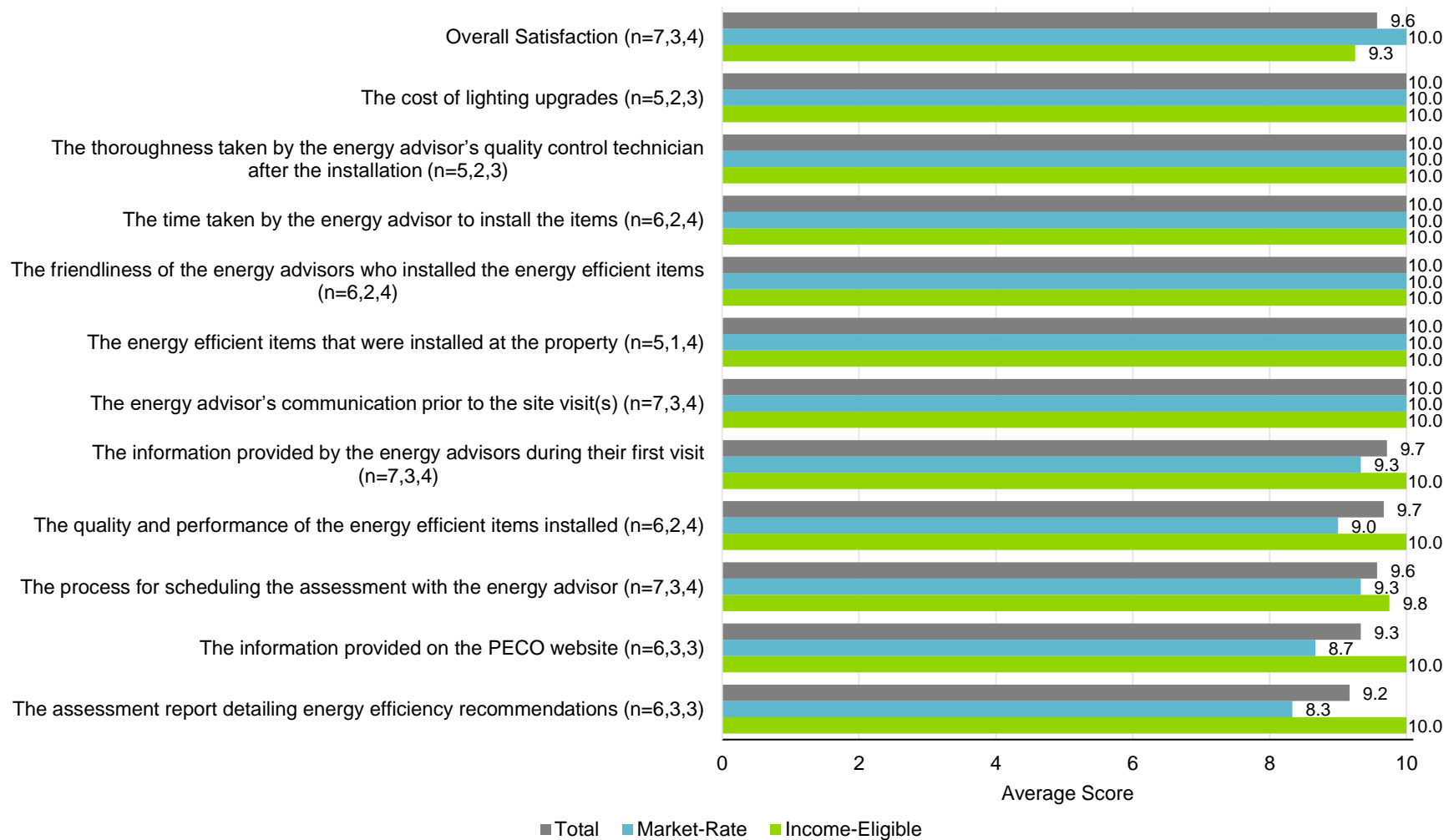
Respondents received the following question: “How did you learn about the Multifamily energy efficiency program? Select all that apply.”

Source: Guidehouse analysis

Next Guidehouse presents the result of the Property Manager survey. The property manager survey included questions about common area upgrades and in-unit direct install measures.

Several questions measured property managers' satisfaction levels with aspects of the Multifamily component, as well as the component overall. Respondents rated their satisfaction using a scale of 0 to 10 with 0 representing "extremely dissatisfied" and 10 representing "extremely satisfied." Respondents could also select "don't know" or "not applicable;" Guidehouse excluded "don't know" and "not applicable" responses from satisfaction analysis. The mean satisfaction for the component overall is 9.6 out of 10 (Market-Rate: 10.0; Income-Eligible: 9.3), as Figure E-21 shows.

Property managers also rated their satisfaction with 11 aspects of the component, as Figure E-21 shows. The energy advisor's communication prior to the site visit(s), the energy efficient items that were installed, the friendliness of the energy advisor who installed the items, the time taken by the energy advisor to install the items, the thoroughness taken by the energy advisor's quality control technician after the installation, and the cost of lighting upgrades all received the highest mean satisfaction score of 10.0 (Market-Rate: 10.0; Income-Eligible: 10.0). The assessment report detailing energy efficiency recommendations received the lowest score of 9.2 (Market-Rate: 8.3; Income-Eligible: 10.0).

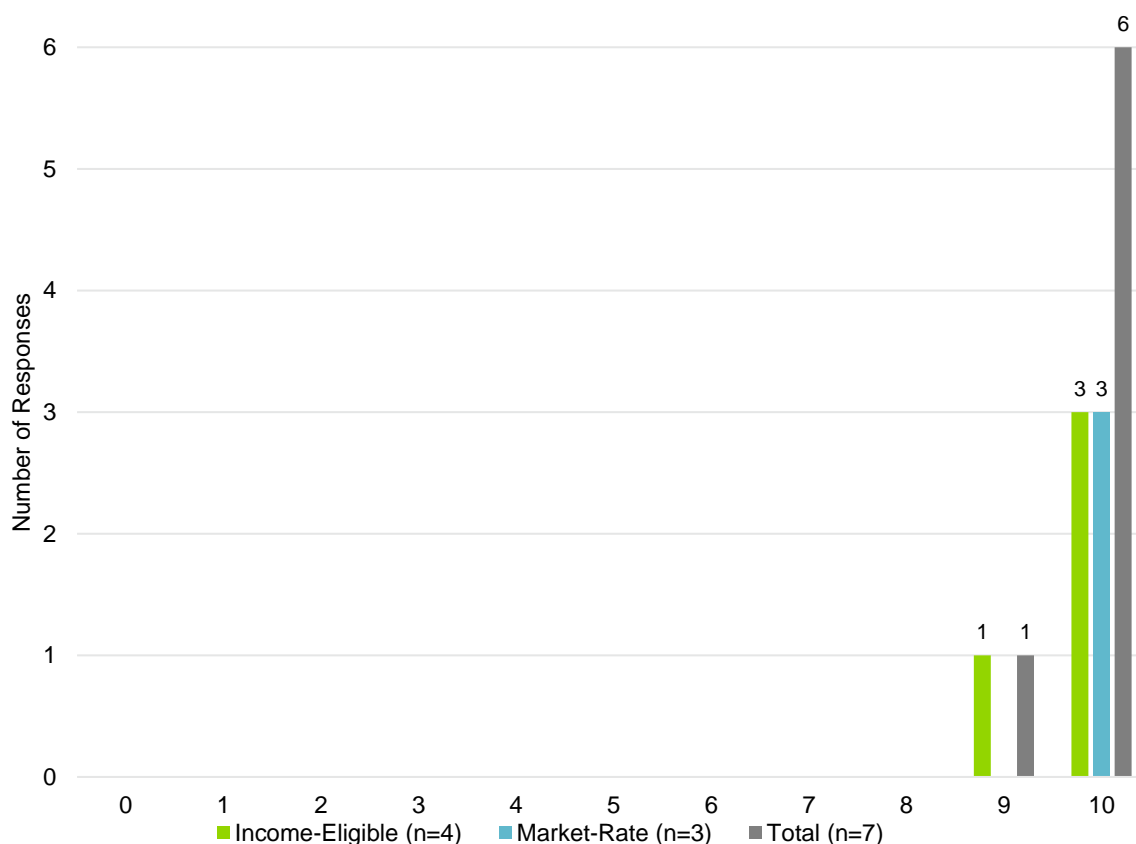
Figure E-21. Multifamily Component Property Manager Satisfaction


Respondents received the following questions: “How would you rate your satisfaction with the Multifamily energy efficiency program overall?” and “How would you rate your satisfaction with the following aspects of the Multifamily energy efficiency program?”.

Source: Guidehouse analysis

On average, property managers rated their likelihood to recommend the Multifamily component to others 9.9 out of 10 (Market-Rate: 10.0; Income-Eligible: 9.8; scale of 0 to 10, where 0 is “not at all likely” and 10 is “extremely likely”), with six respondents indicating they are extremely likely to recommend the component (Figure E-22).

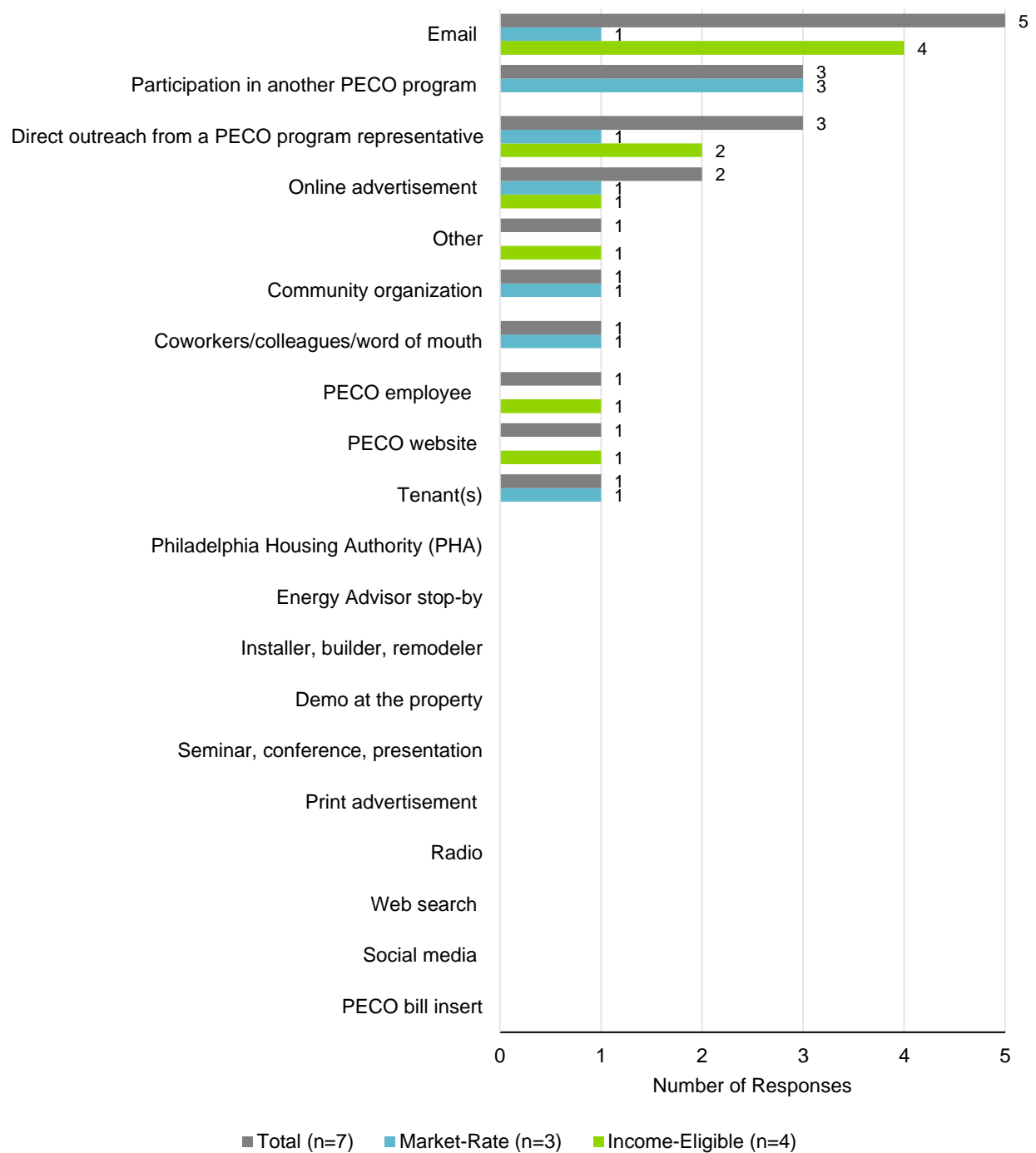
Figure E-22. Property Manager Likelihood of Recommending the Multifamily Component (n=7)



