



pecoSM

AN EXELON COMPANY

Richard G. Webster, Jr.
Vice President
Regulatory Policy & Strategy

Telephone 215.841.5777
Fax 215.841.6208
www.peco.com
dick.webster@peco-energy.com

PECO
2301 Market Street
S15
Philadelphia, PA 19103

September 30, 2024

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 Annual Report for
June 1, 2023 through May 31, 2024**

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 Annual Energy Efficiency & Conservation Report for the period June 1, 2023 through May 31, 2024.

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 30, 2024
Page 2

Enclosures

CC:K. Brown, Law Bureau (e-mail only)

D. Gill, Deputy Director, Bureau of Technical Utility Services (e-mail only)

J. Sherrick, Policy & Planning/Conservation Supervisor (e-mail only)

K. A. Hafner, Director, Office of Special Assistants (e-mail only)

P. T. Diskin, Director, Bureau of Technical Utility Services (e-mail only)

K. Monaghan, Director, Bureau of Audits (e-mail only)

A. Kaster, Director, Bureau of Investigation & Enforcement (e-mail only)

Office of Consumer Advocate (e-mail only)

Office of Small Business Advocate(e-mail only)

McNees, Wallace & Nurick (e-mail only)



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

Program Year 15
(June 1, 2023 - May 31, 2024)

Prepared for:



For Pennsylvania Act 129 of 2008
Energy Efficiency and Conservation Plan

Submitted by:

Guidehouse Inc.
2617 Broadway
Boulder, Colorado 80304
(303) 728-2500

September 30, 2024

guidehouse.com This deliverable was prepared by Guidehouse Inc. for the sole use and benefit of, and pursuant to a client relationship exclusively with PECO ("Client"). The work presented in this deliverable represents Guidehouse's professional judgement based on the information available at the time this report was prepared. The information in this deliverable may not be relied upon by anyone other than Client. Accordingly, Guidehouse disclaims any contractual or other responsibility to others based on their access to or use of the deliverable.

Table of Contents

1. Introduction	15
2. Summary of Achievements	16
2.1 Carryover Savings from Phase III of Act 129	16
2.2 Phase IV Energy Efficiency Achievements to Date	17
2.2.1 Phase IV Performance, Multifamily Housing	20
2.3 Phase IV Performance by Customer Segment	20
2.4 Summary of Participation by Program	21
2.5 Summary of Impact Evaluation Results	23
2.6 Summary of Energy Impacts by Program	23
2.6.1 Incremental Annual Energy Savings by Program	24
2.6.2 Lifetime Energy Savings by Program	24
2.7 Summary of Peak Demand Reduction Impacts by Program	25
2.7.1 Peak Demand Savings Nominated to PJM Forward Capacity Market	26
2.8 Summary of Fuel Switching Impacts.....	27
2.9 Summary of Cost-Effectiveness Results.....	27
2.10 Comparison of Performance to Approved EE&C Plan	28
2.11 Findings and Recommendations	29
3. Evaluation Results by Program	30
3.1 Residential EE Program	33
3.1.1 Participation and Reported Savings by Customer Segment	34
3.1.2 Gross Impact Evaluation	34
3.1.3 Net Impact Evaluation.....	39
3.1.4 Verified Savings Estimates	42
3.1.5 Process Evaluation	42
3.1.6 Program Finances and Cost-Effectiveness Reporting	49
3.1.7 Status of Recommendations	51
3.2 Income-Eligible EE Program.....	54
3.2.1 Participation and Reported Savings by Customer Segment	54
3.2.2 Gross Impact Evaluation	55
3.2.3 Net Impact Evaluation.....	56
3.2.4 Verified Savings Estimates	57
3.2.5 Process Evaluation	57
3.2.6 Program Finances and Cost-Effectiveness Reporting	62
3.2.7 Status of Recommendations	63
3.3 Residential HER Program	65
3.3.1 Participation and Reported Savings by Customer Segment	65
3.3.2 Gross Impact Evaluation	65

3.3.3 Net Impact Evaluation	66
3.3.4 Verified Savings Estimates	66
3.3.5 Process Evaluation	67
3.3.6 Program Finances and Cost-Effectiveness Reporting	67
3.3.7 Status of Recommendations	68
3.4 Income-Eligible HER Program.....	69
3.4.1 Participation and Reported Savings by Customer Segment.....	69
3.4.2 Gross Impact Evaluation	69
3.4.3 Net Impact Evaluation.....	70
3.4.4 Verified Savings Estimates	70
3.4.5 Process Evaluation	71
3.4.6 Program Finances and Cost-Effectiveness Reporting	71
3.4.7 Status of Recommendations	72
3.5 Non-Residential EE Program.....	73
3.5.1 Participation and Reported Savings by Customer Segment.....	74
3.5.2 Gross Impact Evaluation	74
3.5.3 Net Impact Evaluation.....	79
3.5.4 Verified Savings Estimates	81
3.5.5 Process Evaluation	81
3.5.6 Program Finances and Cost-Effectiveness Reporting	87
3.5.7 Status of Recommendations	89
4. Portfolio Finances and Cost Recovery.....	93
4.1 Program Financials	93
4.2 Cost Recovery.....	94
Appendix A. Site Inspection Summary.....	95
Appendix B. HER Impact Evaluation Detail	98
B.1 Billing Data Management	98
B.2 Impact Regression Results	98
B.3 Recipient Household Counts.....	101
B.4 Dual Participation Analysis.....	101
B.5 Persistence and First-Year Savings	102
B.6 Demand Savings.....	104
B.7 Summary	106
Appendix C. PY15 and P4TD Summary by Customer Segment and IE Carveout	107
Appendix D. Summary of Program-Level Impacts, Cost-Effectiveness, and HIM	108
NTG.....	108
D.1 Program- and Component-Level Impacts Summary	108
D.2 Program-Level Cost-Effectiveness Summary.....	109
D.3 HIM NTG	111

D.4 Program-Level Comparison of Performance to Approved EE&C Plan	111
Appendix E. Residential and Income-Eligible EE Programs	113
E.1 Rebates and Marketplace (Market-Rate)	113
E.1.1 Gross Impact Evaluation	113
E.1.2 Net Impact Evaluation	115
E.1.3 Process Evaluation.....	123
E.2 Appliance Recycling (Market-Rate and Income-Eligible)	128
E.2.1 Gross Impact Evaluation.....	128
E.2.2 Net Impact Evaluation	129
E.2.3 Process Evaluation.....	129
E.3 In-Home Assessment (Market-Rate)	129
E.3.1 Gross Impact Evaluation.....	129
E.3.2 Net Impact Evaluation	130
E.3.3 Process Evaluation.....	130
E.4 New Construction (Market-Rate).....	130
E.4.1 Gross Impact Evaluation.....	130
E.4.2 Net Impact Evaluation	131
E.4.4 Process Evaluation.....	132
E.5 Multifamily (Market-Rate and Income-Eligible)	132
E.5.1 Gross Impact Evaluation.....	132
E.5.2 Net Impact Evaluation	133
E.5.3 Process Evaluation.....	133
E.6 Single-Family and Long-Term Savings (Income-Eligible)	133
E.6.1 Gross Impact Evaluation.....	134
E.6.2 Net Impact Evaluation	134
E.6.3 Process Evaluation.....	134
Appendix F. Residential and Income-Eligible Home Energy Report Programs... 140	
F.1 Gross Impact Evaluation	140
F.2 Net Impact Evaluation	140
F.3 Process Evaluation	140
Appendix G. Non-Residential EE Program	141
G.1 Downstream Rebates	141
G.1.1 Gross Impact Evaluation	141
G.1.2 Net Impact Evaluation	143
G.1.3 Process Evaluation	143
G.2 Midstream Rebates	144
G.2.1 Gross Impact Evaluation	144
G.2.2 Net Impact Evaluation	146
G.2.3 Process Evaluation	146

G.3 Small Business Direct Install.....	146
G.3.1 Gross Impact Evaluation	147
G.3.2 Net Impact Evaluation	147
G.3.3 Process Evaluation	147
G.4 New Construction	147
G.4.1 Gross Impact Evaluation	148
G.4.2 Net Impact Evaluation	149
G.4.3 Process Evaluation	154
Appendix H. Pilot Programs	158

List of Figures

Figure 2-1. Portfolio Carryover Savings from Phase III of Act 129.....	16
Figure 2-2. Income-Eligible Carryover from Phase III.....	17
Figure 2-3. EE&C Plan Performance Toward Phase IV Portfolio Compliance Target (MWh) ..	18
Figure 2-4. EE&C Plan Performance Toward Phase IV Portfolio Compliance Target (MW)	19
Figure 2-5. EE&C Plan Performance Toward Phase IV Income-Eligible Compliance Target...	20
Figure 3-1. PECO Phase IV Verified Savings Pathways	30
Figure 3-2. Rebates and Marketplace Overall Satisfaction by Pathway.....	45
Figure 3-3. Rebates and Marketplace Mean Satisfaction by Pathway	46
Figure 3-4. Rebates and Marketplace Mean Likelihood to Recommend by Pathway	47
Figure 3-5. Sources of Rebates and Marketplace Awareness by Pathway.....	48
Figure 3-6. Sentiments Toward Solar Panels	49
Figure 3-7. Single-Family Income-Eligible Satisfaction.....	59
Figure 3-8. Satisfaction with Aspects of Free Energy Checkup and Energy Saving Kits.....	60
Figure 3-9. Single-Family Income-Eligible Likelihood to Recommend	61
Figure 3-10. Sources of Single-Family Income-Eligible Component Awareness.....	62
Figure 3-11. Non-Residential New Construction Component Overall Satisfaction (n=9).....	84
Figure 3-12. Non-Residential New Construction Component Satisfaction (n=9).....	85
Figure 3-13. Non-Residential New Construction Component Likelihood to Recommend (n=8)	86
Figure 3-14. Sources of Non-Residential New Construction Component Awareness (n=9).....	87
Figure E-1. Free Ridership Algorithm – Downstream Delivery Pathway	120
Figure E-2. Free Ridership Algorithm – Marketplace Delivery Pathway.....	121
Figure E-3. Downstream Pathway Satisfaction.....	124
Figure E-4. Marketplace Pathway Satisfaction	125
Figure E-5. Likelihood of Recommending PECO’s Downstream Pathway (n=91)	126
Figure E-6. Likelihood of Recommending PECO’s Marketplace (n=43).....	126
Figure E-7. Awareness of PECO’s Downstream Pathway (n=91).....	127
Figure E-8. Awareness of PECO’s Marketplace Pathway (n=43)	128
Figure E-9. Single-Family Income-Eligible Component Satisfaction – Free Energy Checkup	136
Figure E-10. Single-Family Income-Eligible Component Satisfaction – Energy Saving Kits...	137
Figure E-11. Likelihood of Recommending PECO’s Free Energy Checkup (n=102).....	138
Figure E-12. Component Awareness of Free Energy Checkup Participants (n=104).....	139
Figure G-1. Free Ridership Algorithm – New Construction	152
Figure G-2. New Construction Component Satisfaction	155
Figure G-3. Likelihood of Recommending the New Construction Component (n=8)	156
Figure G-4. Component Awareness of New Construction Participants (n=9).....	157

List of Tables

Table 2-1. PY15 Summary Statistics by Customer Segment.....	20
Table 2-2. Phase IV Summary Statistics by Customer Segment	21
Table 2-3. EE&C Portfolio Participation by Program	22
Table 2-4. Point of Purchase and Giveaway Measures	22
Table 2-5. Impact Evaluation Results Summary.....	23
Table 2-6. Incremental Annual Energy Savings by Program (MWh/Yr)	24
Table 2-7. Lifetime Energy Savings by Program (MWh).....	24
Table 2-8. Peak Demand Savings by Energy Efficiency Program (MW/Yr)	25
Table 2-9. Planned FCM Nominations by Act 129 Program Year and PJM Delivery Year	26