Respondents received the following question: “How likely are you to recommend the Multifamily energy efficiency program to others?”

Source: Guidehouse analysis

Property managers were asked how they learned about the Multifamily component. Most respondents learned of the component through email (5). One respondent reported that they learned about the component through Grid Magazine (Figure E-23).

Figure E-23. Multifamily Component Property Manager Awareness


Respondents received the following question: “How did you learn about the Multifamily energy efficiency program? Select all that apply.”

Source: Guidehouse analysis

E.6 Single-Family (Income-Eligible)

This Single-Family IE (SFIE) component improves the energy efficiency of single-family homes for income-eligible customers to help reduce their electric bills and make their homes more comfortable. This program, which is known to customers as the Free Home Energy Check-up, 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 implementor 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 received measures funded through Act 129, they are included in the evaluation activities, and the measure savings are fed into the SFIE results.

According to the Phase IV Evaluation Plan,⁶⁵ the SFIE component is planned to account for 70% of Income-Eligible EE Program energy savings, 74% of Income-Eligible EE Program demand savings, 4% of total portfolio energy savings, and 3% of portfolio demand savings. The Single-Family component is implemented by CMC.

E.6.1 Gross Impact Evaluation

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

Table E-16. illustrates the factors that led to variation between the reported and adjusted database savings and impacted the observed realization rates reported in Section 3.2.2.

Table E-16. Detailed Findings for Single-Family (Income-Eligible)

Measure	Percentage of IE Energy Savings ¹	Tracking Database Energy Ratio	Tracking Database Demand Ratio	Reason for Adjustment
ENERGY STAR Lighting	38.1%	0.90	0.96	Tracking data should use baseline wattage for kits measures. HOU and CF should use “All Bulbs” for direct install measure lines.
Ductless Heat Pump	15.6%	1.02	1.04	Updated erroneous baseline assumption that was brought to Guidehouse’s attention by the CSP
Insulation	1.3%	0.94	0.72	TRM dictates that when baseline cooling system is nonexistent it should be set to air source heat pump with early replacement.

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

Source: Guidehouse analysis

Guidehouse conducted an online survey of sampled recipients in PY14, 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

⁶⁵ Guidehouse, *Phase IV Evaluation Plan, Energy Efficiency and Conservation Portfolio*, revised April 13, 2023.

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 3.1.2. These results were combined with the results of the tracking database analysis to determine final verified gross savings.

As Table E-17. presents, Guidehouse stratified the sample by measure type, as described in the Sample Design Memo.⁶⁶ Overall, Guidehouse exceeded the sample response rate as a result of higher-than-expected survey participation for the Single-Family Medium impact stratum. The Single-Family – High Impact and Long-Term Savings stratum underachieved as a result of lower-than-expected survey participation.

Table E-17. Single-Family (Income-Eligible) Sample Project Count

Stratum	Target Count	Achieved Count
Single-Family – High impact (project savings \geq 2 MWh)	30	6
Single-Family – Medium impact ($0.24 \text{ MWh} \leq$ project savings $< 2 \text{ MWh}$)	40	86
Single-Family – Low impact ($.01 \text{ MWh} \leq$ project savings $< 0.24 \text{ MWh}$)	40	46
Long-Term Savings – High impact (project savings $\geq 1.4 \text{ MWh}$)	6	0
Long-Term Savings – Low impact ($.4 \text{ MWh} \leq$ project savings $< 1.4 \text{ MWh}$)	10	0
Very low impact (project savings $< 0.4 \text{ MWh}$)	0	0
Total Sampled Projects	126	138

Source: Guidehouse analysis

E.6.2 Net Impact Evaluation

Guidehouse did not conduct NTG research for Income-Eligible components as per the SWE's Evaluation Framework.⁶⁷

E.6.3 Process Evaluation

Guidehouse did not conduct process evaluation for this component in PY14.

E.7 Long-Term Savings (Income-Eligible)

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 Evaluation Plan,⁶⁸ this component is planned to account for 5% of Income-Eligible EE Program energy savings, 1% of Income-

⁶⁶ PECO, *PY14 Residential and IE Impact Sample Design Memo 03-16-23*, dated March 16, 2023

⁶⁷ SWE. *Evaluation Framework for Pennsylvania Act 129 Phase IV Energy Efficiency and Conservation Programs*. July 16, 2021. https://www.puc.pa.gov/media/1584/swe-phaseiv_evaluation_framework071621.pdf.

⁶⁸ Guidehouse, *Phase IV Evaluation Plan, Energy Efficiency and Conservation Portfolio*, revised April 13, 2023.

Eligible EE Program demand savings, 0.3% of total portfolio energy savings, and 0.004% of total portfolio demand savings. The Long-Term Savings component is implemented by CMC.

E.7.1 Gross Impact Evaluation

Guidehouse conducted a tracking database analysis for this component for all measures outlined in the PA TRM and latest IMPs using a combination of TRM default values and EDC-provided data. Guidehouse did not conduct additional component-specific verification activities in PY13, and instead applied energy and demand verification ratios based on IE Whole Home evaluation activities in PY12 to the result of the tracking database analysis to arrive at final PY13 gross impact results.⁶⁹

Table E-18. illustrates the factors that led to variation between the reported and adjusted database savings and impacted the observed realization rates reported in Section 3.2.2.

Table E-18. Detailed Findings for Long-Term Savings (Income-Eligible)

Measure	Percentage of IE Energy Savings ¹	Tracking Database Energy Ratio	Tracking Database Demand Ratio	Reason for Adjustment
Ductless Heat Pump	0.8%	1.03	1.02	TRM dictates that when baseline cooling system is nonexistent it should be set to ductless heat pump with early replacement

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

² Reported demand savings for this measure were zero.

Source: Guidehouse analysis

Guidehouse conducted an online survey of sampled recipients in PY14, 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 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 3.1.2. These results were combined with the results of the tracking database analysis to determine final verified gross savings.

As Table E-10 in Section E.6 presents, Guidehouse stratified the sample by measure type, as described in the Sample Design Memo.⁷⁰ The achieved sample counts are also outlined in Section E.6.

E.7.2 Net Impact Evaluation

Guidehouse did not conduct NTG research for Income-Eligible components as per the SWE's Evaluation Framework.⁷¹

⁶⁹ Guidehouse, *Phase IV Evaluation Plan, Energy Efficiency and Conservation Portfolio*, revised April 13, 2023.

⁷⁰ PECO, *PY14 Residential and IE Impact Sample Design Memo 03-16-23*, dated March 16, 2023

⁷¹ SWE. *Evaluation Framework for Pennsylvania Act 129 Phase IV Energy Efficiency and Conservation Programs*. July 16, 2021. https://www.puc.pa.gov/media/1584/swe-phaseiv_evaluation_framework071621.pdf.

E.7.3 Process Evaluation

Guidehouse did not conduct a process evaluation for this component in PY14.

Appendix F. Residential and Income-Eligible Home Energy Report Programs

This appendix details the evaluation methods and activities Guidehouse deployed in PY14 for select Residential and Income-Eligible HER Programs. According to the Phase IV Evaluation Plan,⁷² these programs are planned to account for 7% of total portfolio energy savings and 14% of total portfolio demand savings. Refer to Sections 3.3 and 3.4 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

Guidehouse did not conduct NTG research for these programs in PY14 as per guidance from the SWE's Evaluation Framework.⁷³

F.3 Process Evaluation

Guidehouse did not conduct a process evaluation for the HER Programs in PY14.

⁷² Guidehouse, *Phase IV Evaluation Plan, Energy Efficiency and Conservation Portfolio*, revised April 13, 2023.

⁷³ SWE. *Evaluation Framework for Pennsylvania Act 129 Phase IV Energy Efficiency and Conservation Programs*. July 16, 2021. https://www.puc.pa.gov/media/1584/swe-phaseiv_evaluation_framework071621.pdf.

Appendix G. Non-Residential EE Program

This appendix details the evaluation sample design, methods, and activities deployed in PY14 for select Non-Residential EE Program components. Refer to Section 3.5 for evaluation findings, results, and conclusions for these components.

G.1 Downstream

The Downstream component includes incentives for existing building retrofit projects with either deemed, partially deemed, or custom measures. Typical measures include lighting, variable frequency drives (VFDs), HVAC systems, motors, refrigeration, and controls. According to the Phase IV Evaluation Plan,⁷⁴ this component is planned to account for 45% of Non-Residential EE Program energy savings, 48% of Non-Residential EE Program demand savings, 33% of total portfolio energy savings, and 34% of total portfolio demand savings. The Phase IV Downstream component is implemented by DNV.

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 1,022 projects from all 891 participants in the component. This analysis used a combination of TRM default values and EDC-provided data for open variables. The team 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, the team reviewed all available project documentation to ensure all assumptions used in measure savings calculations were supported by the project documentation and to ensure the calculation methodology was correct.

The evaluation team supplemented engineering desk reviews with phone verifications, which the team assigned to projects per the Sample Design Memo⁷⁵ 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 nameplate data, operating schedules, a careful

⁷⁴ Guidehouse, *Phase IV Evaluation Plan, Energy Efficiency and Conservation Portfolio*, revised April 13, 2023.

⁷⁵ PECO, *PY14 NonResidential Impact Sample Design Memo 12-08-22*, dated December 08, 2022.

description of site conditions, and overall verification of the information contained in the project files. The team 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.⁷⁶ 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. The evaluation team made repeated attempts via email and phone calls to schedule site visits or complete phone interviews. For projects that were assigned a phone verification, the team 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.⁷⁷ Six projects were converted to engineering desk review after the team exhausted all customer contact attempts.