Table 2-10. Fuel Switching Summary.....	27
Table 2-11. Summary of Portfolio Finances – Gross Verified	27
Table 2-12. Comparison of Expenditures to Phase IV EE&C Plan (\$1,000)	28
Table 2-13. Comparison of Actual Program Savings to EE&C Plan Projections	28
Table 3-1. Gross Impact Evaluation Activities	31
Table 3-2. Process and NTG Evaluation Activities	31
Table 3-3. Residential EE Program Participation and Reported Impacts	34
Table 3-4. Residential Impact Sample Targets and Completes	35
Table 3-5. Residential EE Program Gross Impact Results for Energy	36
Table 3-6. Residential EE Program Gross Impact Results for Demand.....	37
Table 3-7. Residential Energy Ratios	37
Table 3-8. Residential Demand Ratios.....	37
Table 3-9. Residential EE Program Net Impact Evaluation Results.....	41
Table 3-10. Residential EE Program HIM Results.....	41
Table 3-11. Residential EE Program PY14 and P4TD Savings Summary	42
Table 3-12. Residential EE Program Process Activities by Component	42
Table 3-13. Residential Rebates and Marketplace Sample Targets and Completes	43
Table 3-14. Residential Survey Approach	44
Table 3-15. Summary of Program Finances – Gross Verified.....	49
Table 3-16. Summary of Program Finances – Net Verified	50
Table 3-17. Summary of Residential EE Evaluation Recommendations.....	52
Table 3-18. Income-Eligible EE Program Participation and Reported Impacts	54
Table 3-19. Income-Eligible EE Program Gross Impact Results for Energy	55
Table 3-20. Income-Eligible EE Program Gross Impact Results for Demand	55
Table 3-21. Income-Eligible Energy Ratios	56
Table 3-22. Income-Eligible Demand Ratios	56
Table 3-23. Income-Eligible EE Program PY14 and P4TD Savings Summary	57
Table 3-24. Income-Eligible EE Program Process Activities by Component.....	57
Table 3-25. Income-Eligible Sample Targets and Completes	58
Table 3-26. Income-Eligible Survey Approach	58
Table 3-27. Summary of Program Finances – Gross Verified.....	62
Table 3-28. Summary of IE EE Evaluation Recommendations.....	64
Table 3-29. Residential HER Program Participation and Reported Impacts	65
Table 3-30. Residential HER Program Gross Impact Results for Energy	66
Table 3-31. Residential HER Program Gross Impact Results for Demand	66
Table 3-32. Residential HER Program PY15 and P4TD Savings Summary	67
Table 3-33. Summary of Program Finances – Gross Verified.....	67
Table 3-34. Income-Eligible HER Program Participation and Reported Impacts.....	69
Table 3-35. Income-Eligible HER Program Gross Impact Results for Energy.....	69
Table 3-36. Income-Eligible HER Program Gross Impact Results for Demand	70
Table 3-37. Income-Eligible HER Program PY15 and P4TD Savings Summary.....	71
Table 3-38. Summary of Program Finances – Gross Verified.....	71
Table 52. Summary of IE HER Evaluation Recommendations	72
Table 3-40. Non-Residential EE Program Participation and Reported Impacts	74
Table 3-41. Non-Residential Project Count by Evaluation Method	75
Table 3-42. Non-Residential EE Program Gross Impact Results for Energy	76
Table 3-43. Non-Residential EE Program Gross Impact Results for Demand	76
Table 3-44. Non-Residential Energy Ratios	76
Table 3-45. Non-Residential Demand Ratios	77
Table 3-46. Non-Residential Program NTG Survey Sample Targets and Completes	80

Table 3-47. Non-Residential EE Program Net Impact Evaluation Results	81
Table 3-48. Non-Residential EE Program PY15 and P4TD Savings Summary	81
Table 3-49. Non-Residential EE Program Process Activities by Component	82
Table 3-50. Non-Residential Sample Targets and Completes	82
Table 3-51. Non-Residential Survey Approach.....	83
Table 3-52. Summary of Program Finances – Gross Verified.....	87
Table 3-53. Summary of Program Finances – Net Verified	88
Table 3-54. Summary of Non-Residential EE Evaluation Recommendations	90
Table 4-1. PY15 Program and Portfolio Total Finances (\$1,000)	93
Table 4-2. P4TD Program and Portfolio Total Finances (\$1,000)	93
Table 4-3. EE&C Plan Expenditures by Cost-Recovery Category	94
Table A-1. PY15 Residential Multifamily Site Visit Summary	95
Table A-2. PY15 Non-Residential Site Visit Summary.....	95
Table B-1. HER Energy Regression Details (kWh/day)	99
Table B-2. HER Percentage Energy Savings	100
Table B-3. HER Active Recipient Households	101
Table B-4. HER Default Upstream Reduction Factors.....	102
Table B-5. HER Double-Counting Savings Adjustments	102
Table B-6. HER Persistence (MWh).....	103
Table B-7. HER First-Year Savings (MWh)	103
Table B-8. HER Demand Regression Details (kW)	105
Table B-9. HER Program Impacts Summary	106
Table C-1. Summary of Income-Eligible Carveout Energy Savings (MWh/Yr).....	107
Table D-1. Incremental Annual Energy Savings by Program and Component (MWh/Yr).....	108
Table D-2. Peak Demand Savings by Energy Efficiency Program and Component (MW/Yr). 108	
Table D-3. PY15 Gross TRC Ratios by Program (\$1,000) ¹	109
Table D-4. PY15 Net TRC Ratios by Program (\$1,000) ¹	109
Table D-5. P4TD Gross TRC Ratios by Program (\$1,000) ¹	110
Table D-6. P4TD Net TRC Ratios by Program (\$1,000) ¹	110
Table D-7. HIM NTG	111
Table D-8. Comparison of PY15 Expenditures with Phase IV EE&C Plan (\$1,000).....	111
Table D-9. Comparison of P4TD Expenditures to Phase IV EE&C Plan (\$1,000).....	112
Table D-10. Comparison of PY15 Actual Program Savings with EE&C Plan Projections	112
Table D-11. Comparison of P4TD Actual Program Savings with EE&C Plan Projections	112
Table E-1. Detailed Findings for Rebates and Marketplace.....	114
Table E-2. Rebates and Marketplace Sample Project Count.....	115
Table E-3. Intention Scoring for the Residential Rebates and Marketplace Component	117
Table E-4. Influence Ratings for Residential Rebate Programs.....	118
Table E-5. Influence Scoring for Residential Rebate Programs.....	119
Table E-6. Detailed Findings for Appliance Recycling	129
Table E-7. Residential New Construction Sample Project Count.....	131
Table E-8. Multifamily Sample Project Count	132
Table E-9. Detailed Findings for Single-Family (Income-Eligible)	134
Table G-1. Non-Residential Downstream Rebates Project Count by Evaluation Method.....	142
Table G-2. Non-Residential Midstream Rebates Project Count by Evaluation Method	145
Table G-3. Non-Residential New Construction Project Count by Evaluation Method.....	149
Table G-4. Intention Scoring for the Non-Residential New Construction Component	150
Table G-5. Influence Scoring for the Non-Residential New Construction Component	151
Table H-1. Implementation Tactic Pilot Programs	158

Acronyms

ASHP	Air Source Heat Pump
BAS	Building Automation System
C&I	Commercial and Industrial
CACS	Central Air Conditioner Switch
CADR	Clean Air Delivery Rate
CAP	Customer Assistance Program
CF	Coincidence Factor
CFL	Compact Fluorescent Lamp
CHP	Combined Heat and Power
CI	Confidence Interval
CSP	Conservation Service Provider, Curtailment Service Provider
CV	Coefficient of Variation
DLC	Direct Load Control
DR	Demand Response
DRA	Demand Response Aggregator
ECM	Energy Conservation Measure
EDC	Electric Distribution Company
EDT	Eastern Daylight Time
EE	Energy Efficiency
EE&C	Energy Efficiency and Conservation
EEMF	Energy Efficiency Marketing Firm
EISA	Energy Independence and Security Act of 2007
EM&V	Evaluation, Measurement, and Verification
EPA	US Environmental Protection Agency
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, and HVAC
LDV	Lagged Dependent Variable
LED	Light-Emitting Diode
LIURP	Low Income Usage Reduction Program
M&V	Measurement and Verification
MF	Multifamily
MMBtu	Million British Thermal Units
MSRP	Manufacturer Suggested Retail Price
MW	Megawatt
MWh	Megawatt-Hour
MWh/yr	Megawatt-Hour per Year
NPV	Net Present Value
NTG	Net-to-Gross
NTGR	Net-to-Gross Ratio
O&M	Operations and Maintenance
P3TD	Phase III to Date
P4TD	Phase IV to Date
PA PUC	Pennsylvania Public Utility Commission
PILD	PECO Instant Lighting Discounts
PSA	Phase IV to Date Preliminary Savings Achieved; equal to VTD+PYRTD
PSA+CO	PSA Savings plus Carryover from Phase III
PSD	Performance Systems Development
PUF	Part-Use Factor
PY	Program Year—e.g., PY8, from June 1, 2016, to May 31, 2017
PYRTD	Program Year Reported to Date
PYTD	Program Year to Date
PYVTD	Program Year Verified to Date
QC	Quality Control
RCx	Retrocommissioning
RTD	Phase IV to Date Reported Gross Savings
RTO	Regional Transmission Organization
RUL	Remaining Useful Lifetime
SEER	Seasonal Energy Efficiency Ratio
SF	Single-Family
SIDS	Smart Ideas Data System
SKU	Stock Keeping Unit
SO	Spillover
SSMVP	Site-Specific Measurement and Verification Plan

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

Types of Savings

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

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

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

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

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

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

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

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

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

Annual Savings: Energy and demand savings expressed on an annual basis, or the amount of energy and/or peak demand an EE&C measure or program can be expected to save over the course of a typical year. Annualized savings are noted as MWh/year or MW/year. The Pennsylvania 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

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/>.

impact evaluation is complete plus the reported gross savings from the current program year (PYTD).

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

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

peco
AN EXELON COMPANY

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).

PY15



367,245 MWh/yr
claimed of electric energy savings, or 103% of target



70.11 MW/yr
claimed of peak demand savings, or 110% of target



\$104,426,931
spent in the program year

Phase IV



1,018,508 MWh/yr
claimed of electric energy savings (including Phase III carryover), or 73% of target



167.88 MW/yr
claimed of peak demand savings, or 65% of target



\$241,546,120
spent in the phase to date

Participation



Benefit-Cost Ratios



1.66
Residential



1.17
Portfolio TRC



1.08
Non-Residential

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

1. Introduction

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

Implementation of Phase IV of the Act 129 programs began on June 1, 2021. This report documents the progress and effectiveness of the Phase IV EE&C accomplishments for PECO in Program Year 15 (PY15), which spans June 1, 2023, through May 31, 2024, 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 PY15. 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) 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 PY15 to examine the design, administration, implementation, and market response to the EE&C program. This report presents the key findings and recommendations identified by evaluation activities and documents any changes to EE&C program delivery based on the recommendations.

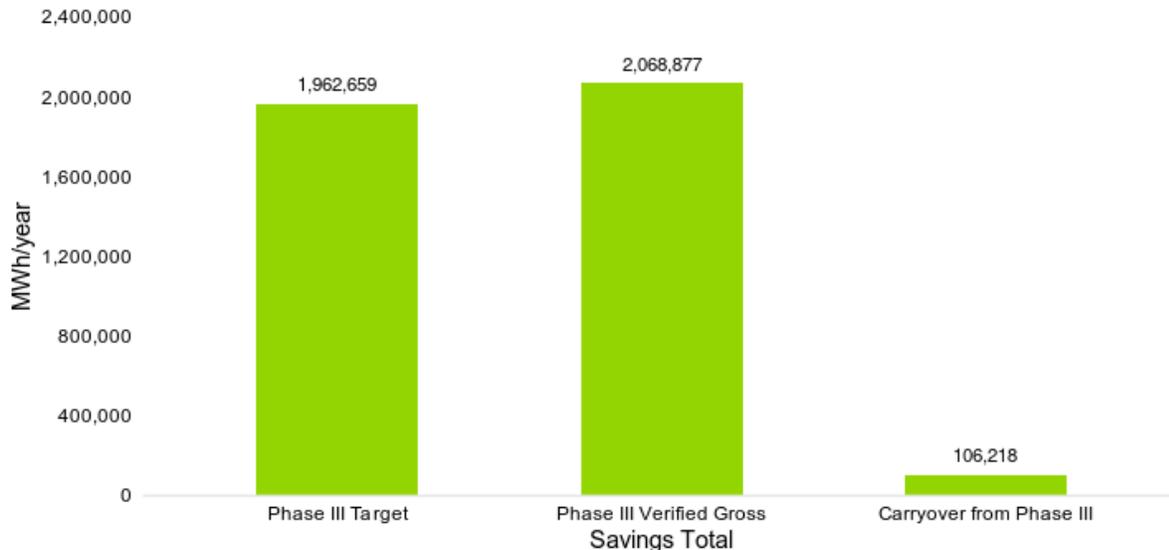
Guidehouse worked with the statewide evaluator (SWE) throughout the report's development to address questions related to compliance as they arose and appreciates the SWE's collaboration to confirm this final report is accurate and agreeable to relevant parties.