Table G-1. shows the number of Downstream projects by evaluation method. Of the 1,022 completed projects, the team originally sampled 30 projects for additional data collection and analysis. Partway through the evaluation, the evaluation team performed a preliminary statistical analysis which showed additional projects were needed to achieve the target relative precision. Additional projects were added to the sample, resulting in a total of 37 sampled projects.

Table G-1. Non-Residential Downstream Project Count by Evaluation Method

Verification Level	Evaluation Target	Number of Projects Evaluated
Tracking Database Analysis	1022	1022
Engineering Desk Review Only	0	6
Phone Verification	30	24
Onsite Verification	0	7
Total Sampled Projects	30	37

Source: Guidehouse analysis

Eleven projects surpassed the energy (kilowatt-hour) savings thresholds set in Table 1-2 of the TRM,⁷⁸ which requires site-specific data collection for enhanced evaluation rigor. For these eleven 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 on seven of the eleven projects that surpassed the savings threshold to gather site-specific information. Site-specific information, like trend data, for the other four projects was gathered remotely without a site visit.

⁷⁶ PECO, *PY14 NonResidential Impact Sample Design Memo* 12-08-22, dated December 08, 2022.

⁷⁷ Guidehouse, *Phase IV Evaluation Plan, Energy Efficiency and Conservation Portfolio*, revised April 13, 2023.

⁷⁸ PA PUC, *Technical Reference Manual; State of Pennsylvania Act 129 Energy Efficiency and Conservation Program*, dated February 2021, <https://www.puc.pa.gov/filing-resources/issues-laws-regulations/act-129/technical-reference-manual/>.

G.1.1.2 Sampling

Using tracking data from PY14, Guidehouse obtained the total number of projects and the total amount of energy savings in the population. With this project data, the evaluation team sampled at the project level for the impact evaluation activities in PY14 to bin projects into six strata, as outlined in the PY14 Sample Design Memo.⁷⁹

Guidehouse first separated CHP projects into their own separate stratum. The sampling team then created a census stratum (Stratum 1 – Very High Impact Projects) for projects reporting more than 1,000 MWh of energy savings. Next, the evaluation team 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, the team 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 37 Downstream projects evaluated:

- Twenty-seven included lighting or lighting control retrofits
- Eight included retrocommissioning or custom HVAC improvements
- One was a door gasket installation
- One was a variable speed drive retrofit

The SWE sampled six total projects for its review. It conducted site visits for three of the projects and conducted engineering desk reviews for all six projects.

G.1.2 Net Impact Evaluation

Guidehouse estimated NTG in PY14 by conducting online surveys with non-residential customers participating in the Non-Residential Downstream component. The team followed the guidance from the SWE for creating the NTG survey guide and conducting NTG research as defined in the Phase IV Evaluation Framework. This section summarizes the SWE guidance and how Guidehouse applied it to the Downstream component. See Section 3.5.3 for the NTG results of the Non-Residential Downstream component.

G.1.2.1 Estimating Free Ridership

Guidehouse followed the SWE's Evaluation Framework⁸⁰ on gathering feedback from participating Downstream customers on their intention to complete energy efficiency projects if they did not receive PECO program assistance, and the Influence the PECO Non-Residential program had on their decision to complete the energy efficiency project this program year. The evaluation team asked specific survey questions to inform these two metrics as follows.

G.1.2.1.1 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

⁷⁹ PECO, *PY14 Non-Residential Impact Sample Design Memo* 12-08-22, dated December 08, 2022.

⁸⁰ SWE. Evaluation Framework for Pennsylvania Act 129 Phase IV Energy Efficiency and Conservation Programs. July 16, 2021. https://www.puc.pa.gov/media/1584/swe-phaseiv_evaluation_framework071621.pdf.

respondent had not received the program assistance. The initial question asks the respondent to identify of a limited set of options that best describe what most likely would have occurred without the program assistance.

The offered response options for the PY14 Non-Residential Downstream component include:

- A. Would not have installed any energy efficient equipment
- B. Would have postponed installation
- C. Would have reduced the project size, scope, or efficiency
- D. Would have installed exactly the same equipment

Options A and B (would not have installed any energy efficient equipment or would have postponed installation) indicate zero free ridership and thus results in a score of 0.0. Option C indicates 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 a follow-up question (How much would your organization have reduced the size, scope, or efficiency of the project?) Option D (installed exactly the same equipment) also requires a follow-up question (Would your organization have paid the entire cost of the upgrade without the program assistance?) to determine a final intention score. Table G-2 shows the questions and scoring for the Downstream component.

Table G-2. Intention Scoring for the Non-Residential Downstream Component

Question	Response	Intention Score
FR1. What would your organization have done without the PECO incentive?	Would not have installed any energy efficient equipment	0.000
	Would have postponed installation	0.000
	Would have reduced the project size, scope, or efficiency	Based on response to FR3
	Would have installed exactly the same equipment	Based on response to FR4
FR2. For how many months would your organization have postponed the project?	-	-
FR3. How much would your organization have reduced the size, scope, or efficiency of the project?	Small amount (1% - 33%)	0.375
	Moderate amount (34% - 66%)	0.250
	Large amount (67% - 99%)	0.125
	Don't Know	0.250 ¹
FR4. Does this mean your organization would have paid the entire cost of the upgrade?	Yes	0.500
	Don't Know	0.375 ¹
	No	0.250 ²

¹ Represents the midpoint of possible values for the follow-up questions to the counterfactual scenario. Don't Know responses were removed from the main counterfactual or intention question but left in for the probing follow-up questions.

² Infrequent response

Source: Guidehouse analysis

G.1.2.1.2 Influence

Component influence is assessed by asking the respondent how much influence – from 0 (not at all influential) to 10 (extremely influential) – various component elements had on the decision to do the project the way it was done. Elements randomized and asked of Non-Residential Downstream participants include:

- Component incentive
- Recommendation from PECO staff
- Component marketing materials
- Recommendation from a PECO component contractor

The component's influence score is equal to the maximum influence rating for any component element rather than, say, the mean influence rating. The rationale is that if any given component element had a great influence on the respondent's decision, then the component itself had a great influence, even if other elements had less influence. Scoring for the 0-10 scale deviated slightly from the SWE's recommended 1-5 scale, however Guidehouse decided to keep all scale questions consistent across Process and NTG survey questions and therefore adjusted the scoring as Table G-3 shows.

Table G-3. Influence Scoring for the Non-Residential Downstream Component

Component Influence Rating	Influence Score
0 – Not at All Influential	0.500
1-2 ¹	0.438
3-4	0.375
5-6	0.250
7-8	0.125
9-10 – Extremely Influential	0.000
Don't Know	0.250

¹ Guidehouse shifted from a 1-5 scale in Phase III to a 0-10 scale in Phase IV and adjusted the scoring to align with other process question scales.

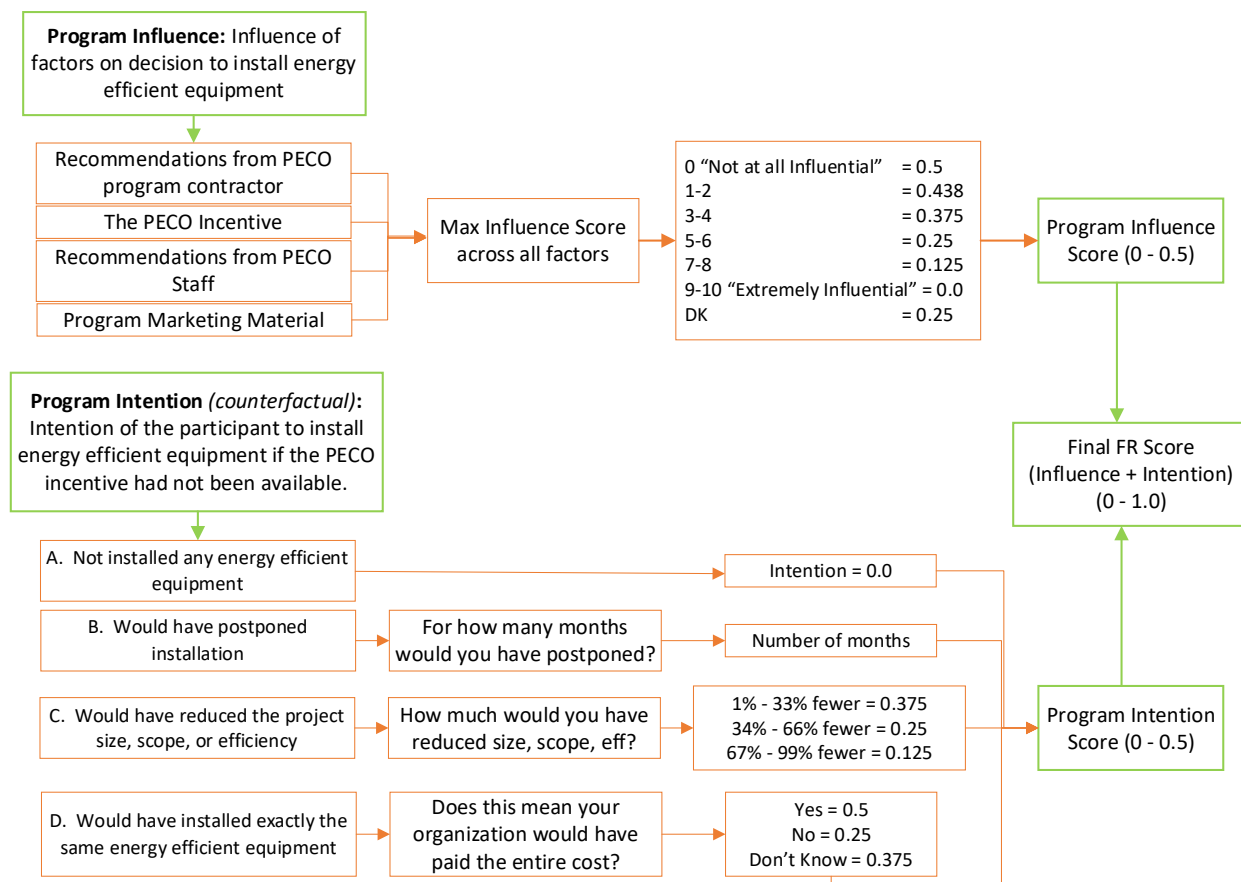
Source: Guidehouse analysis

G.1.2.2 Total Free Ridership Score

Total free ridership is the sum of the intention and influence components, resulting in a score ranging from zero to one. See Section 3.5.3.2 for the full free ridership results from the Downstream component.

G.1.2.3 Algorithm Diagram

The following diagram is a visual representation of the scoring of the free ridership questions.

Figure G-1. Free Ridership Algorithm – Downstream


Source: Guidehouse analysis

G.1.2.4 Estimating Participant Spillover

The participant spillover battery of questions assesses, for each participant, the number and description of non-incented energy efficient equipment installed since component participation; and the component's influence on the participant's decision to install those technologies. This section summarizes the spillover approach for the Downstream component in PY14.

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?
- [IF YES:] Please describe the energy-efficiency equipment. [Probe for measure type, size, and quantity]

Guidehouse asked about and documented all additional, non-rebated equipment installed since component participation, whether eligible for component rebates, in the TRM but not eligible, or

not in the TRM, and the level of influence the prior component participation had on their decision to install the equipment.⁸¹ The Downstream component asked:

- On a 0 to 10 scale, with 0 meaning “not at all influential” and 10 meaning “extremely influential,” how influential was your experience in PECO Ways to Save on your decision to install this additional equipment at this facility?

The influence rating is assigned a value that determines what proportion of the measure’s savings are attributed to the component:

A rating of 8, 9, or 10 = 1.0 (full savings attributed to the component).

A rating of 3, 4, 5, 6, or 7 = 0.5 (half of the savings attributed to the component).

A rating of 0, 1, or 2 = 0 (no savings attributed to the component).

Downstream respondents reported the installation of additional equipment including new HVAC equipment and additional LED bulbs without pursuing a PECO rebate for the upgrades. Guidehouse calculated estimates of energy savings per the TRM where applicable and 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 like-spillover equipment.

Guidehouse then estimated the attributable Equipment SO savings to the component as the product of the measure savings, number of units, and influence score for each respondent:

$$\text{Equipment SO} = \text{Equipment Savings} * \text{Number of Units} * \text{Component Influence}$$

To extrapolate the reported attributable SO from each participant to the Downstream population, Guidehouse:

- Totaled the savings associated with each component participant, to give the overall participant SO savings.

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

- 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 component.

$$\sum \text{Participant SO (population)} = (\sum \text{Participant SO (sample)}) / (\text{Sample } n)$$

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

$$\% \text{ Participant SO} = (\sum \text{Participant SO (population)}) / (\text{Component Savings})$$

⁸¹ Guidehouse only asked the influence question to participants once, even if they reported installing multiple additional equipment types without receiving incentives.

G.1.3 Process Evaluation

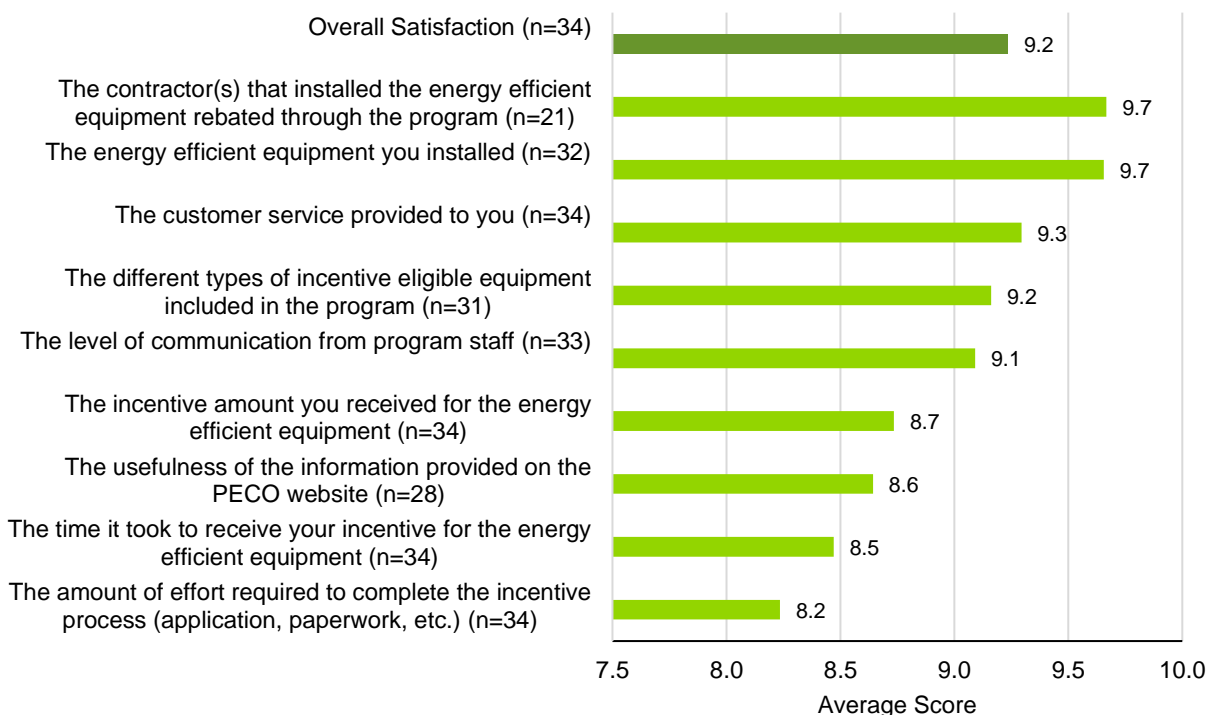
Non-Residential EE Program process evaluation activities and findings are discussed in Section 3.5.5. This section describes additional insights from process evaluation activities conducted for the Downstream component, known to participants as PECO Ways to Save, specifically.

Guidehouse contacted 508 customers who participated in the Downstream component during PY14 to conduct the process evaluation for this component. Thirty-four participants replied to the survey resulting in a 7% response rate.

Several questions measured satisfaction levels with aspects of the Downstream component as well as the Downstream component overall. Respondents rated their satisfaction using a scale of 0 to 10, with 0 representing “extremely dissatisfied” and 10 representing “extremely satisfied”. Respondents could also select “don’t know” or “not applicable”, Guidehouse excluded “don’t know” or “not applicable” responses from analysis. The mean satisfaction for the component overall is 9.2 out of 10, as seen in Figure G-2.

Respondents also rated their satisfaction with nine aspects of the component, as Figure G-2 shows. The energy efficient equipment installed and the contractor(s) that installed the component rebated equipment both received the highest mean satisfaction score of 9.7 out of 10. The amount of effort required to complete the incentive process received the lowest mean satisfaction score of 8.2 out of 10.

Figure G-2. Downstream Component Satisfaction

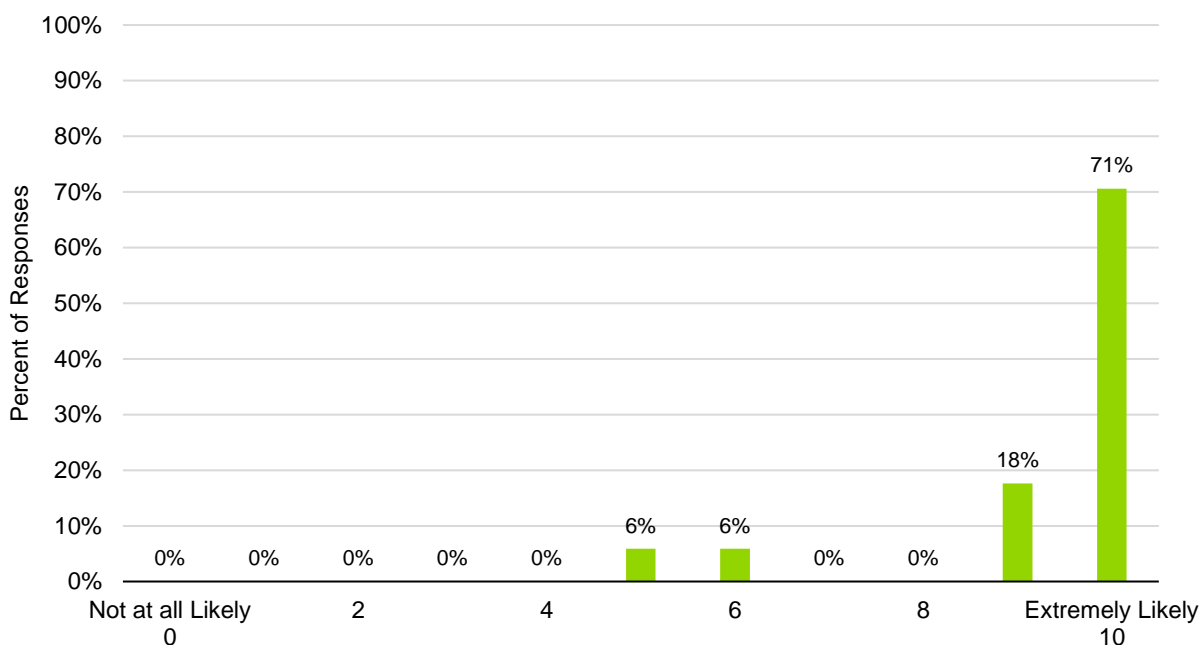


Respondents received the following questions: “How would you rate your satisfaction with PECO Ways to Save overall?” and “How would you rate your satisfaction with the following aspects of PECO Ways to Save?”

Source: Guidehouse analysis

On average, respondents rated their likelihood to recommend the Downstream component to others as 9.3 out of 10, as Figure G-3 shows. The scale used was from 0 to 10, with 0 representing “not at all likely” and 10 representing “extremely likely”. Guidehouse excluded “don’t know” responses from analysis.

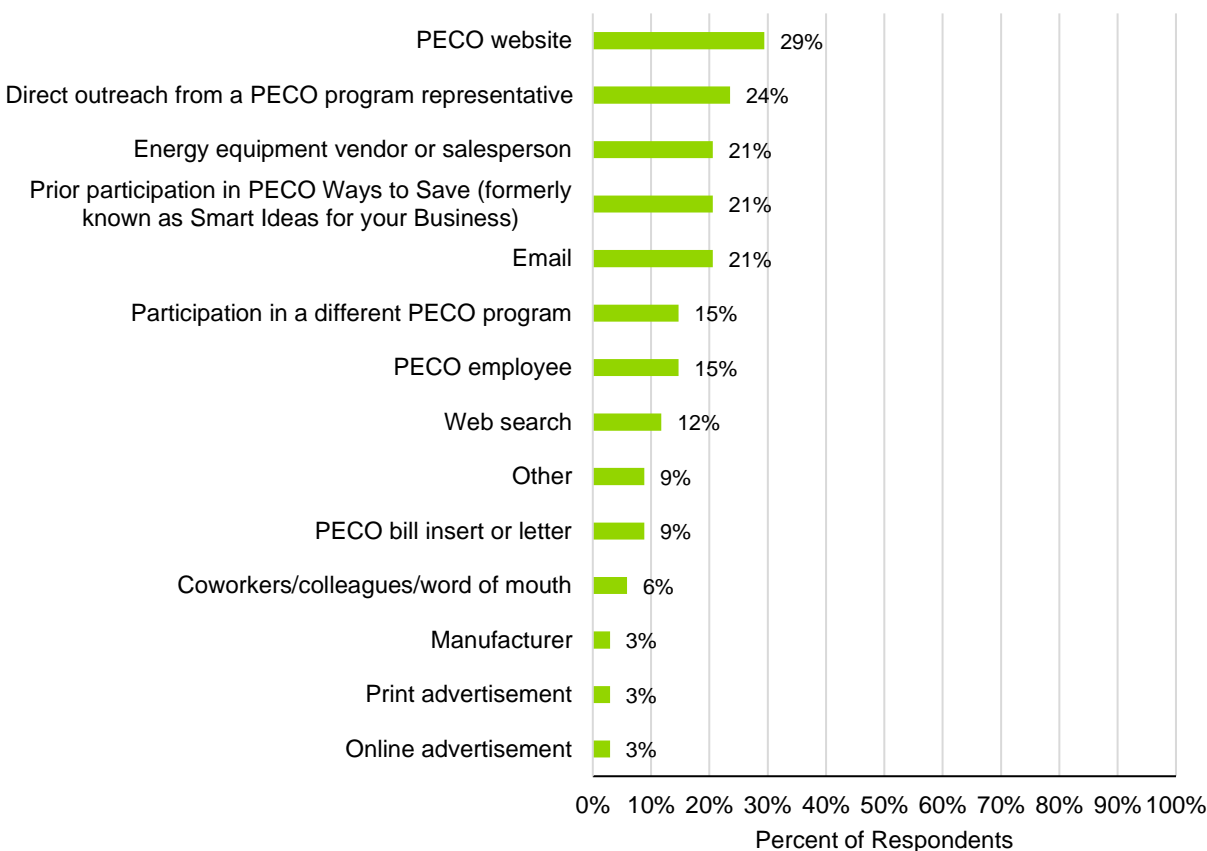
Figure G-3. Likelihood of Recommending the Downstream Component (n=34)



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

Source: Guidehouse analysis

Respondents were asked how they learned of the Downstream component, as Figure G-4 shows. Nearly a third (29%) of respondents became aware of the component through the PECO website. Respondents were least frequently made aware of the component through an online advertisement, print advertisement, or the manufacturer, all three choices at 3% of respondents. Guidehouse excluded “don’t know” responses from analysis.