2. Summary of Achievements

2.1 Carryover Savings from Phase III of Act 129

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

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



Source: SWE Phase III Report²

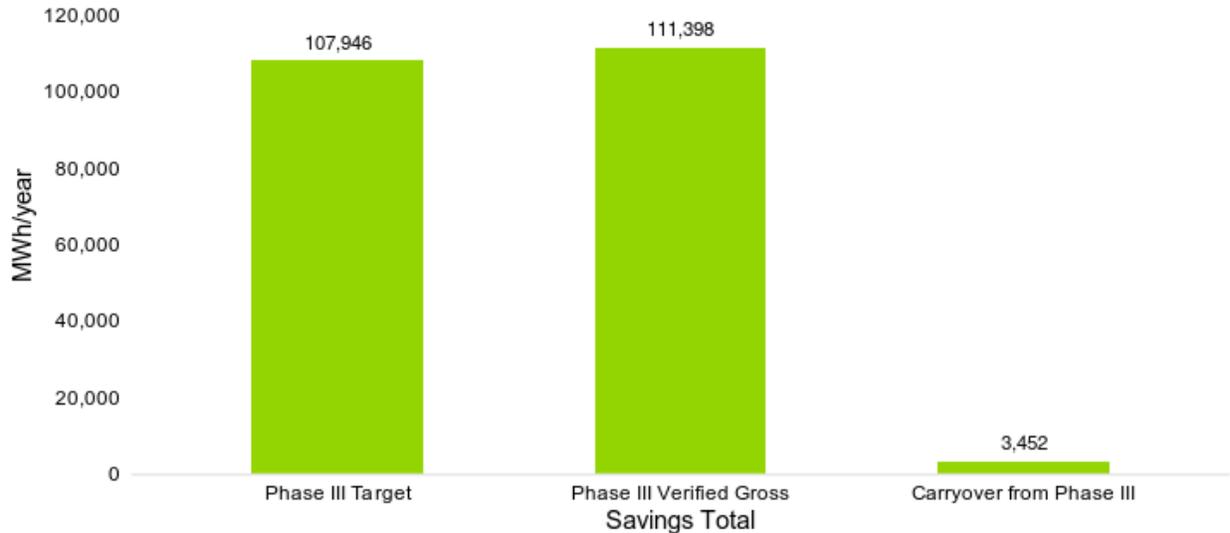
The Commission’s Phase IV Implementation Order³ also allowed EDCs to carry over savings in excess of the Phase III income-eligible (IE) savings goal.⁴ Figure 2-2 shows the calculation of carryover savings for the IE customer segment.

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

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

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

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



Source: SWE Phase III Report⁵

2.2 Phase IV Energy Efficiency Achievements to Date

Phase IV energy savings targets (MWh) were established at the meter level and peak demand reduction targets (MW) were set at the system level. Accordingly, the MWh totals in this report are presented at the meter level, while peak demand savings are adjusted for transmission and distribution (T&D) losses to reflect system-level savings. Since the beginning of PY15 on June 1, 2023, PECO has claimed:

- 375,516 MWh/yr of reported gross electric energy savings (PYRTD)
- 67.14 MW/yr of reported gross peak demand savings (PYRTD)
- 367,245 MWh/yr of verified gross electric energy savings (PYVTD)
- 70.11 MW/yr of verified gross peak demand savings (PYVTD)
- 3,192 MWh/yr of unverified gross electric energy savings
- 0.01 MW/yr of unverified gross peak demand savings

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

- 916,557 MWh/yr of reported gross electric energy savings (RTD)
- 165.19 MW/yr of reported gross peak demand savings (RTD)

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

- 912,290 MWh/yr of verified gross electric energy savings (VTD)
- 167.88 MW/yr of verified gross peak demand savings (VTD)
 - This represents 65.6% of the May 31, 2026, peak demand savings compliance target of 256 MW/yr.

Including carryover savings from Phase III, PECO has achieved:

- 1,018,508 MWh/yr of VTD + portfolio-level carryover energy savings – This represents 73.8% of the May 31, 2026, energy savings compliance target of 1,380,837 MWh/yr.

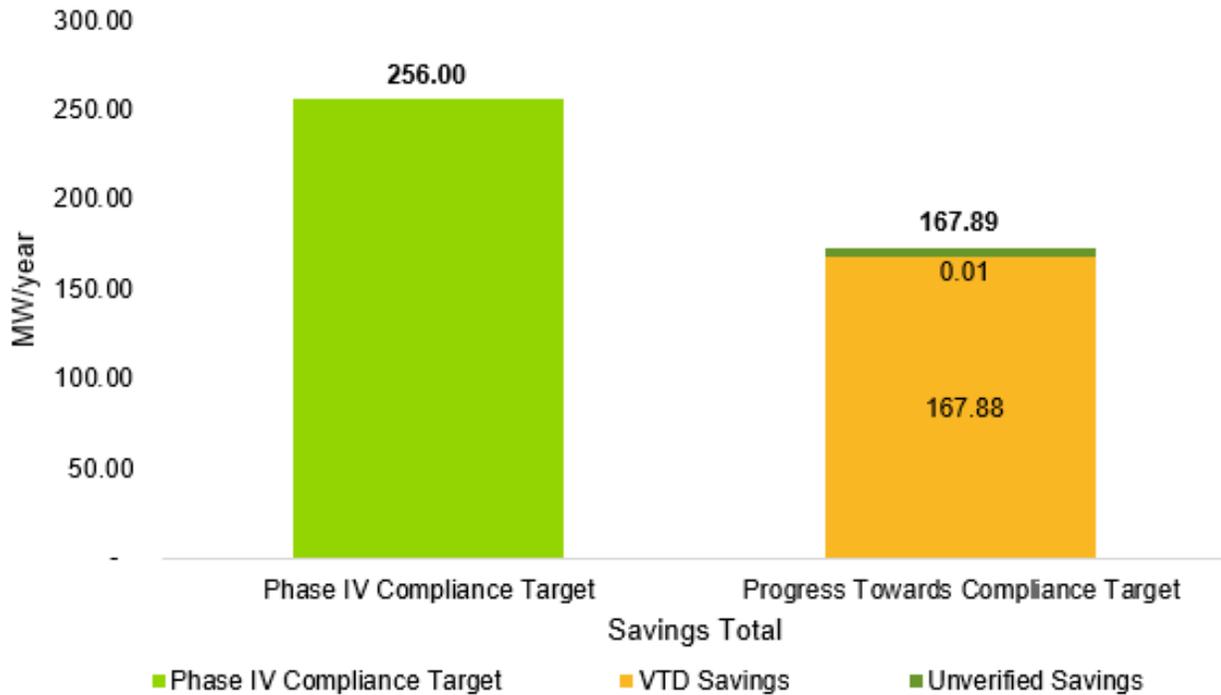
Figure 2-3 summarizes PECO’s progress toward the Phase IV MWh portfolio compliance target and Figure 2-4 summarizes progress toward the Phase IV MW portfolio compliance target.

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)



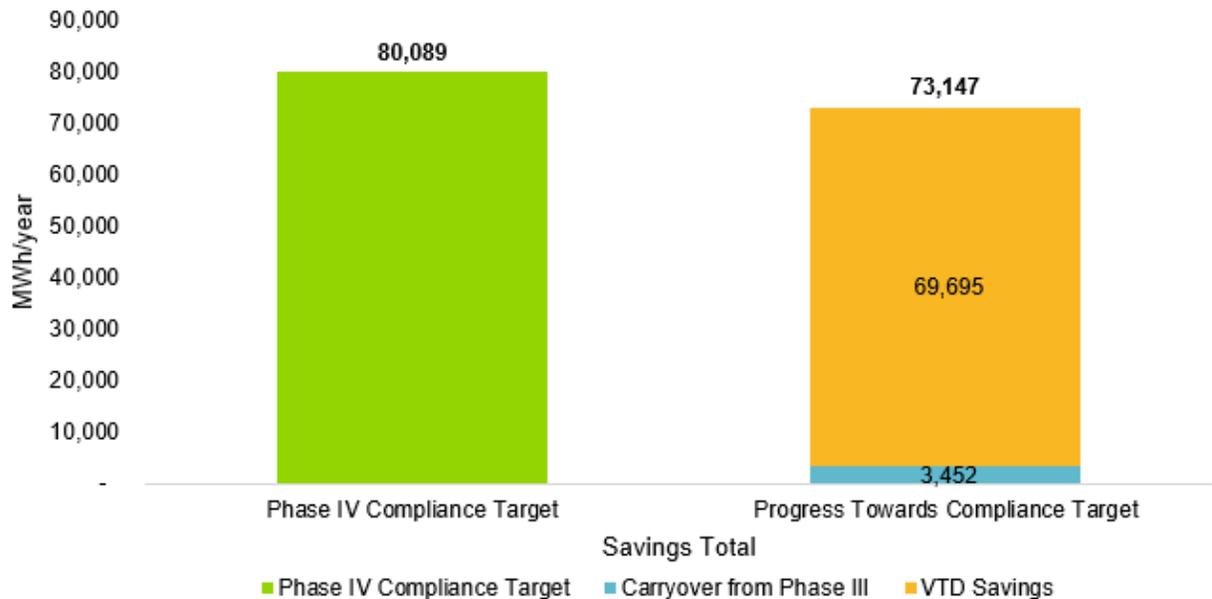
Source: Guidehouse analysis

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 73 EE&C measures to its residential and non-residential customer classes. There are 24 measures available to the IE customer segment at no cost to the customer. This represents 27.3% of the total measures offered in the EE&C Plan⁶ 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 91% of the Phase IV IE energy savings target.

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

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



Source: Guidehouse analysis

2.2.1 Phase IV Performance, Multifamily Housing

PECO has achieved 6,875 MWh/yr of verified gross electric energy savings (PYVTD) from multifamily housing. This includes 1,303 MWh/yr of verified gross electric savings through the Residential Program Multifamily component; 1,660 MWh/yr of verified gross electric energy savings (PYVTD) through the IE Program Multifamily component; and 3,912 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 PY15. 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. PY15 Summary Statistics by Customer Segment

Parameter	Residential (Non-IE)	Income-Eligible ⁴	Small C&I (Non-GNI)	Large C&I (Non-GNI)	Small C&I (GNI) ⁴	Large C&I (GNI) ⁴	Municipal Lighting	Total
Number of participants ¹	277,673	10,316	7,160	1,074	810	334	15	297,382
PYVTD MWh/yr ³	61,090	24,573	164,988	73,978	19,040	23,088	488	367,245

Parameter	Residential (Non-IE)	Income-Eligible ⁴	Small C&I (Non-GNI)	Large C&I (Non-GNI)	Small C&I (GNI) ⁴	Large C&I (GNI) ⁴	Municipal Lighting	Total
PYVTD MW/yr (system) ³	10.22	2.05	35.99	13.18	4.33	4.34	-	70.11
Incentives ² (\$1000)	5,999	8,883	34,558	11,230	5,504	3,911	104	70,189

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

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

3 For the Non-Residential Program, 3,192 MWh and 0.01 MW of reported savings are unverified in PY15. These unverified savings are included in reported savings values and excluded from verified savings values.

4 The savings, spending, and participation values for the IE and GNI segments have been removed from the parent sector.

Source: Guidehouse analysis

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

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

Parameter	Residential (Non-IE)	Income-Eligible ⁴	Small C&I (Non-GNI)	Large C&I (Non-GNI)	Small C&I (GNI) ⁴	Large C&I (GNI) ⁴	Municipal Lighting	Total
Number of participants ¹	685,559	28,405	13,559	2,943	1,581	720	45	732,812
VTD MWh/yr ³	210,128	58,354	314,493	245,687	35,623	44,804	3,200	912,290
VTD MW/yr (system) ³	37.59	5.87	66.49	41.62	7.74	8.57	0.01	167.88
Incentives ² (\$1000)	19,111	20,770	61,581	30,609	7,495	5,930	617	146,113

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

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

3 For the Non-Residential Program, 3,192 MWh and 0.01 MW of reported savings are unverified in PY15. These unverified savings are included in reported savings values and excluded from verified savings values.

4 The savings, spending, and participation values for the IE and GNI segments have been removed from the parent sector.

Source: Guidehouse analysis

2.4 Summary of Participation by Program

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

- For Residential New Construction, participation is defined as the count of unique job identifiers by program year.
- 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 Point of Purchase delivery channel and Giveaways through the Residential In-Home Assessment, Income-Eligible Single-Family, Multifamily, and Multifamily Income-Eligible components. Participation for those delivery channels and components is calculated as the sum of rebated measures. These are summarized separately in Table 2-4.

Table 2-3 provides the current participation for PY15 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 (excluding Point of Purchase)	15,089	45,451
Appliance Recycling	1,249	19,886
In-Home Assessment (excluding giveaways)	3,058	10,059
New Construction	2,036	5,900
Multifamily (excluding giveaways)	1,468	1,715
Multifamily Income-Eligible (excluding giveaways)	1,181	14,284
Residential Total	24,081	97,295
Single-Family (excluding giveaways)	9,222	23,630
Appliance Recycling	753	4,389
Income-Eligible Total	9,975	28,019
Residential HER	214,617	550,187
Income-Eligible HER	39,429	39,429
Downstream Rebates ¹	777	2,386
Midstream Rebates	7,083	13,360
Small Business Direct Install	1,350	1,983
New Construction	70	153
Non-Residential Total	9,280	17,882
Portfolio Total	297,382	732,812

¹ Includes pilot participants.

Source: Guidehouse analysis

Table 2-4. Point of Purchase and Giveaway Measures

Program and Component	PYTD Participation	P4TD Participation
Rebates and Marketplace - Point of Purchase	453,982	4,634,242
Income-Eligible Single-Family - Giveaways	323,214	663,570
Residential In-Home Assessment - Giveaways	617,816	714,425
Residential Multifamily - Giveaways	-	18,858
Residential Multifamily Income-Eligible - Giveaways	-	47,265

Program and Component	PYTD Participation	P4TD Participation
Point of Purchase and Giveaway Total	1,395,012	6,078,360

Participation is calculated as the sum of rebated measure units.

Source: Guidehouse analysis

2.5 Summary of Impact Evaluation Results

During PY15, Guidehouse completed impact evaluations for several program components in the portfolio. Table 2-5 summarizes the realization rates and net-to-gross (NTG) ratios (NTGRs) by evaluation component. Guidehouse outlines the process to arrive at the below realization rates in Section 3.

Table 2-5. Impact Evaluation Results Summary

Program and Component	Energy Realization Rate	Demand Realization Rate	NTGR
Rebates and Marketplace	0.77	0.99	0.85
Appliance Recycling	1.17	1.14	0.53
In-Home Assessment	1.00	0.96	0.93
New Construction	1.00	0.37	0.55
Multifamily	0.96	0.95	0.82
Multifamily Income-Eligible	0.92	0.92	1.00
Residential Total	0.85	0.89	0.84
Single-Family	1.10	1.03	1.00
Appliance Recycling	1.11	1.07	1.00
Income-Eligible Total	1.10	1.03	1.00
Residential HER	0.99	1.65	1.00
Income-Eligible HER	2.87	9.43	1.00
Downstream Rebates	0.93	0.99	0.72
Midstream Rebates	1.04	1.05	0.69
Small Business Direct Install	0.97	0.93	0.90
New Construction	0.99	0.97	0.30
Non-Residential Total	0.99	1.02	0.70
Portfolio Total	0.98	1.04	0.75

Source: Guidehouse analysis

2.6 Summary of Energy Impacts by Program

Act 129 compliance targets are based on annualized savings estimates (MWh/year). Each program year, the annual savings achieved by EE&C program activity is recorded as incremental annual, or first-year, savings and added to an EDC's progress toward compliance. Incremental annual savings estimates are presented in Section 2.6.1. Lifetime energy savings incorporate the effective useful life (EUL) of installed measures and estimate the total energy savings associated with EE&C program activity. Lifetime savings are used in the TRC test by program participants when assessing the economics of upgrades and by the SWE when

calculating the emissions benefits of Act 129 programs. Section 2.6.2 presents the lifetime energy savings by program.

2.6.1 Incremental Annual Energy Savings by Program

Table 2-6 presents a summary of the PY15 and P4TD energy savings by program. The energy impacts in this report are presented at the meter level and do not reflect adjustments for T&D losses. The verified gross savings are adjusted by the energy realization rate and the verified net savings are adjusted by both the realization rate and NTGR.

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

Program	PYRTD (MWh/yr)	PYVTD Gross (MWh/yr)	PYVTD Net (MWh/yr)	RTD (MWh/yr)	VTD Gross (MWh/yr)	VTD Net (MWh/yr)
Residential	48,613	41,211	34,506	149,137	138,641	99,172
Residential Income-Eligible	22,133	24,407	24,407	59,471	58,002	58,002
Residential HER	21,810	21,546	21,546	79,647	79,148	79,148
Income-Eligible HER	(83)	(237)	(237)	1,957	1,667	1,667
Non-Residential ¹	283,043	280,317	195,715	626,346	634,833	433,573
Portfolio Total	375,516	367,245	275,936	916,557	912,290	671,561

¹ For the Non-Residential Program, 3,192 MWh of reported savings are unverified in PY15. These unverified savings are included in reported savings values and excluded from verified savings values.

Source: Guidehouse analysis

The previously reported VTD savings from prior years for the following programs have changed since the PY14 final annual report was submitted:

- **Residential:** SWE audit activities recommended an adjustment of -256 MWh/year to the PY14 gross verified savings primarily due to adjustments to assumptions around multifamily kit items.
- **Income-Eligible:** SWE audit activities recommended an adjustment of 64 MWh/year to the PY14 gross verified savings as a result of assuming a <1 in-service-rate for direct install items.

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 PY15 ranges from 9-12 years while the home energy report (HER) programs' EULs are between 1 and 3 years. The weighted average portfolio EUL is ~10 years.

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

Program	PYVTD Gross Lifetime (MWh)	PYVTD Net Lifetime (MWh)	VTD Gross Lifetime (MWh)	VTD Net Lifetime (MWh)
Residential	535,160	448,084	1,712,917	1,253,035
Residential Income-Eligible	261,549	261,549	642,583	642,583
Residential HER	86,182	86,182	210,133	210,133

Program	PYVTD Gross Lifetime (MWh)	PYVTD Net Lifetime (MWh)	VTD Gross Lifetime (MWh)	VTD Net Lifetime (MWh)
Income-Eligible HER	730	730	4,231	4,231
Non-Residential ¹	2,541,664	1,774,562	6,157,126	4,190,386
Portfolio Total	3,425,286	2,571,108	8,726,991	6,300,369

¹ For the Non-Residential Program, 3,192 MWh of reported savings are unverified in PY15. These unverified savings are included in reported savings values and excluded from verified savings values.

Source: Guidehouse analysis

The previously reported VTD lifetime savings from prior years, for the following programs, have changed since the PY14 final annual report was submitted:

- **Residential:** SWE audit activities recommended an adjustment of -256 MWh/year to the PY14 gross verified savings primarily due to adjustments to lighting wattage values. This corresponds to an adjustment of -2,473 MWh to the VTD gross lifetime savings and -2,467 MWh to the VTD net lifetime savings.
- **Income-Eligible:** SWE audit activities recommended an adjustment of 64 MWh/year to the PY14 gross verified savings as a result of adjustments to a few individual measures. This corresponds to an adjustment of -3,272 MWh to both the VTD gross and net lifetime savings. The lifetime savings adjustment is negative despite positive PY14 savings due to differing measure life values for adjusted measures.

2.7 Summary of Peak Demand Reduction Impacts by Program

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

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

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

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

Program	PYRTD (MW/yr) (system)	PYVTD Gross (MW/yr) (system)	PYVTD Net (MW/yr) (system)	RTD (MW/yr)	VTD Gross (MW/yr)	VTD Net (MW/yr)
Residential	5.34	4.74	3.63	23.33	22.15	15.20
Residential Income-Eligible	1.98	2.04	2.04	6.14	5.82	5.82
Residential HER	3.55	5.85	5.85	12.96	16.79	16.79
Income-Eligible HER	(0.01)	(0.13)	(0.13)	0.32	(0.08)	(0.08)
Non-Residential ¹	56.28	57.61	40.51	122.45	123.21	84.86
Portfolio Total	67.14	70.11	51.90	165.19	167.88	122.58

¹ For the Non-Residential Program, 0.01 MW of reported savings are unverified in PY15. These unverified savings are included in reported savings values and excluded from verified savings values.

Source: Guidehouse analysis

There are no changes to previously reported VTD peak demand savings from prior years since the PY14 final annual report was submitted.

2.7.1 Peak Demand Savings Nominated to PJM Forward Capacity Market

For Phase IV of Act 129, EDCs are expected to retain the capacity rights to Act 129 projects and nominate a portion of the resources acquired to PJM Forward Capacity Market (FCM). If the resources clear, proceeds flow back to the rate class that generated the Act 129 savings to offset cost recovery via riders.

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

PECO hired a turnkey service provider to handle the strategy and details for bidding into PJM’s FCM.⁷ This approach balances the benefits to PECO customers with the risk posed to customers by the potential for deficiency charges from PJM. All revenue, net of those paid to the provider, will be returned to customers as an offset to plan costs. Table 2-9 summarizes PECO’s plans for wholesale recognition of Phase IV peak demand savings by Act 129 program year and PJM delivery year.⁸

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	23.6 to 24.9		24.9	23.6	23.6	23.9		
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	98.7 to 147	50.1	75	88.7 to 117.7	73.8 to 120.8	48.9 to 95.9	25 to 72	10 to 28

DY = Demand Year for PJM

Source: Guidehouse analysis

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

⁸ The future of EE Resources in the PJM FCM is uncertain. In September 2024, PJM filed a proposal with FERC to end payments to EE Resource providers and prevent future participation in auctions starting with the Base Residual Auction (BRA) for the 2026/2027 Delivery Year (DY). A final ruling from FERC is pending.

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 PY15 and to date in Phase IV.

Table 2-10. Fuel Switching Summary

Metric	PY15	P4TD
Fuel Switching Measures Offered	CHP	CHP
Fuel Switching Measures Implemented	1	2
VTD Gross Energy Savings Achieved via Fuel Switching (MWh/yr)	548	58,418
P4TD Gross Increased Fossil Fuel Consumption Due to Fuel Switching Measures (MMBtu/yr)	2,336	231,787
P4TD Incentive Payments for Fuel Switching Measures (\$1,000)	\$55	\$2,055

Source: Guidehouse analysis

2.9 Summary of Cost-Effectiveness Results

Table 2-11 presents a detailed breakdown of portfolio finances and cost-effectiveness. TRC benefits in Table 2-11 were calculated using gross verified impacts. Net present value (NPV) PY15 costs and benefits are expressed in 2023 dollars. NPV costs and benefits for Phase IV values are expressed in 2021 dollars.

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

Row	Cost Category*	PYTD (\$1,000)		P4TD (\$1,000)	
1	Incremental Measure Costs (IMCs)	\$106,847		\$375,678	
2	Rebates to Participants and Trade Allies	\$23,914		\$65,885	
3	Upstream/Midstream Incentives	\$33,058		\$59,197	
4	Material Cost for Self-Install Programs (EE&C Kits)	\$2,509		\$7,167	
5	Direct Installation Program Materials and Labor	\$10,707		\$15,658	
6	Participant Costs (row 1 minus the sum of rows 2-5)	\$36,657		\$227,772	
		EDC	CSP	EDC	CSP
7	Program Design	\$0	\$0	\$0	\$0
8	Administration and Management	\$27,136	\$0	\$74,485	\$0
9	Marketing	\$3,924	\$0	\$13,209	\$0
10	Program Delivery	\$0	\$0	\$0	\$0
11	EDC Evaluation Costs	\$3,177		\$0	
12	SWE Audit Costs	\$0		\$0	
13	Program Overhead Costs (sum of rows 7-12)	\$34,238		\$95,434	
14	Total NPV TRC Costs (sum of rows 1 and 13)	\$141,084		\$471,112	
15	Total NPV Lifetime Electric Energy Benefits	\$101,169		\$249,396	
16	Total NPV Lifetime Electric Capacity Benefits	\$90,142		\$211,795	
17	Total NPV Lifetime Operations and Maintenance (O&M) Benefits	\$18,982		\$60,346	
18	Total NPV Lifetime Fossil Fuel Impacts	-\$9,992		-\$32,337	
19	Total NPV Lifetime Water Impacts	\$24,408		\$63,943	

Row	Cost Category*	PYTD (\$1,000)	P4TD (\$1,000)
20	Total NPV TRC Benefits (sum of rows 15-19)	\$224,709	\$553,143
21	TRC Benefit-Cost Ratio (row 20 divided by row 14)	1.59	1.17

* 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 PY15 expenditures compared with the budget estimates set forth in the EE&C Plan for PY15 and P4TD. PY15 values are presented in 2023 dollars and P4TD values are presented in 2021 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)
PY15 Portfolio	\$96,930	\$104,427	1.08
P4TD	\$256,390	\$241,546	0.94

Source: Guidehouse analysis

Table 2-13 compares PY15 and P4TD verified gross program savings with the energy savings projections set forth in the EE&C Plan. Program-level comparisons of expenditures to plans are presented in 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)
PY15 Portfolio MWh	355,343	367,245	1.03
P4TD MWh	936,948	912,290	0.97
PY15 Portfolio MW	63.9	70.11	1.10
P4TD MW	173.8	167.88	0.97

For the Non-Residential Program, 3,192 MWh and 0.01 MW of reported savings are unverified in PY15. These unverified savings are included in reported savings values and excluded from verified savings values.