Figure G-4. Component Awareness of Downstream Participants (n=34)


Respondents received the following question: “How did you learn about PECO Ways to Save? Select all that apply.”

Source: Guidehouse analysis

G.2 Midstream

The Midstream 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 and Lookback pathways (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 are 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.

The Midstream Lookback pathway issues midstream incentives and savings attribution letters to program-qualifying lighting projects that are not captured through the POS pathway (the customer does not receive an instant discount during purchase at the distributor). The Lookback

pathway reviews distributor transaction data, identifies program-qualifying projects that did not receive an incentive, and issues incentives to both the purchaser and the distributor.

In 2022, PECO and DNV expanded the Midstream component to begin offering incentives for non-lighting measures including HVAC, refrigeration and food service, and compressed air. According to the Phase IV Evaluation Plan,⁸² this component is expected to account for 28% of Non-Residential EE Program energy savings, 26% of Non-Residential EE Program demand savings, 20% of total portfolio energy savings, and 19% of total portfolio demand savings. The Phase IV Midstream component is implemented by DNV.

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 7,799 projects from all 3,920 participants in the Midstream component. This analysis used a combination of TRM default values and EDC-provided data for open variables. The team 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, the team reviewed all available project documentation to ensure all assumptions used in measure savings calculations were supported by the project documentation and to ensure the calculation methodology was correct.

The evaluation team supplemented engineering desk reviews with phone verifications, which the team assigned to projects per the Sample Design Memo⁸³ 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. The team 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.⁸³ 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,

⁸² Guidehouse, *Phase IV Evaluation Plan, Energy Efficiency and Conservation Portfolio*, revised April 13, 2023.

⁸³ PECO, *PY14 NonResidential Impact Sample Design Memo 12-08-22*, dated December 08, 2022.

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. The evaluation team made repeated attempts via email and phone calls to schedule site visits or complete phone interviews. For projects that were assigned a phone verification, the team 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.⁸⁴ Thirty-five projects were converted to a file review after the team exhausted all customer contact attempts.

Table G-4. shows the number of Midstream projects by evaluation method. Of the 3,373 completed projects through 2,153 participants, the team originally sampled 72 projects for increased evaluation rigor. Partway through the evaluation, the evaluation team performed a preliminary statistical analysis which showed additional projects were needed to achieve the target relative precision. Additional projects were added to the sample, resulting in a total of 76 sampled projects.

Table G-4. Non-Residential Midstream Project Count by Evaluation Method

Verification Level	Evaluation Target	Final Evaluation Total
Tracking Database Analysis	3,373	3,373
Engineering Desk Review Only	0	35
Phone Verification	72	40
Onsite Verification	0	1
Total Sampled Projects	72	76

Source: Guidehouse analysis

One project surpassed the energy (kilowatt-hour) savings thresholds set in Table 1-2 of the TRM,⁸⁵ which requires site-specific data collection for enhanced evaluation rigor. For this project, Guidehouse completed a site visit and installed metering equipment to obtain site-specific HOU and operation data.

G.2.1.2 Sampling

Using tracking data from PY14, Guidehouse obtained the total number of projects and the total amount of energy savings in the population. With this project data, the evaluation team sampled at the project level for the impact evaluation activities in PY14 to bin projects within five strata, as outlined in the PY14 Sample Design Memo.⁸⁶

Guidehouse first created a census stratum (Stratum 1 – Very High Impact Projects) for projects exceeding 1,000 MWh of energy savings. Next, the evaluation team sorted the remaining projects by size and excluded all projects making up the lowest 3% of total Midstream energy

⁸⁴ Guidehouse, *Phase IV Evaluation Plan, Energy Efficiency and Conservation Portfolio*, revised April 13, 2023.

⁸⁵ PA PUC, *Technical Reference Manual; State of Pennsylvania Act 129 Energy Efficiency and Conservation Program*, dated February 2021, <https://www.puc.pa.gov/filing-resources/issues-laws-regulations/act-129/technical-reference-manual/>.

⁸⁶ PECO, *PY14 NonResidential Impact Sample Design Memo 12-08-22*, dated December 08, 2022.

savings. Finally, the team divided the population into three additional strata: those projects making up the top, middle, and lowest third of the total remaining Midstream energy savings.

For Midstream projects, all 76 sampled projects included lighting or lighting control retrofits. The SWE sampled five total projects for its review and conducted engineering desk reviews for all five sites.

G.2.2 Net Impact Evaluation

Guidehouse did not conduct NTG research for the Non-Residential Midstream component in PY14.

G.2.3 Process Evaluation

Guidehouse did not conduct a process evaluation for this component in PY14.

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 Evaluation Plan,⁸⁷ this component is predicted to account for 17% of Non-Residential EE Program energy savings, 17% of Non-Residential Program demand savings, 12% of total portfolio energy savings, and 12% of total portfolio demand savings. The Phase IV Small Business Direct Install component was implemented by SmartWatt from June 2021 through January 2022 (the same CSP as Phase III). DNV began implementing the component in February 2022 using an open contractor network.

G.3.1 Gross Impact Evaluation

G.3.1.1 Methodology

In the first step of the gross impact evaluation, Guidehouse conducted a tracking database analysis for all 568 projects from all 545 participants in the Small Business Direct Install component. This analysis used a combination of TRM default values and EDC-provided data for open variables. The team 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

⁸⁷ Guidehouse, *Phase IV Evaluation Plan, Energy Efficiency and Conservation Portfolio*, revised April 13, 2023.

based on model numbers and other information as it was available. In the engineering desk review, the team reviewed all available project documentation to ensure all assumptions used in measure savings calculations were supported by the project documentation and to ensure the calculation methodology was correct.

The evaluation team supplemented engineering desk reviews with phone verifications, which the team assigned to projects per the Sample Design Memo⁸⁸ 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. The team made updates to the measure savings calculations based on customer responses during the phone verifications as warranted.

Guidehouse made every attempt to complete its verification efforts. The evaluation team made repeated attempts via email and phone calls to complete phone interviews. For projects that were assigned a phone verification, the team 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.⁸⁹ Eight projects were converted to a file review after the team exhausted all customer contact attempts.

Table G-5 shows the number of Small Business Direct Install projects by evaluation method. Of the 568 completed projects through 545 participants, the team originally projected sampling 15 projects for increased evaluation rigor. Partway through the evaluation, the evaluation team performed a preliminary statistical analysis which showed additional projects were needed to achieve the target relative precision. Additional projects were added to the sample, resulting in a total of 27 sampled projects.

Table G-5. Non-Residential Small Business Direct Install Project Count by Evaluation Method

Verification Level	Evaluation Target	Final Evaluation Total
Tracking Database Analysis	568	568
Engineering Desk Review Only	0	8
Phone Verification	15	19
Onsite Verification	0	0
Total Sampled Projects	15	27

Source: Guidehouse analysis

G.3.1.2 Sampling

Using tracking data from PY14, Guidehouse obtained the total number of projects and the total amount of energy savings in the population. With this project data, the evaluation team sampled at the project level for the impact evaluation activities in PY14 to bin projects within five strata, as outlined in the PY14 Sample Design Memo.⁹⁰

⁸⁸ PECO, PY14 NonResidential Impact Sample Design Memo 12-08-22, dated December 08, 2022.

⁸⁹ Guidehouse, Phase IV Evaluation Plan, Energy Efficiency and Conservation Portfolio, revised April 13, 2023.

⁹⁰ PECO, PY14 NonResidential Impact Sample Design Memo 12-08-22, dated December 08, 2022.

Guidehouse first created a census stratum (Stratum 1 – Very High Impact Projects) for projects exceeding 500 MWh of energy savings. Next, the evaluation team sorted the remaining projects by size and excluded all projects making up the lowest 3% of total Small Business Direct Install energy savings. Finally, the team 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, 25 sampled projects included lighting or lighting control retrofits and two projects included door gasket installations. The SWE sampled three total projects for its review and conducted engineering desk reviews for all three sites.

G.3.2 Net Impact Evaluation

Guidehouse did not conduct NTG research for this component in PY14.