Source: Guidehouse analysis

The following list briefly discusses specific reasons verified savings exceeded or fell short of projected savings in PY15 as well as contextual market factors that each program faced:

- The Residential EE Program achieved 85% of EE&C Plan projections for PY15 for energy savings and 73% of EE&C Plan projections for PY15 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 147% of EE&C Plan projections for PY15 for energy savings and 78% of EE&C Plan projections for PY15 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 3.1 of this report.
- The Residential HER Program achieved 97% of EE&C Plan projections for PY15 for energy savings and 133% of EE&C Plan projections for PY15 for demand savings. Differences between verified savings and EE&C Plan projections for PY15 are due to modeled evaluation findings, discussed in Section 3.3 of this report.
- The Income-Eligible HER Program achieved negative savings in PY15 due to the nature of the model-based evaluation approach for this program. Differences between verified savings and EE&C Plan projections for PY15 are discussed in Section 3.4 of this report.
- The Non-Residential EE Program achieved 105% of EE&C Plan projections for PY15 energy savings and 116% of EE&C Plan projections for demand 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.

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

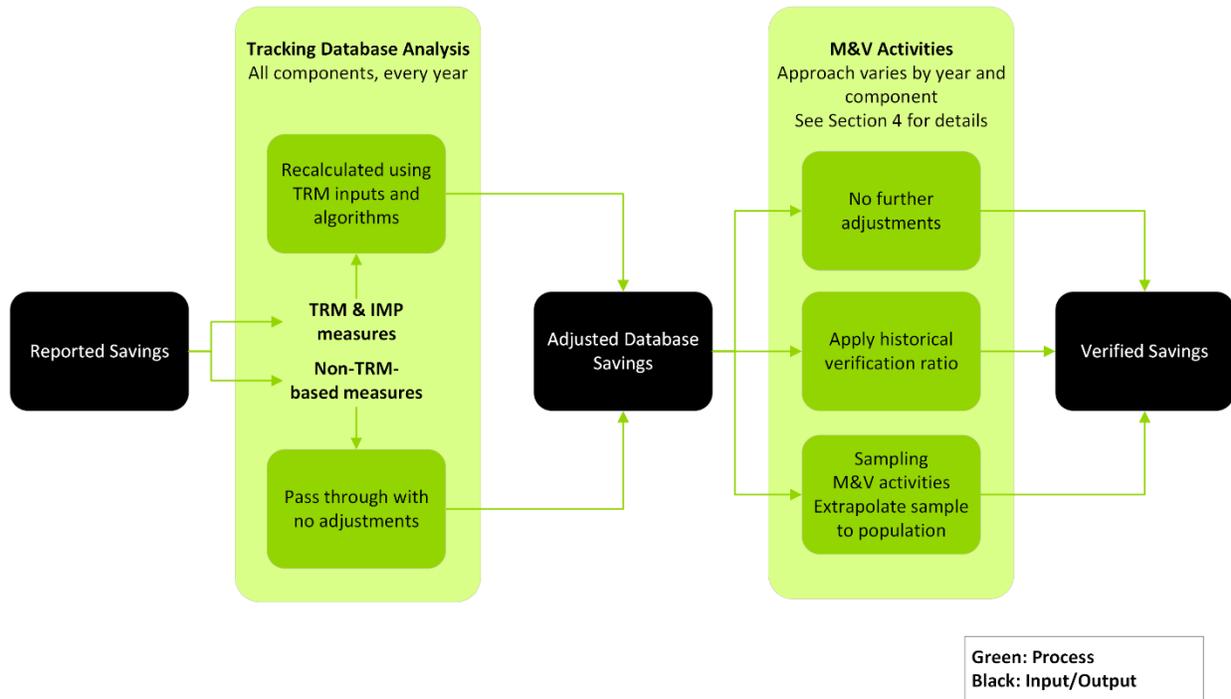
2.11 Findings and Recommendations

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 PY15 along with the outcomes of those activities. Guidehouse used a two-part approach to determine verified gross impacts as described in the Evaluation Plan⁹ and illustrated in Figure 3-1. In the first part, Guidehouse conducted a tracking database analysis for each program component to determine the adjusted database savings.

Figure 3-1. PECO Phase IV Verified Savings Pathways



Note: This graphic does not show unverified savings. PY15 unverified savings do not go through the PY15 analysis activities; they will be evaluated in PY16 and are reported separately throughout the report.

Source: Guidehouse Evaluation Plan

In the second part, Guidehouse determined the verified savings following the PY15 evaluation activities shown in **Error! Not a valid bookmark self-reference.**, where “X” denotes M&V activities, and a blank value denotes application of a historical verification ratio. The relative impact of each step in the two-part process was characterized by calculating the ratio between each output. The tracking database ratio (TDR) is defined as the adjusted database savings divided by the reported savings. The verification ratio is defined as the verified savings divided by the adjusted database savings. A ratio close to one indicates that step in the process had minimal impact on the gross savings. A ratio further from one indicates that step had a larger impact on the gross savings.

⁹ Guidehouse, *Phase IV Evaluation Plan, Energy Efficiency and Conservation Portfolio*, revised November 8, 2023.

Table 3-1. Gross Impact Evaluation Activities

Program	Component	PY13	PY14	PY15	PY16	PY17
Residential	Rebates and Marketplace	X	X ¹	X ²		
Residential	Appliance Recycling		X		X	
Residential	In-Home Assessment		X		X	
Residential	New Construction	X		X		
Residential	Multifamily		X	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 Rebates	X	X	X ³	X ³	X
Non-Residential	Midstream Rebates	X	X	X	X	X
Non-Residential	New Construction	X		X		X
Non-Residential	Small Business Direct Install		X		X	

Note: “X” denotes M&V activities. A blank value denotes application of a historical verification ratio except for upstream lighting, which had no further adjustments.

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

2 Guidehouse conducted an intercept survey (based on QR codes scanned in-store by participants) for spray foam measures, which are not fully deemed in the TRM in PY15 to verify savings.

3 Guidehouse reviewed reported projects for RCx projects that use IPMVP Option C to assess their implementation date. IPMVP Option C projects lacking 12 months of post-measure data at the time of the evaluation were classified as “unverified savings” during that year, to be evaluated and verified the following program year.

Source: *Guidehouse Evaluation Plan*¹⁰

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 both process and NTG evaluation activities, and a blank value denotes no specific research was undertaken in PY15.

Table 3-2. Process and NTG Evaluation Activities

Program	Component	PY13	PY14	PY15	PY16	PY17
Residential	Rebates and Marketplace		X	X	X	NTG ¹

¹⁰ Guidehouse, *Phase IV Evaluation Plan*.

¹¹ Guidehouse, *Phase IV Evaluation Plan*.

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

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

1 Guidehouse will perform an NTG evaluation for select high impact measures (HIMs) through customer surveys.

2 Guidehouse did not conduct process and NTG activities due to lack of participation in the Midstream Rebates component. The team will reevaluate Midstream Rebates participation and consider conducting process and NTG activities in PY16 instead of PY17.

3 Guidehouse will continue the process and NTG survey efforts into PY16 in an effort to increase the number of responses to the survey and to gather additional process feedback about the New Construction component.

Source: *Guidehouse Evaluation Plan*¹²

¹² Guidehouse, *Phase IV Evaluation Plan*.

3.1 Residential EE Program

The Residential EE Program offers customers in single-family and multifamily buildings opportunities to save energy across their electric end uses. The Residential Program includes five components, with some components having multiple pathways to participate. The Residential EE Program is designed to serve customers who have a household income greater than 150% of the federal poverty level (FPL), also referred to as market-rate customers.¹³ The Appliance Recycling and Multifamily components serve both the Residential and Income-Eligible EE programs.

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

- **Rebates and Marketplace:** The Rebates and Marketplace component includes customer instant discounts and rebates for HVAC, appliances, and energy-saving devices. There are multiple delivery pathways to receive product rebates: Downstream, Marketplace, and Point of Purchase. CLEARResult implements the Rebates and Marketplace component.
- **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. ARCA implemented the Appliance Recycling component. However, ARCA was unable to fulfill their obligations early in the program year, which resulted in the program being put on hold indefinitely.
- **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). CLEARResult implements the In-Home Assessment (market-rate) component.

All In-Home Assessment component participants receive an assessment of their home's energy performance and direct installation of basic efficiency measures (e.g., LED lighting, water conservation devices, hot water pipe insulation, smart strips). A subset of eligible participants may opt in for additional In-Home Assessment instant rebates for more comprehensive measures (such as insulation, air sealing, and HVAC services).

- **New Construction:** The Residential New Construction component supports the construction of more comfortable, durable, and energy efficient homes compared with those simply built to code. This component works with Home Energy Rating System raters and builders to create more energy efficient homes during the design and construction phases. PSD implements the New Construction component.
- **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 common areas. The component serves buildings with market-rate customers, IE customers, and a mix of residential and commercial customer types. CMC implements the Multifamily component for both the residential and IE

¹³ The Residential EE programs are designed to serve customers who have a household income greater than 150% of the FPL, also referred to as market-rate customers. However, customers who fall under the 150% FPL, also known as Income-Eligible, are not excluded from participating in the residential programs as some programs (such as the online marketplace) are open to all customers.

segments. The IE and market-rate services are delivered consistently across sectors, although incentives may vary. Verifying, sampling, and reporting program savings will differentiate between and allocate savings to either the residential or IE customer segment accordingly.

Program participants receive an assessment of their building’s energy performance and direct installation of basic efficiency measures (e.g., LED lighting, water conservation devices, hot water pipe insulation, smart strips). A subset of participants may opt in for additional rebates of more comprehensive measures (such as insulation and air sealing).

3.1.1 Participation and Reported Savings by Customer Segment

Table 3-3 presents the participation counts, reported energy and demand savings, and incentive payments for the Residential EE Program in PY15 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
PY15 # Participants ²	23,627	341	101	12	24,081
PYRTD MWh/yr	47,001	119	1,320	172	48,613
PYRTD MW/yr	5.06	0.01	0.24	0.03	5.34
PY15 Incentives (\$1,000)	5,999	59	790	22	6,871

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 Plan¹⁴ for PY15. The Residential EE Program gross impact evaluation included a comprehensive tracking database analysis of all TRM-based and interim measure protocols (IMPs)-based measures to confirm that reported savings align with TRM and IMP standards, including relevant PY15 codes and standards updates. Guidehouse reviewed all measures within the Residential EE Program. Guidehouse adjusted the reported savings based on discrepancies identified in the tracking database analysis. This results in adjusted database savings and the TDR.

Additionally, for the Rebates and Marketplace, Multifamily, and New Construction components, in PY15, 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 147 customer responses for ENERGY STAR Certified Connected Thermostats, Advanced Power Strips, Air Purifiers and Dehumidifiers, Air Conditioners and Heat Pumps, Central HVAC Fans, Refrigerators and Freezers, Clothes Washers and Dryers, Heat Pump Water Heaters, Variable Speed Pool Pumps, and Other measures. This includes 13 customers surveyed to estimate savings for spray foam.

¹⁴ Guidehouse, *Phase IV Evaluation Plan*.

Spray Foam measures are incentivized through a retailer Point of Purchase program. Guidehouse set up survey QR codes at retail locations for spray foam purchasers. Guidehouse then surveyed purchasers who opted into the survey roughly 4 weeks after their purchase to allow time for installation. The survey collected information about if, how, and where the cans were used. Guidehouse used the survey results in conjunction with SWE guidance¹⁵ to estimate the average savings achieved per can sold. Purchasers who provided their contact information through the in-store QR code were entered in a monthly sweepstakes for a \$50 electronic gift card (e-gift card) through the Tango platform. Customers that completed the follow-up survey were provided with a \$20 e-gift card through the Tango platform.

- **New Construction:** The evaluation team conducted an engineering desk review for a sample of 21 projects in PY15.
- **Multifamily:** The evaluation team conducted both onsite verification and engineering desk review verification activities for a sample of eight Residential buildings and 10 IE buildings in PY15. The evaluation team verified the installation of measures reported in the tracking database. Education measures were evaluated in PY14 and were not reevaluated in PY15.

All samples were designed and implemented to meet the targets set in Guidehouse’s sampling design memos.¹⁶ Table 3-4 outlines the impact survey sample targets and completes. Survey completes are defined as a survey where the participant successfully completed the entire survey through to the end. Additional details of the impact evaluation completed in PY15 can be found in 4.2Appendix E. Details on the survey activities, approach, and incentives for the Rebates and Marketplace Downstream and Marketplace surveys can be found in Appendix 4.2E.1.1.

Table 3-4. Residential Impact Sample Targets and Completes

Component	Stratum	Number Contacted	Target Completes	Actual Completes	Response Rate	Percentage of Target Achieved
Rebates and Marketplace-Downstream	Central A/C & Heat Pumps ¹	98	9	8	8%	144%
	Ductless Heat Pumps ¹	37		5	14%	
	Furnace Fans	118	6	10	8%	167%
	Purifiers and Dehumidifiers	106	9	14	13%	156%
	Heat Pump Water Heaters	87	5	10	11%	200%
	Variable Speed Pool Pumps	93	5	7	8%	140%
	Clothes Washers & Dryers	93	5	14	15%	280%
	Refrigerators & Freezers	190	6	11	6%	183%

¹⁵ Pennsylvania Statewide Evaluator Memo_Spray Foam and 2021 TRM Measure 2.6.2 Verification Guidance 05.20.24.docx.

¹⁶ Guidehouse, *PECO PY15 Residential Impact Sample Design Memo Draft-SWE Comments_2.29.2024*, dated March 4, 2024.

Component	Stratum	Number Contacted	Target Completes	Actual Completes	Response Rate	Percentage of Target Achieved
	Other (Room A/C, Smart Thermostat, Bathroom Ventilation Fan)	88	5	12	14%	240%
	Total	910	50	91	10%	182%
Rebates and Marketplace-Marketplace	Advanced Power strips	31	6	2	6%	33%
	ENERGY STAR Air Purifiers & Dehumidifiers	66	6	8	12%	133%
	Smart Thermostats	920	26	33	4%	127%
	Total	1,017	38	43	4%	113%
Rebates and Marketplace-Point of Purchase	Canned Spray Foam ²	38	80	25	32%	31%
Multifamily	High Impact (project savings ≥ 35,000 kWh)	8	4	4	50%	100%
	(900 kWh ≤ project savings < 35,000 kWh)	43	4	4	9%	100%
	Total	51	8	8	16%	100%
Multifamily – Income-Eligible	High Impact (project savings ≥ 35,000 kWh)	6	4	5	83%	125%
	(900 kWh ≤ project savings < 35,000 kWh)	34	4	5	15%	125%
	Total	40	8	10	25%	125%

1 The initial sample design combined ductless heat pumps and air source heat pumps (ASHPs) into one stratum. Guidehouse conducted post hoc stratification to separate ductless heat pumps into their own strata to accommodate differences between ASHPs and ductless heat pump data quality and evaluated results.

2 Spray Foam Target Completes and Actual Completes are based on numbers of cans. Number Contacted and Response Rate are based on survey QR code scans and survey responses.

Source: Guidehouse analysis

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

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

Component	PYRTD MWh/yr	Energy Realization Rate	Sample CV or Error Ratio	Relative Precision at 85% C.L.
Rebates and Marketplace	32,801	0.77	0.39	0.05
Appliance Recycling	1,046	1.17	0.17	0.02
In-Home Assessment	8,206	1.00	0.56	0.09
New Construction	3,392	1.00	0.01	0.00
Multifamily	1,360	0.96	0.11	0.06
Multifamily Income-Eligible	1,809	0.92	0.26	0.13
Program Total	48,613	0.85	0.54	0.06 [90% C.L.]

Note: Guidehouse conducted tracking database analysis for all components and primary data collection and analysis for the Rebates and Marketplace, Multifamily, and New Construction components in PY15. For the Appliance Recycling and In-Home Assessment components, Guidehouse applied the energy and demand verification ratios from the PY14 evaluation to the results of the PY15 adjusted database analysis.

Source: Guidehouse analysis

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

Component	PYRTD MW/yr	Demand Realization Rate	Sample CV or Error Ratio	Relative Precision at 85% C.L.
Rebates and Marketplace	3.23	0.99	0.24	0.03
Appliance Recycling	0.21	1.14	0.14	0.02
In-Home Assessment	0.60	0.96	0.64	0.10
New Construction	0.84	0.37	0.64	0.17
Multifamily	0.17	0.95	0.10	0.06
Multifamily Income-Eligible	0.29	0.92	0.21	0.11
Program Total	5.34	0.89	0.25	0.03 [90% C.L.]

Note: Guidehouse conducted tracking database analysis for all components and primary data collection and analysis for the Rebates and Marketplace, Multifamily, and New Construction components in PY15. For the Appliance Recycling and In-Home Assessment components, Guidehouse applied the energy and demand verification ratios from the PY14 evaluation to the results of the PY15 adjusted database analysis.

Source: Guidehouse analysis

The introduction to Section 3 describes the two-step evaluation method that 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 on the evaluation plan.¹⁷ The TDR and the verification ratio together represent the overall energy or demand realization rate.

Table 3-7. Residential Energy Ratios

Component	Energy TDR	Energy Verification Ratio ¹	Energy Realization Rate
Rebates and Marketplace	0.99	0.78	0.77
Appliance Recycling	1.14	1.02	1.17
In-Home Assessment	1.00	1.00	1.00
New Construction	1.00	1.00	1.00
Multifamily	1.00	0.96	0.96
Multifamily Income-Eligible	1.08 ²	0.85	0.92
Residential Total	1.00	0.85	0.85

1 The verification ratios for Appliance Recycling, In-Home Assessment, and Multifamily Education measures are from PY14 verification activities.

2 The Energy Tracking Database Ratio for the Multifamily Income-Eligible component is greater than one because the CSP uses a placeholder reported energy savings value (1 kWh). When Guidehouse updates this value as part of the Tracking Database Review, additional savings are assigned, resulting in higher verified savings.

Source: Guidehouse analysis

Table 3-8. Residential Demand Ratios

Component	Demand TDR	Demand Verification Ratio ¹	Demand Realization Rate
Rebates and Marketplace	1.01	0.98	0.99
Appliance Recycling	1.12	1.02	1.14
In-Home Assessment	0.97	0.99	0.96
New Construction	1.00	0.37	0.37
Multifamily	1.00	0.95	0.95
Multifamily Income-Eligible	1.03	0.89	0.92

¹⁷ Guidehouse, *Phase IV Evaluation Plan*.

Component	Demand TDR	Demand Verification Ratio ¹	Demand Realization Rate
Residential Total	1.01	0.88	0.89

¹ The verification ratios for Appliance Recycling, In-Home Assessment, and Multifamily’s Education measures are from PY14 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 several measures, including heat pump water heaters, electronically commutated motor (ECM) fans, refrigerator/freezer recycling, and variable speed pool pumps. The adjustment with the largest impact on savings was made for faucet aerators. The tracking database analysis resulted in an overall energy TDR of 1.00 and demand TDR of 1.01. Further measure-level detail can be found in Appendix E.
- Rebates and Marketplace Downstream and Marketplace Surveys:** These surveys found that a portion of the population that purchased smart thermostats from the PECO marketplace did not install the measure and planned to return it. Reasons for returning the thermostat include that the thermostat does not work or is incompatible with their HVAC system. This resulted in a realization rate of 0.83 for energy and 0.89 for demand. Uninstalled thermostats have been a recurring finding in Phase IV, resulting in energy realization rates of 0.72 in PY13 and 0.87 in PY14.
- Ductless Heat Pumps:** Guidehouse made two changes to the ductless heat pump measure savings. First, Guidehouse identified that reported savings appear to double-count system capacities. Correcting this issue significantly reduced savings, by as much as 75% per project. Second, Guidehouse verified that some ductless heat pumps replaced electric resistance baselines. Adjusting baseline efficiencies increased savings by up to 300%. These two adjustments partially offset each other, resulting in final realization rates of 63% for energy and 52% for demand for ductless heat pumps in the Downstream pathway of the Rebates and Marketplace component. The initial sample design combined ductless heat pumps and air source heat pumps (ASHPs) into one stratum. Guidehouse conducted post hoc stratification to separate ductless heat pumps into their own strata to accommodate differences between ASHPs and ductless heat pumps data quality and high variation in evaluated results.
- Canned Spray Foam:** Guidehouse conducted a separate survey to verify installations of spray foam. Guidehouse surveyed 38 customers and received 13 responses, 11 of which included valid data and represented the usage of 25 cans that were purchased through the program. Guidehouse found that these 25 cans were used to seal 30 windows, eight doors, three sliding glass doors, 50 pipe or wire penetrations, and 19 other gaps or holes in the walls of conditioned spaces. Guidehouse used these totals and the SWE’s guidance memo to estimate energy savings of 42.22 kWh per can sold and summer peak demand savings of 0.00049 kW per can sold, resulting in an energy realization rate for spray foam measures of 64% and a demand realization rate of 114%.
- New Construction:** The reported demand savings used the average single-hour demand savings estimated by the model for the entire home from 6 p.m. to 7 p.m. This demand savings estimate does not align with Pennsylvania’s peak demand time period

and is not in alignment with TRM guidance. Guidehouse evaluated Residential New Construction demand savings in accordance with TRM guidance and the SWE's updated guidance. This evaluation involves estimating HVAC demand savings based on the heating and cooling capacities of the efficient home and a baseline equivalent home, using baseline and efficient HVAC efficiencies. Non-HVAC demand savings are calculated on a per-measure basis using other prescriptive TRM guidance. The difference in demand savings estimation methodology resulted in a peak demand savings realization rate of 37% for the Residential New Construction component.

- **Multifamily Site Inspections:** This field verification effort included both residential multifamily and IE multifamily customers. The field team found that some lamps had been installed in temporary fixtures, such as bedside lamps or standing lamps, and that when residents moved out, they took these fixtures with them, lowering verified quantities. Similarly, advanced power strips were often taken when residents left. The verification ratios are found in Table 3-7 and Table 3-8.

3.1.3 Net Impact Evaluation

As described in the Phase IV Evaluation Plan¹⁸ for PY15 and in Table 3-2, Guidehouse conducted NTG research for the Residential EE Program Downstream and Marketplace pathways of the Rebates and Marketplace component. Table 3-9 summarizes the pathway-level NTGRs evaluated in PY15. Further details of the survey responses are in Section 3.1.5.1 and Table 3-13.

3.1.3.1 Methodology

Guidehouse followed the SWE's framework¹⁹ for conducting NTG research and analysis for Downstream programs. The SWE guidance included detail on gathering feedback from PECO customers about their *intentions* for installing energy efficient upgrades and the *influence* the program had on their purchasing decisions.

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

- **Free Ridership:** The self-reported free ridership survey battery is brief to avoid customer burden and includes two metrics 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 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

¹⁸ Guidehouse, *Phase IV Evaluation Plan*.

¹⁹ Pennsylvania Statewide Evaluator, *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.

Guidehouse team divides the total spillover savings by the total gross savings for the sample to arrive at the spillover result.

Guidehouse estimated the final NTGR score using Equation 3-1 **Error! Reference source not found.**

Equation 3-1. NTGR Equation

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

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

The following bullets summarize the methods used to estimate the NTG for each Residential EE Program component. 4.2Appendix E provides details on the NTG methods and algorithms used for the Rebates and Marketplace component.

- **Rebates and Marketplace Component – Downstream Pathway** (known to customers as the PECO Rebates and Discounts Program): In alignment with the process evaluation survey activity detailed in Section 3.1.5, Guidehouse completed online surveys with residential customers receiving a PECO rebate through the Downstream pathway. The survey asked participants to rate the amount of influence (on a 0-10 influence scale) the program had on their decision to purchase and install energy efficient equipment through the program. The survey also asked about the intentions of each participant if the program had not been available.
- **Rebates and Marketplace Component – Marketplace Pathway** (known to customers as the PECO Marketplace): In alignment with the process evaluation survey activity detailed in Section 3.1.5, Guidehouse completed online surveys with residential customers purchasing energy efficient equipment through PECO’s online marketplace portal. The survey asked participants if they had plans to purchase the equipment prior to finding it on the online marketplace, and how influential the marketplace was on their decision to purchase the equipment at that time.

3.1.3.2 NTG Results

Guidehouse created target completes for each component based on eTRACK+ participation data. Sample targets and completes are shown in Table 3-13. Sample design memos were reviewed and approved by the SWE prior to survey fielding.

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

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

Component	PYVTD	Free Ridership	Spillover	NTGR	Relative Precision (@ 85% CL)
Rebates and Marketplace – Downstream	7,562	0.42	0.05	0.63	0.13
Rebates and Marketplace – Marketplace	924	0.33	0.10	0.78	0.15

Source: Guidehouse analysis

- Rebates and Marketplace Component – Downstream Pathway:** Free-ridership for the Downstream pathway dropped 4% from PY11 (0.46), while spillover decreased by 43%, from 0.48 in PY11 to 0.05 in PY15.
- Rebates and Marketplace Component – Marketplace Pathway:** Free-ridership for the Marketplace pathway remained consistent with PY11 results of 0.32, while spillover increased 7% from 0.03 in PY11 to 0.10 in PY15.

3.1.3.3 High Impact Measure Research

Guidehouse used the NTG surveys for the Downstream pathway to conduct NTG research for high impact measures (HIMs) and identified the top five energy saving measures for the Residential EE Program in PY15 (Table 3-10.).