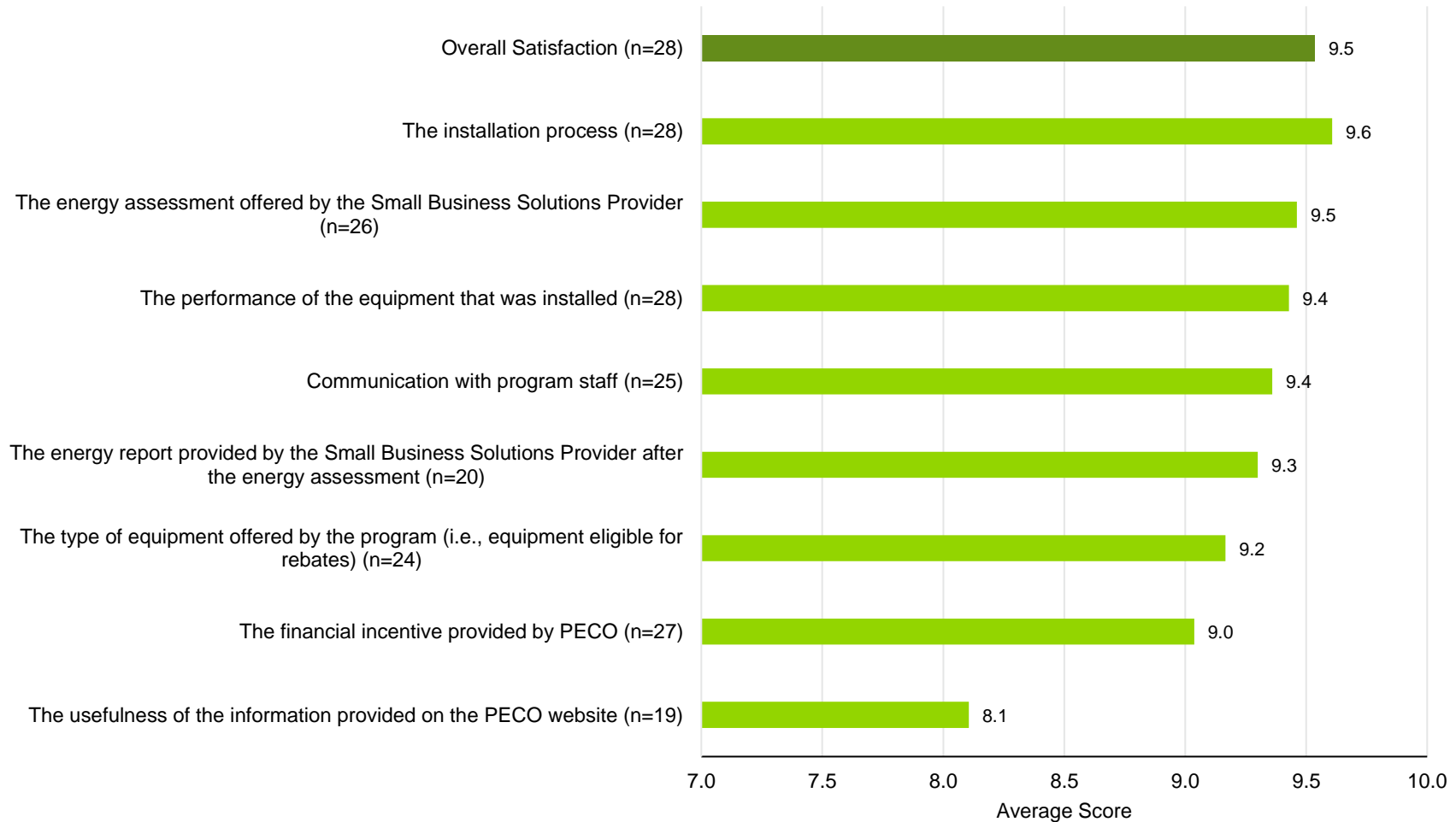
G.3.3 Process Evaluation

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 Small Business Direct Install component, known to participants as PECO Small Business Solutions, specifically.

Guidehouse contacted 324 customers who participated in the Small Business Direct Install component during PY14 to conduct the process evaluation for this component. Twenty-eight participants replied to the survey resulting in a 9% response rate.

Several questions measured respondent satisfaction levels with aspects of the Small Business Direct Install component, as well as the program overall. Respondents rated their satisfaction using a scale of 0 to 10 with 0 representing “extremely dissatisfied” and 10 representing “extremely satisfied.” Respondents could also select “don’t know” or “not applicable;” Guidehouse excluded “don’t know” or “not applicable” responses from analysis. The mean satisfaction for the component overall is 9.5 out of 10, as Figure G-5 shows.

Respondents also rated their satisfaction with ten aspects of the component, as Figure G-5 shows. The installation process received the highest mean satisfaction score of 9.6. Several other of the highest average satisfaction scores were the energy assessment offered by the Small Business Direct Install provider (9.5) and performance of the equipment that was installed (9.4). The usefulness of the information provided on the PECO website (8.1) was an aspect of PECO’s Small Business Direct Install component that could improve.

Figure G-5. Small Business Direct Install Component Satisfaction


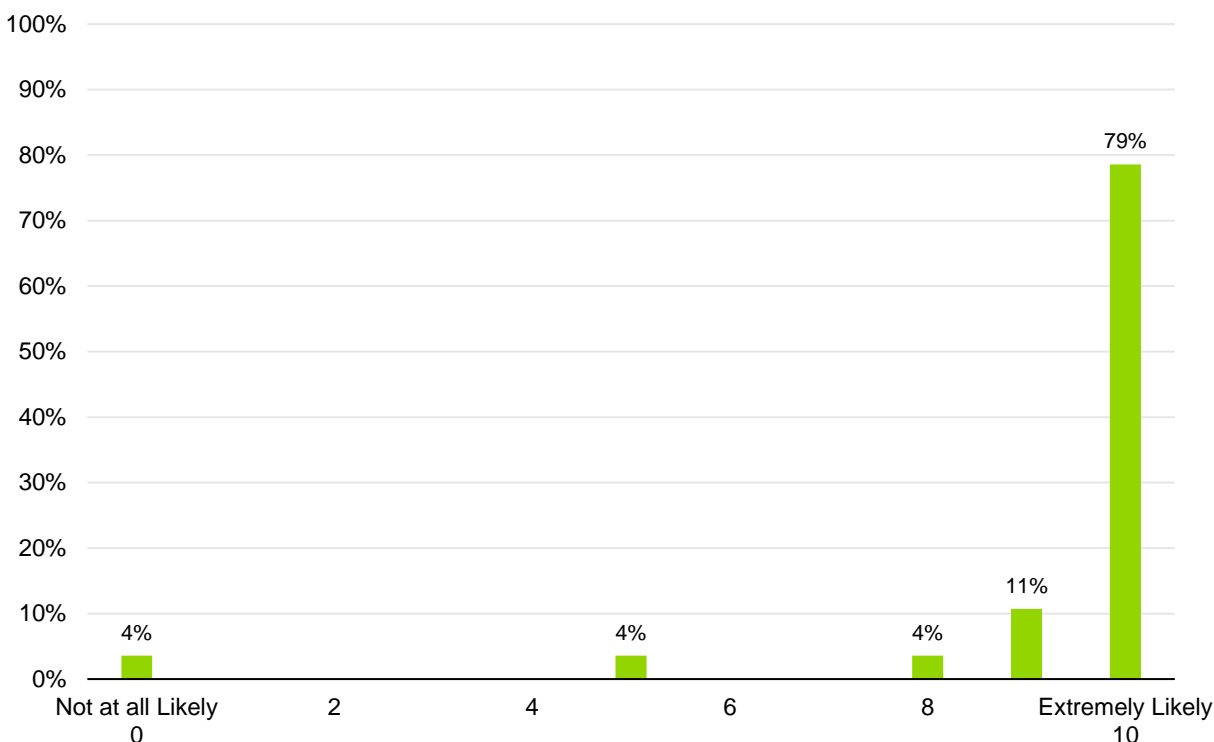
Respondents received the following questions: “How would you rate your satisfaction with PECO Small Business Solutions overall?” and “How would you rate your satisfaction with the following aspects of PECO Small Business Solutions?”

Note: Two additional aspects of the program were erroneously included in the survey question and were removed from analysis.

Source: Guidehouse analysis

On average, respondents rated their likelihood to recommend the Small Business Direct Install component to others as 9.3 out of 10 (scale of 0 to 10, where 0 is “not at all likely” and 10 is “extremely likely”), with 79% of respondents indicating they are extremely likely to recommend the component (Figure G-6). Only one respondent indicated it was not at all likely they would recommend the component. Guidehouse excluded “don’t know” responses from analysis.

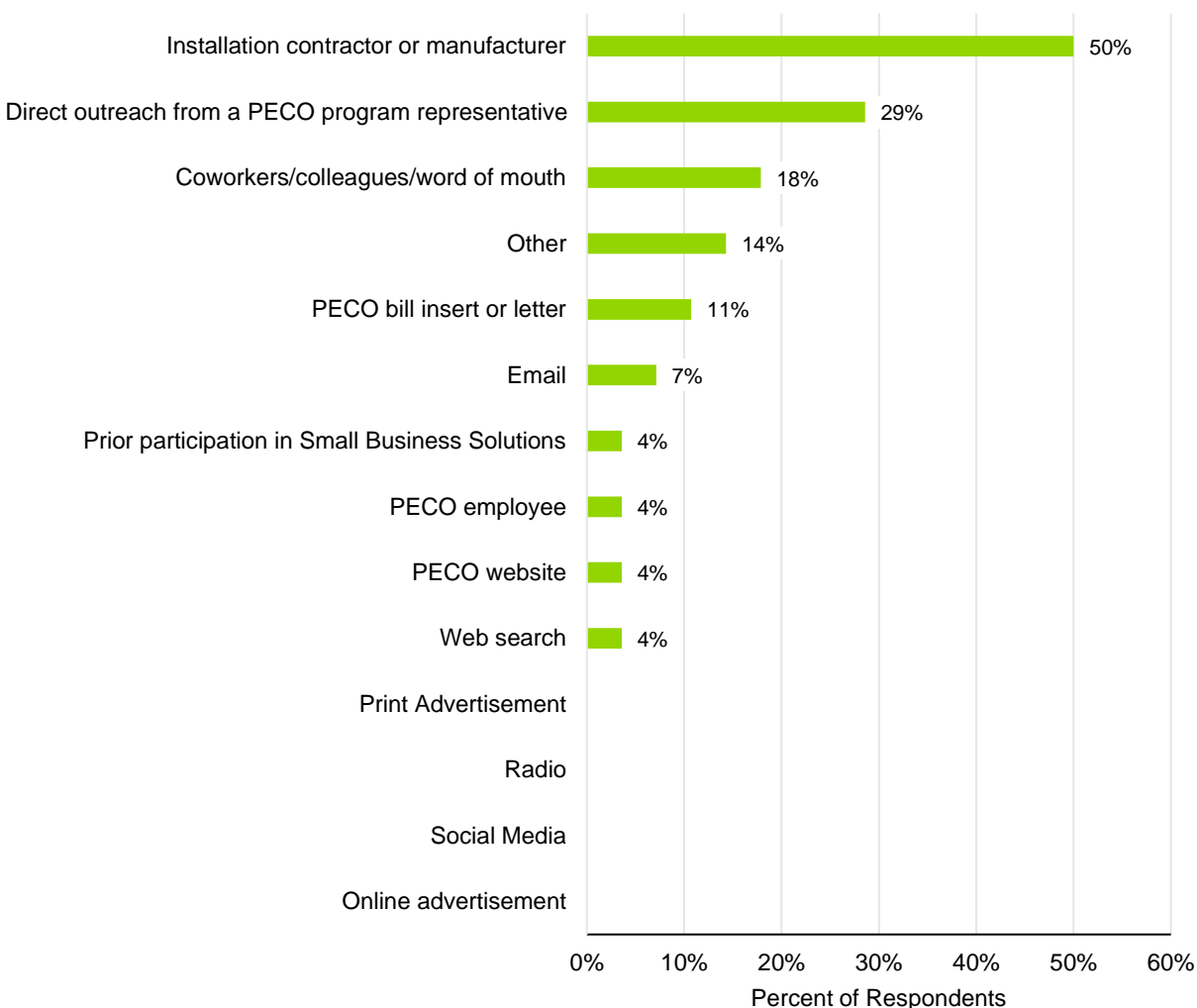
Figure G-6. Likelihood of Recommending the Small Business Direct Install Component (n=28)



Respondents received the following question: “How likely are you to recommend PECO Small Business Solutions to others?”.

Source: Guidehouse analysis

Respondents were asked how they learned about the Small Business Direct Install component. Respondents reported they learned about the Small Business Direct Install component from four major categories: installation contractor or manufacturer (50%), direct outreach from a PECO program representative (29%), coworkers/colleagues/word of mouth (18%) and the other category (14%), as Figure G-7 shows. The other category respondents reported they learned about the program through a friend (2), a recommendation from a lighting distributor and a recommendation by an environmental group. Guidehouse excluded “don’t know” responses from analysis.

Figure G-7. Small Business Direct Install Component Awareness (n=28)


Respondents received the following question: “How did you learn about PECO Small Business Solutions? Select all that apply.”