Table 3-10. Residential EE Program HIM Results

HIM	Percentage of Program Savings ¹	Free Ridership	Spillover	NTGR
Central AC and Heat Pump – Downstream	16.6%	0.38	0.01	0.63
Advanced Power Strips – Marketplace	9.4%	0.17	0.00	0.83
Purifiers and Dehumidifiers – Marketplace	5.5%	0.13	0.29	1.15
Furnace Fans – Downstream	3.1%	0.61	0.12	0.51
Smart Thermostats – Marketplace	2.7%	0.35	0.09	0.74
Purifiers and Dehumidifiers - Downstream	1.6%	0.35	0.17	0.82

¹ The total program savings used for the Percentage of Program Savings calculation includes only the Rebates and Marketplace component of the Residential EE Program.

Source: Guidehouse analysis

- HIMs included in the PY15 evaluation come from the Rebates and Marketplace component of the Residential EE Program, specifically the Downstream and Marketplace pathways. Air Purifiers and Dehumidifiers are offered through both pathways but have noticeably different free ridership results. These results indicate the online marketplace is having more impact on customers purchasing a new air purifier or dehumidifier as they shop online, whereas customers visiting a retail store are more likely looking to purchase a new air purifier or dehumidifier without program intervention. Spillover results also differ between pathways, with respondents reporting that PECO’s online marketplace had more influence on their decision to install additional energy efficient equipment than those shopping at retail stores.

- Energy efficient furnace fans received the highest free ridership score of the HIMs and was also a HIM in the prior evaluation cycle in PY11. The free ridership score increased 14% (from 0.47 in PY11 to 0.61 in PY15) indicating less impact from the program on customer’s decision to include an efficient furnace fan when upgrading their HVAC system.
- Smart thermostat free-ridership results remained consistent between PY11 (0.37) and PY15 (0.35).

3.1.4 Verified Savings Estimates

In Table 3-11., the realization rates and NTGRs determined by Guidehouse are applied to the reported energy and demand savings estimates to calculate the verified net savings estimates for the Residential EE Program in PY15. Additional detail of the savings calculations performed in PY15 can be found in 4.2Appendix E.

Table 3-11. Residential EE Program PY15 and P4TD Savings Summary

Savings Type	Energy (MWh/yr)	Demand (MW/yr)
PYRTD	48,613	5.34
PYVTD Gross	41,211	4.74
PYVTD Net	34,506	3.63
RTD	149,137	23.33
VTD Gross	138,641	22.15
VTD Net	99,172	15.20

Source: Guidehouse analysis

3.1.5 Process Evaluation

The PY15 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 PY15, identify significant implementation changes, and identify areas of strength and areas of improvement. Guidehouse also fielded two surveys, one for the Downstream pathway and one for the Marketplace pathway of the Rebates and Marketplace component, 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. These surveys were fielded in conjunction with NTG and impact evaluation surveys to reduce burden on the participant base.

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

Component	Pathway	PM/CSP Interview	Survey	Survey Recipient
Rebates and Marketplace	Downstream	✓	✓	Downstream Pathway Customers

Component	Pathway	PM/CSP Interview	Survey	Survey Recipient
Rebates and Marketplace	Marketplace	✓	✓	Online Marketplace Pathway Customers
Appliance Recycling	NA	✓	-	N/A
In-Home Assessment	NA	✓	-	N/A
New Construction	NA	✓	-	N/A
Multifamily	NA	✓	-	N/A
Multifamily Income-Eligible	NA	✓	-	N/A

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 approval 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.

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. Similarly, the gross impact evaluation considers any survey that collects all necessary information to evaluate gross savings to be complete, regardless of if the survey participant finishes any of the remainder of the survey.

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

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

Pathway	Stratum	Number Contacted	Target Completes	Actual Completes	Response Rate	Percentage of Target Achieved
Downstream	Central A/C and Heat Pumps	135	9	13	10%	144%
	Furnace Fans	118	6	10	8%	167%
	Refrigerators and Freezers	190	6	11	6%	183%
	Purifiers and Dehumidifiers	106	9	14	13%	156%
	Clothes Washers and Dryers	93	5	14	15%	280%
	Other	88	5	12	14%	240%
	Variable Speed Pool Pumps	93	5	7	8%	140%

Pathway	Stratum	Number Contacted	Target Completes	Actual Completes	Response Rate	Percentage of Target Achieved
	Heat Pump Water Heaters	87	5	10	11%	200%
	Total	910	50	91	10%	182%
	Advanced Power Strips	31	6	2	6%	33%
Marketplace	Purifiers and Dehumidifiers	66	6	8	12%	133%
	Smart Thermostats	920	26	33	4%	127%
	Total	1,017	38	43	4%	113%
Rebates and Marketplace Total		1,927	88	134	7%	152%

Source: Guidehouse analysis

Guidehouse’s standard survey email outreach approach includes sending sampled customers an initial invitation email and up to two reminder emails. Guidehouse offered the first 100 customers who completed each survey a \$10 electronic gift card (e-gift card) through the Tango platform. During survey fielding, Guidehouse monitored survey completes by stratum and took extra steps to bolster response rates and survey completes. With permission from PECO, in an attempt to increase the response rate for the Marketplace pathway’s advanced power strip stratum, Guidehouse sent a fourth and final reminder with an increased e-gift card value of \$20 to customers who purchased an advanced power strip. Table 3-14. summarizes the implementation of these efforts by each component.

Table 3-14. Residential Survey Approach

Component	Pathway	Incentive Offered
Rebates and Marketplace	Downstream	\$10
Rebates and Marketplace	Marketplace	\$10
Rebates and Marketplace	Marketplace (Advanced Power Strip final reminder email)	\$20

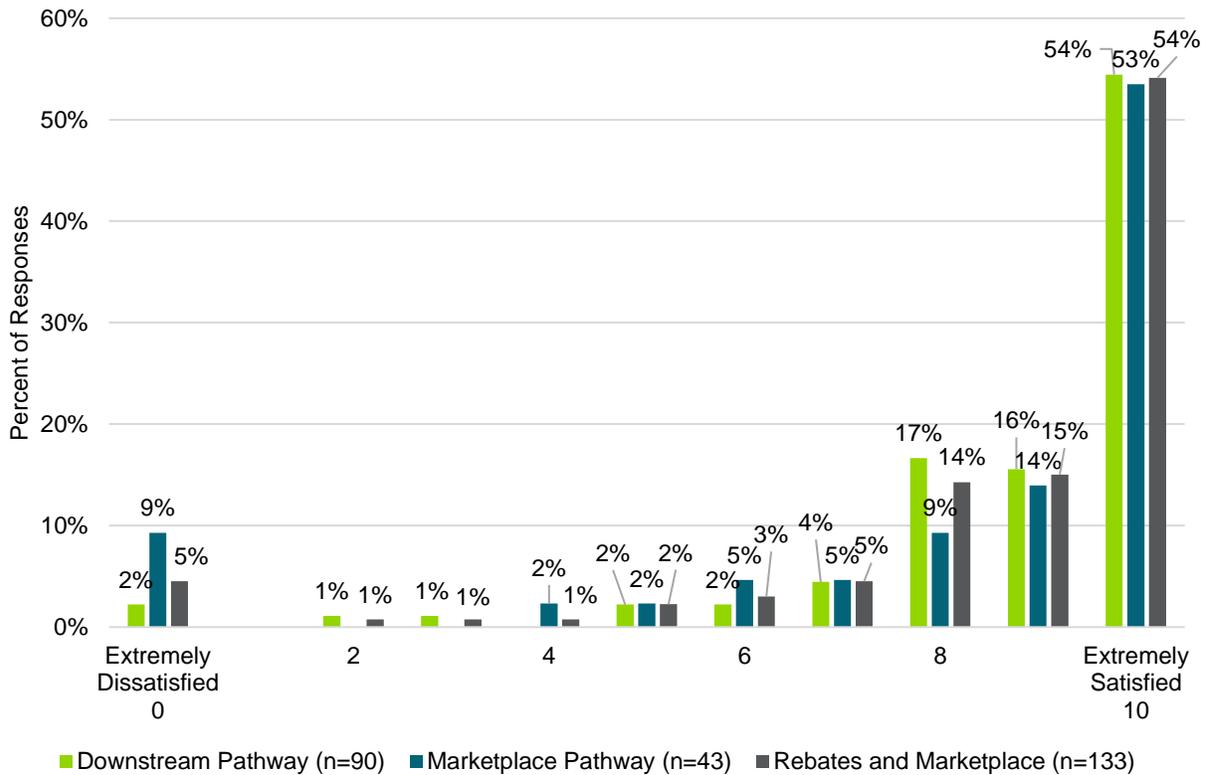
Source: Guidehouse analysis

3.1.5.2 Key Findings from Process Evaluation

Guidehouse presents key findings here for the Rebates and Marketplace component Downstream and Marketplace pathways only, as they were the only Residential component pathways evaluated in PY15. Appendix E includes sections for each component, though most components have no findings in PY15.

As Figure 3-2 shows, respondents are overall satisfied with PECO’s Residential EE Program. Respondents provided an overall satisfaction score of 8.6 out of 10 for the Rebates and Marketplace component, using a scale where 0 is “extremely dissatisfied” and 10 is “extremely satisfied.” Respondents provided a score of 8.8 out of 10 for the Downstream pathway and 8.2 out of 10 for the Marketplace pathway. Of the four respondents who reported an overall satisfaction of 0 out of 10 for the Marketplace pathway, two reported issues with the delivery of their item and two expressed dissatisfactions with the PECO Marketplace return policy.

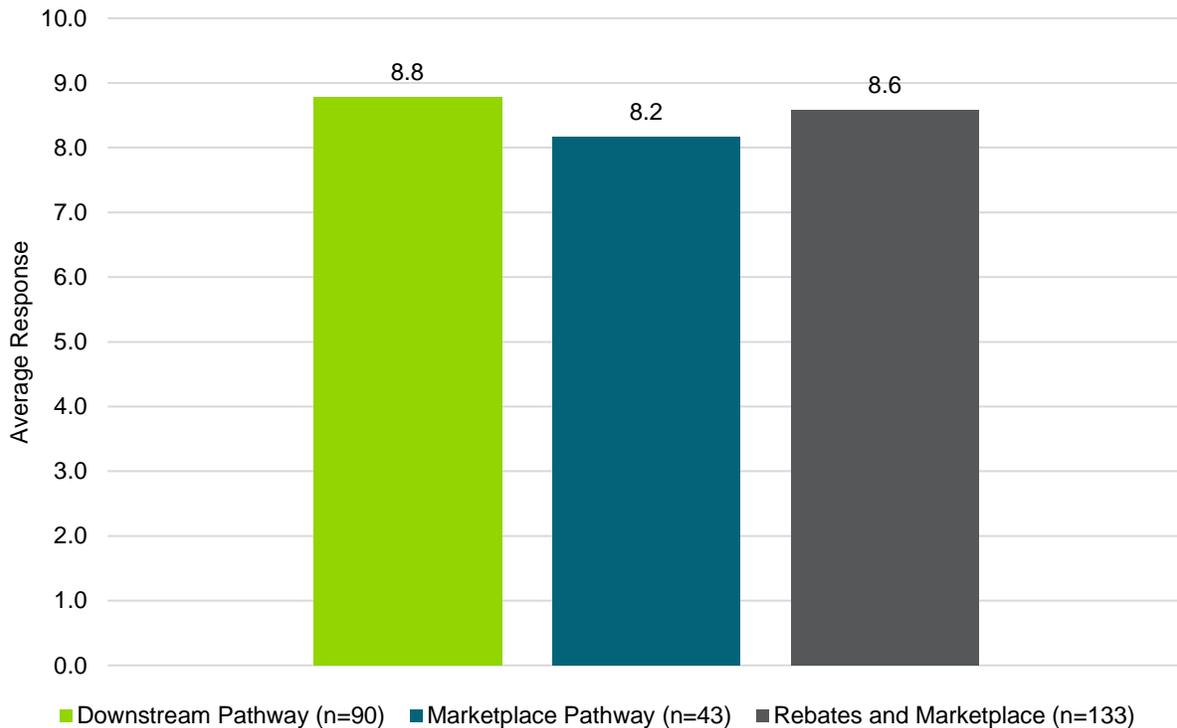
Figure 3-2. Rebates and Marketplace Overall Satisfaction by Pathway



Respondents received the following question: “How would you rate your satisfaction with [Pathway Name] overall?”
 Guidehouse excluded “don’t know” responses from analysis.
 Source: Guidehouse Downstream Pathway (n=90)

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

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



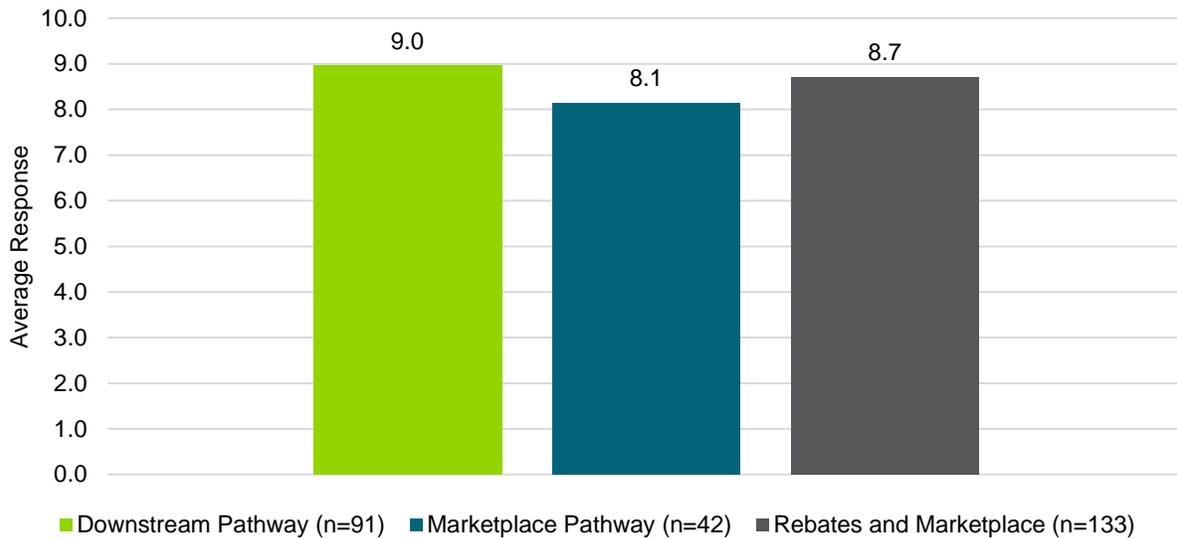
Respondents received the following question: “How would you rate your satisfaction with [Pathway Name] overall?” Guidehouse excluded “don’t know” responses from analysis.