Note: Guidehouse removed any instance that respondents did not report they learned about the Small Business Direct Install component through an outreach method.

Source: Guidehouse analysis

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 Evaluation Plan,⁹¹ this component is expected to account for 10% of Non-Residential EE Program energy savings, 10% of Non-Residential EE Program demand savings, 7% of total portfolio energy savings, and 6% of total portfolio demand savings. The Phase IV New Construction component is implemented by DNV.

G.4.1 Gross Impact Evaluation

Guidehouse conducted a tracking database analysis for all 146 projects across all 50 participants in the component. This analysis used a combination of TRM default values and EDC-provided data for open variables. The team 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 PY13 evaluation of the New Construction program to the PY14 adjusted database savings for energy and demand to arrive at PY14 gross impact results.

G.4.2 Net Impact Evaluation

Guidehouse estimated NTG in PY14 by conducting online surveys with non-residential customers participating in the Non-Residential New Construction component. The team followed the guidance from the SWE for creating the NTG survey guide and conducting NTG research as defined in the Phase IV Evaluation Framework. This section summarizes the SWE guidance and how Guidehouse applied it to the New Construction component.

G.4.2.1 Estimating Free Ridership

Guidehouse followed the SWE's recommendation of gathering feedback from participating New Construction customers on their *Intention* to complete energy efficiency projects if they did not receive PECO program assistance, and the *Influence* the PECO component had on their decision to complete the energy efficiency project this program year. The evaluation team asked specific survey questions to inform these two metrics as follows.

G.4.2.1.1 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 of a limited set of options that best describe what most likely would have occurred without the program assistance.

The offered response options for the PY14 New Construction component include:

- A. Would not have designed and built the project above code
- B. Would have postponed the new construction project

⁹¹ Guidehouse, *Phase IV Evaluation Plan, Energy Efficiency and Conservation Portfolio*, revised April 13, 2023.

C. Would have reduced the project size, scope, or efficiency of the project

D. Would have designed and built the project exactly the same

Options A and B (would not have designed and built the project above code and would have postponed the new construction project) indicates zero free ridership and thus results in a score of 0.0. Option C indicates 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 a follow-up question (How much would your organization have reduced the size, scope, or efficiency of the project?) Option D (designed and built the project exactly the same) also requires a follow-up question (Would your organization have paid the entire cost of the project without the program assistance?) to determine a final intention score. Table G-6 shows the questions and scoring for the New Construction component.

Table G-6. Intention Scoring for the Non-Residential New Construction Component

Question	Response	Intention Score
FR1. What would your organization have done without the PECO incentive?	Not have designed and built the project above code	0.0
	Postponed project	0.0
	Reduced size, scope, efficiency	Based on response to FR3
	Designed and built exactly the same	Based on response to FR4
FR2. For how many months would your organization have postponed the project?	-	-
FR3. How much would your organization have reduced the size, scope, or efficiency 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 ¹
FR4. Does this mean your organization would have paid the entire cost of the upgrade?	Yes	0.50
	Don't Know	0.375 ¹
	No	0.25 ²

¹ Represents the midpoint of possible values for the follow-up questions to the counterfactual scenario. Don't Know responses were removed from the main counterfactual or intention question but left in for the probing follow-up questions.

² Infrequent response

Source: Guidehouse analysis

G.4.2.1.2 Influence

Component influence is assessed by asking the respondent how much influence – from 0 (not at all influential) to 10 (extremely influential) – various component elements had on the decision to do the project the way it was done. Elements randomized and asked of New Construction participants include:

- Component incentive
- Recommendation from PECO staff
- Component marketing materials

- Recommendation from a PECO contractor

The component's influence score is equal to the maximum influence rating for any component element rather than, say, the mean influence rating. The rationale is that if any given component element had a great influence on the respondent's decision, then the component itself had a great influence, even if other elements had less influence. Scoring for the 0-10 scale deviated slightly from the SWE's recommended 1-5 scale, however Guidehouse decided to keep all scale questions consistent across Process and NTG survey questions and therefore adjusted the scoring as Table G-7 shows.

Table G-7. Influence Scoring for the Non-Residential New Construction Component

Component Influence Rating	Influence Score
0 – Not at All Influential	0.500
1-2 ¹	0.438
3-4	0.375
5-6	0.250
7-8	0.125
9-10 – Extremely Influential	0.000
Don't Know	0.250

¹ Guidehouse shifted from a 1-5 scale in Phase III to a 0-10 scale in Phase IV and adjusted the scoring to align with other process question scales.

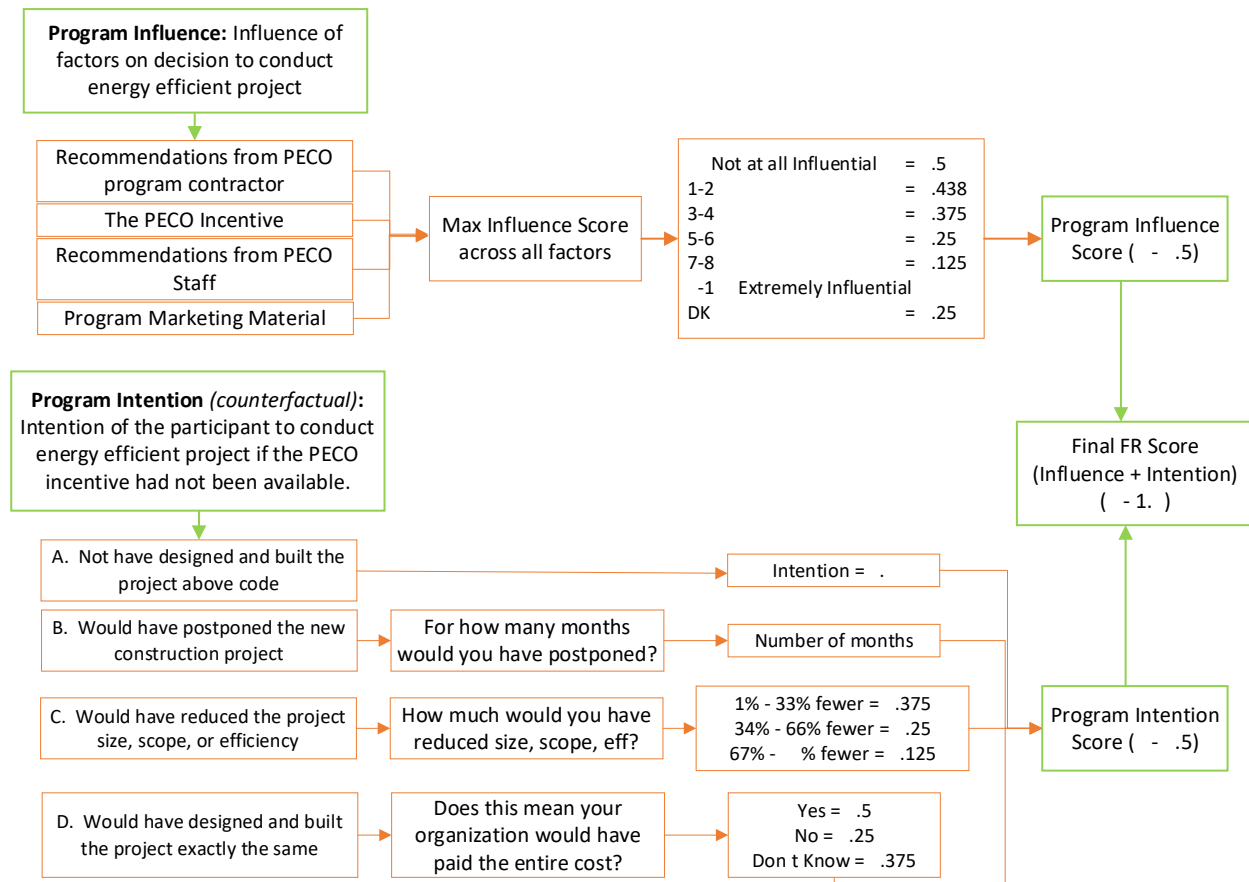
Source: Guidehouse analysis

G.4.2.2 Total Free Ridership Score

Total free ridership is the sum of the intention and influence components, resulting in a score ranging from zero to one. See Section 3.5.3.2 for the full free ridership results from the New Construction component.

G.4.2.3 Algorithm Diagram

The following diagram is a visual representation of the scoring of the free ridership questions.

Figure G-8. Free Ridership Algorithm – New Construction


Source: Guidehouse analysis

G.4.2.4 Estimating Participant Spillover

The participant spillover battery of questions assesses, for each participant, the number and description of non-incented energy efficient equipment installed since component participation; and the component's influence on the participant's decision to install those technologies. This section summarizes the spillover approach for the New Construction component in PY14.

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?
- [IF YES:] Please describe the energy-efficiency equipment. [Probe for measure type, size, and quantity]

Guidehouse asked about and documented all additional, non-rebated equipment installed since component participation, whether eligible for component rebates, in the TRM but not eligible, or not in the TRM and about the level of influence the prior component participation had on their decision to install the additional equipment. The New Construction component 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 PECO Ways to Save on your decision to install this additional equipment at this facility?

The influence rating is assigned a value that determines what proportion of the measure’s savings are attributed to the component:

A rating of 8, 9, or 10 = 1.0 (full savings attributed to the component).

A rating of 3, 4, 5, 6, or 7 = 0.5 (half of the savings attributed to the component).

A rating of 0, 1, or 2 = 0 (no savings attributed to the component).

Guidehouse did not receive enough completed surveys to evaluate participant spillover. The team will continue the Non-Residential New Construction NTG research in PY15 and combine results with the PY14 respondents.

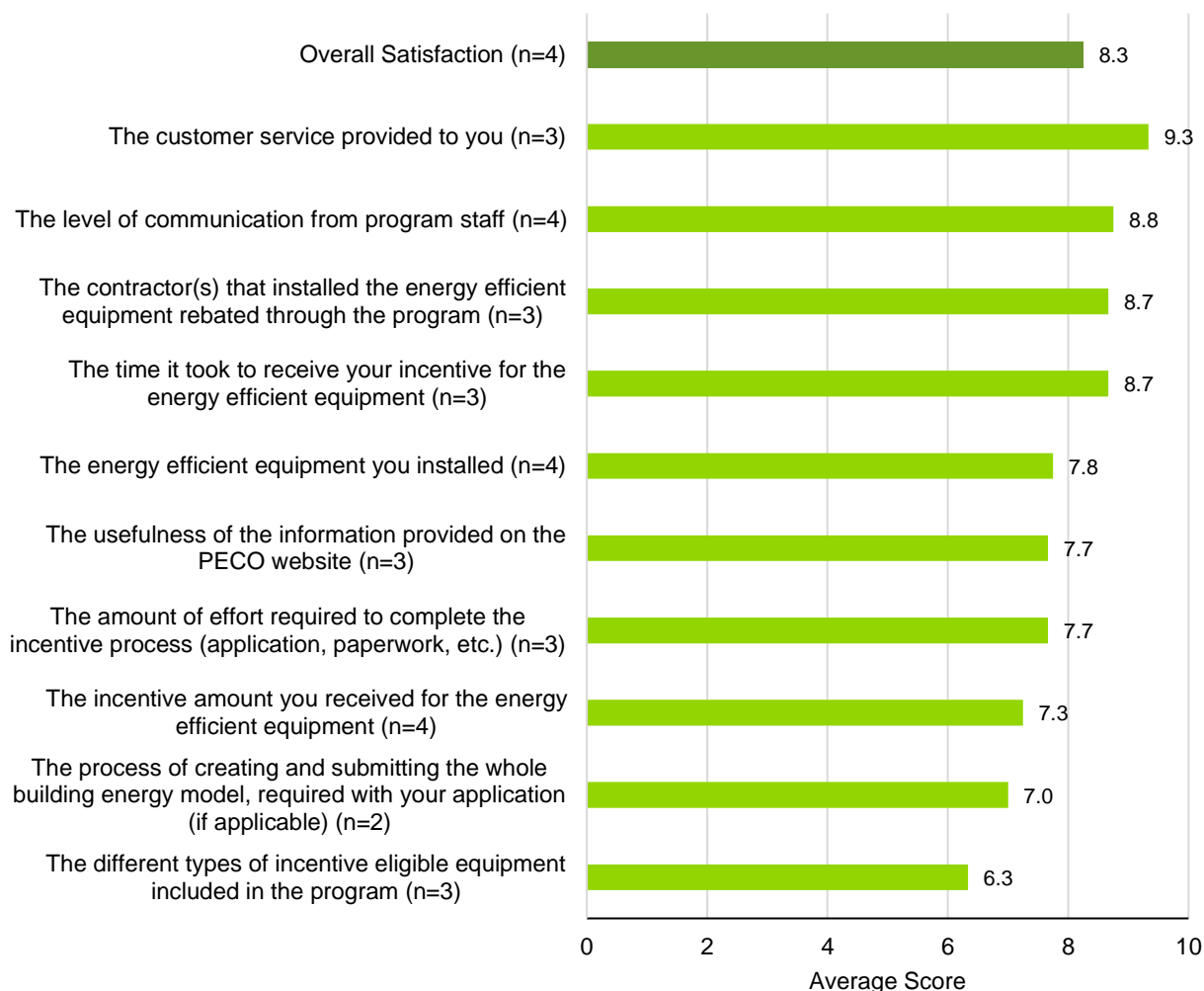
G.4.3 Process Evaluation

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 Non-Residential New Construction component, known to participants as PECO Ways to Save, specifically.

Guidehouse contacted 47 customers who participated in the New Construction component during PY14 to conduct the process evaluation for this component. Four participants replied to the survey resulting in a 9% response rate. Due to the low response rate, Guidehouse plans to continue the Non-Residential New Construction process evaluation through PY15. Results-to-date are presented here.

Several questions measured satisfaction levels with aspects of the New Construction component, as well as the New Construction component overall. Respondents rated their satisfaction using a scale of 0 to 10, with 0 representing “extremely dissatisfied” and 10 representing “extremely satisfied”. Respondents could also select “don’t know” or “not applicable”, Guidehouse excluded “don’t know” or “not applicable” responses from analysis. The mean satisfaction for the program overall is 8.3 out of 10, as Figure G-9 shows.

Respondents also rated their satisfaction with ten aspects of the component, as Figure G-9 shows. The customer service provided received the highest mean satisfaction score of 9.3 out of 10. The different types of eligible equipment included in the component received the lowest mean satisfaction score of 6.3 out of 10.

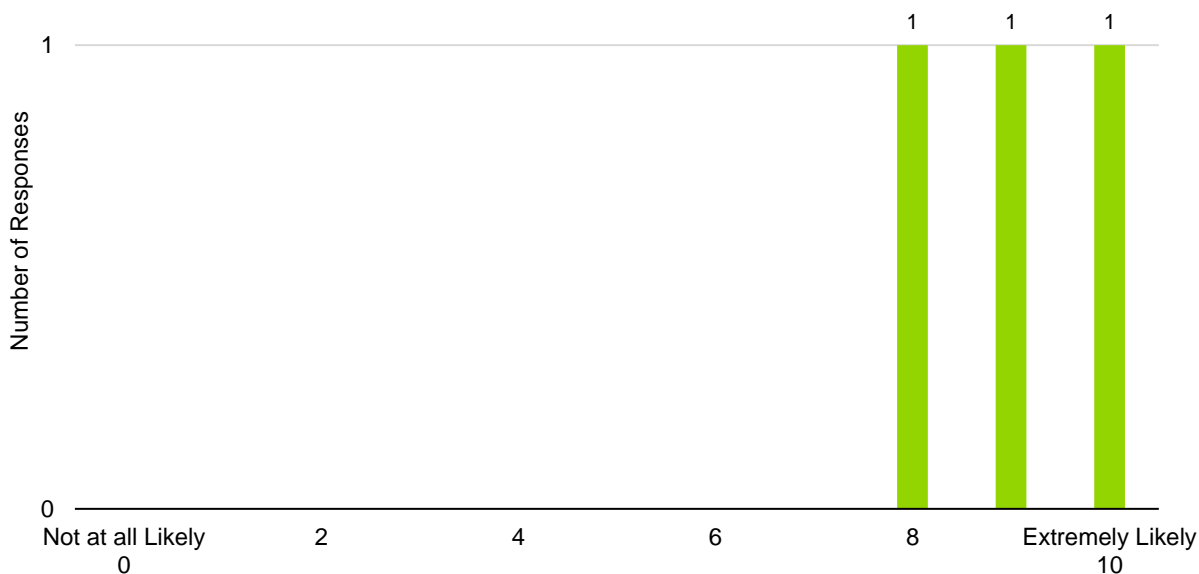
Figure G-9. New Construction Component Satisfaction


Respondents received the following questions: “How would you rate your satisfaction with PECO Ways to Save overall?” and “How would you rate your satisfaction with the following aspects of PECO Ways to Save?”

Source: Guidehouse analysis

On average, respondents rated their likelihood to recommend the New Construction component to others as 9.0 out of 10, as Figure G-10 shows. The scale used was from 0 to 10, with 0 representing “Not at all likely” and 10 representing “Extremely likely”. Guidehouse excluded “don’t know” responses from analysis.

Figure G-10. Likelihood of Recommending the New Construction Component (n=3)

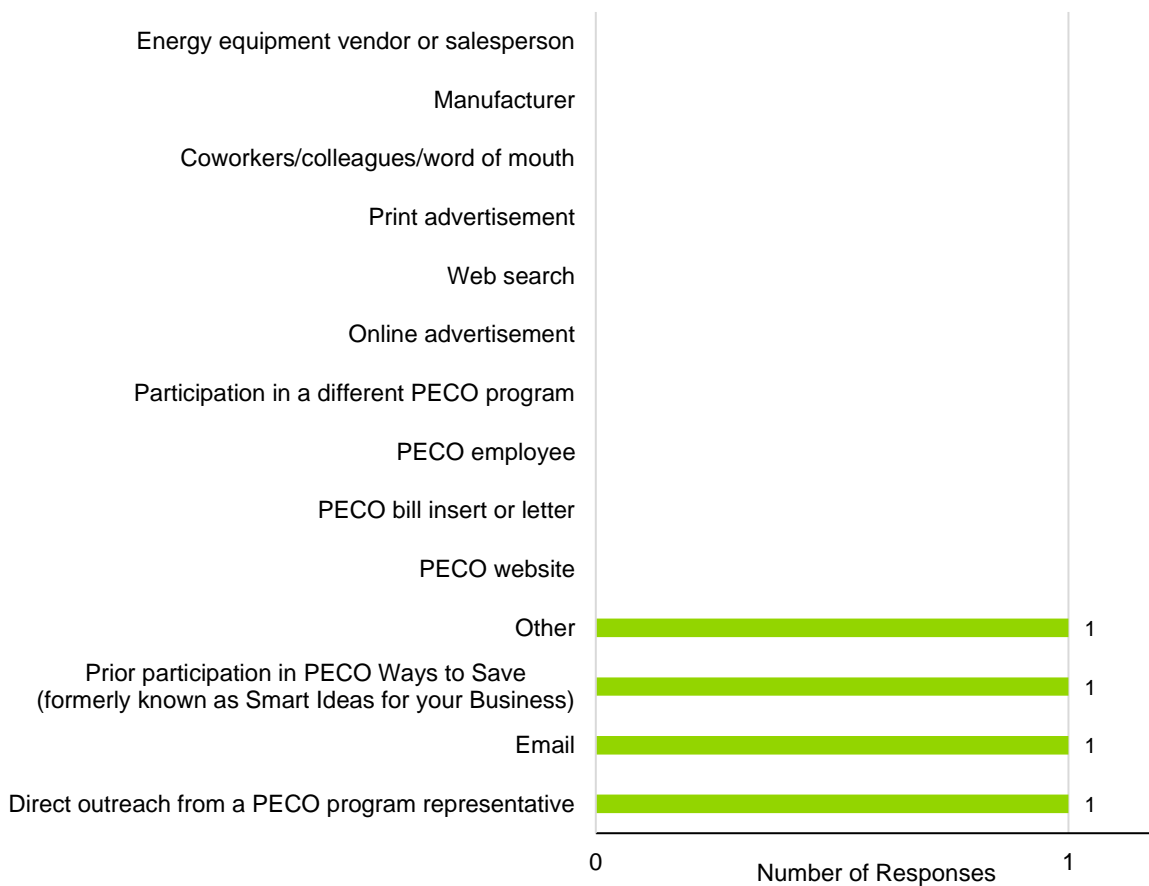


Respondents received the following question: “How likely are you to recommend PECO Ways to Save to others?”.

Source: Guidehouse analysis

Respondents were asked how they learned of the New Construction component, as Figure G-11 shows. Each of the four respondents were made aware of the component in a different way: direct outreach from a PECO representative; via email; prior participation; and through data from their electrical contractor (“other”).

Figure G-11. Component Awareness of New Construction Participants (n=4)



Respondents received the following question: “How did you learn about PECO Ways to Save? Select all that apply.”

Source: Guidehouse analysis

Appendix H. Pilot Programs

PECO is implementing three implementation tactic pilots, approved by the PUC, as determined by the settlement agreement.⁹² These three pilots are the Residential Comprehensive Projects, Non-Residential Comprehensive Projects, and IE Health and Safety (H&S) Pilots. These savings, costs, and participation, in Table H-1, are included in the Residential, Non-Residential, and Income-Eligible EE program results above. The final evaluation of the pilots will be reported separately upon completion of the implementation period of the pilots, which end in late 2023.

Table H-1. Implementation Tactic Pilot Programs

Pilot	PY14 Participation ¹	Reported Energy Savings (MWh)	Reported Demand Savings (MW)	Incentive Spending (\$1,000)	Bonus Incentive Spending (\$1,000)	Non-Incentive Spending (\$1,000)
Residential Comprehensive Projects	605	269	0.073	\$106	160	\$75
Non-Residential Comprehensive Projects	10	3,174	0.318	\$303	\$38	\$76
Income-Eligible Healthy and Safety (H&S)	36	756	0.027	Bridge Measures: \$1,093	H&S: \$258	\$10

Note: These pilots facilitate participation by offering bonus incentives through existing PECO EE programs and do not directly achieve the reported savings entirely on their own.

¹ Participation is the customer count.

Source: Guidehouse analysis

⁹² PECO, *PECO Settlement EEC Term Sheet*, dated February 11, 2021.

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