Source: Guidehouse analysis

Figure 34 shows the mean likelihood to recommend PECO’s Residential EE Program. On average, the Downstream pathway respondents reported a score of 9.0 out of 10 and Marketplace pathway respondents reported a score of 8.1 out of 10, using a scale where 0 is “not at all likely” and 10 is “extremely likely.” The mean likelihood of recommending the Rebates and Marketplace component overall is 8.7 out of 10.

Customers were also asked what changes to PECO Marketplace would make them more likely to recommend it to others. Three respondents expressed frustration with the PECO Marketplace return policy, indicating that a more expansive return policy would increase their likelihood to recommend the PECO Marketplace to others. Specifically, some items require an installation contractor and sometimes the contractor is not able to install the items until after the return window has closed. This can create issues if the contractor finds that the item needs to be returned or is not compatible with the customer’s home, and the customer cannot return the item.

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

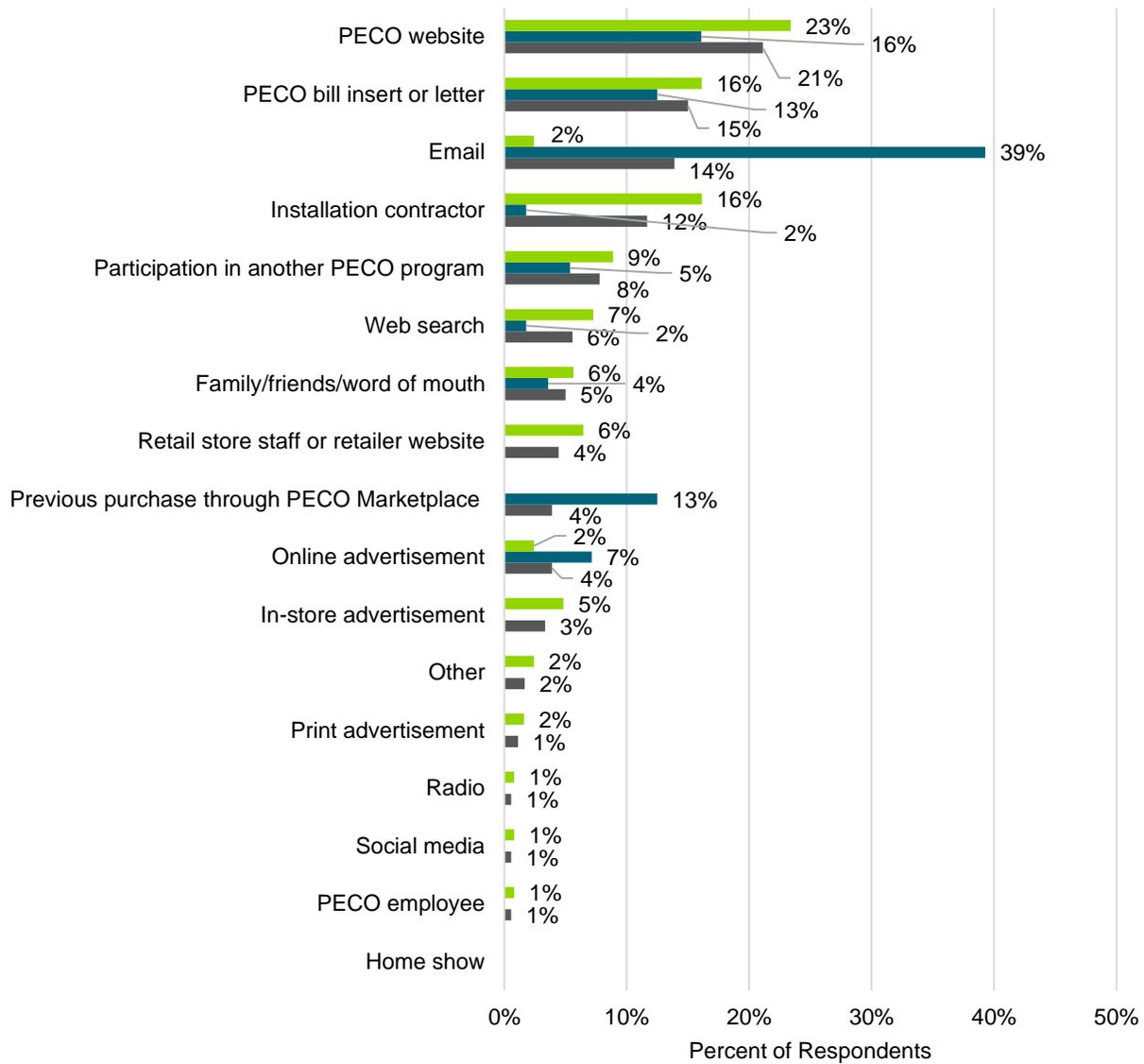


Respondents received the following question: “How likely are you to recommend [Pathway Name] to others?”
Guidehouse excluded “don’t know” responses from analysis.

Source: Guidehouse analysis

As Figure 3-5 shows, most Rebates and Marketplace component respondents reported learning about the component through the PECO website, a PECO bill insert or letter, email, or an installation contractor. Marketplace pathway customers also reported that a previous purchase through PECO Marketplace was a main driver for program awareness. Despite most respondents indicating a high likelihood to recommend the program (Figure 3-4), few respondents (6% for Downstream and 4% for Marketplace, as Figure 3-5 shows) heard about the program through word of mouth.

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



■ Downstream Pathway (n=91) ■ Marketplace Pathway (n=42) ■ Rebates and Marketplace (n=133)

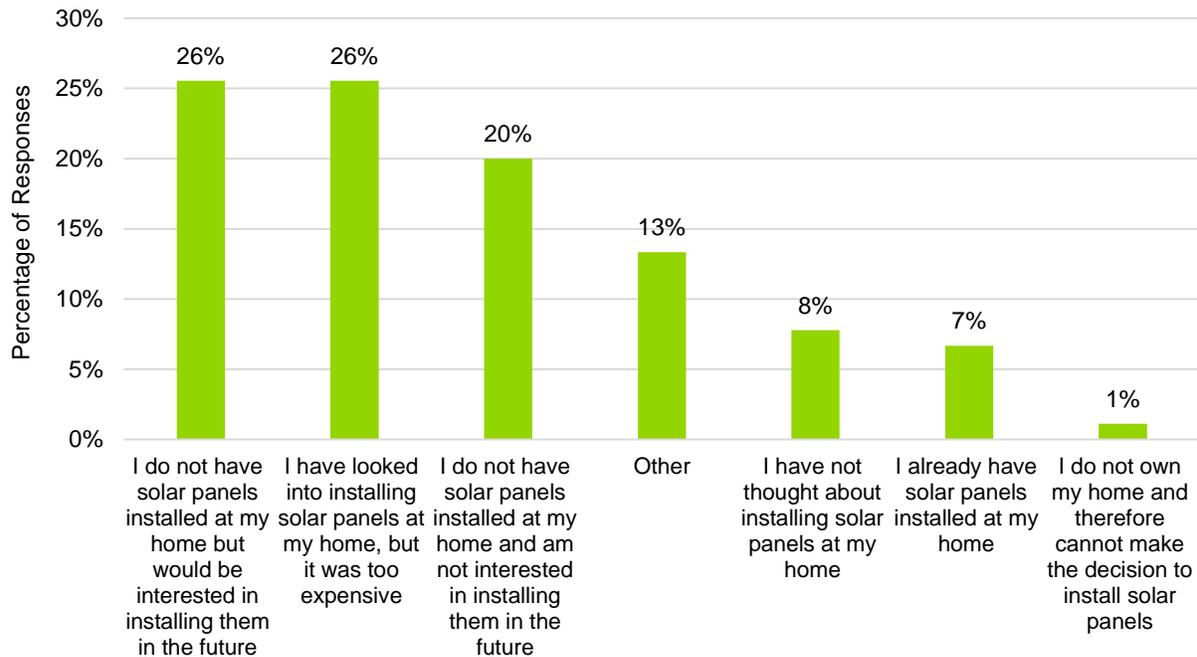
Respondents received the following question: “How did you learn about [Pathway Name]? Select all that apply.”

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

Source: Guidehouse analysis

Customers in the Downstream pathway were also asked their sentiments toward solar panels. Of respondents, 51% reported interest in installing solar panels, but some (26%) reported that they are concerned about the price, as Figure 3-6 shows.

Figure 3-6. Sentiments Toward Solar Panels (n=90)



Respondents received the following question: “Please select the option below that best describes your sentiments toward solar panels.”

Source: Guidehouse analysis

Detailed findings by component and pathway are presented in 4.2Appendix E.

3.1.6 Program Finances and Cost-Effectiveness Reporting

Table 3-15. presents a detailed breakdown of program finances and cost-effectiveness. TRC benefits in Table 3-15. were calculated using gross verified impacts. NPV PY15 costs and benefits are expressed in 2023 dollars; Phase IV totals are in 2021 dollars.

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

Row	Cost Category*	PYTD (\$1,000)		P4TD (\$1,000)	
1	Incremental Measure Costs (IMCs)	\$15,532		\$88,233	
2	Rebates to Participants and Trade Allies	\$4,435		\$14,395	
3	Upstream/Midstream Incentives	\$1,700		\$4,478	
4	Material Cost for Self-Install Programs (EE&C Kits)	\$736		\$2,092	
5	Direct Installation Program Materials and Labor	\$0		\$18	
6	Participant Costs (row 1 minus the sum of rows 2 through 5)	\$8,661		\$67,250	
		EDC	CSP	EDC	CSP
7	Program Design	\$0	\$0	\$0	\$0
8	Administration and Management	\$5,767	\$0	\$17,383	\$0
9	Marketing	\$0	\$0	\$0	\$0
10	Program Delivery	\$0	\$0	\$0	\$0

Row	Cost Category*	PYTD (\$1,000)	P4TD (\$1,000)
11	EDC Evaluation Costs	\$0	\$0
12	SWE Audit Costs	\$0	\$0
13	Program Overhead Costs (sum of rows 7 through 12)	\$5,767	\$17,383
14	Total NPV TRC Costs (sum of rows 1 and 13)	\$21,299	\$105,616
15	Total NPV Lifetime Electric Energy Benefits	\$15,690	\$48,361
16	Total NPV Lifetime Electric Capacity Benefits	\$9,889	\$43,263
17	Total NPV Lifetime O&M Benefits	\$1,178	\$24,509
18	Total NPV Lifetime Fossil Fuel Impacts	(\$319)	(\$5,461)
19	Total NPV Lifetime Water Impacts	\$2,829	\$13,164
20	Total NPV TRC Benefits (sum of rows 15 through 19)	\$29,268	\$123,836
21	TRC Benefit-Cost Ratio (row 20 divided by row 14)	1.37	1.17

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

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, operations and maintenance (O&M), interactive effects, and secondary fossil fuel impacts. In addition, the NTGRs are applied to the IMCs, therefore the IMCs are different on a net savings basis compared 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	\$13,005		\$62,971	
2	Rebates to Participants and Trade Allies	\$4,435		\$14,395	
3	Upstream/Midstream Incentives	\$1,700		\$4,478	
4	Material Cost for Self-Install Programs (EE&C Kits)	\$736		\$2,092	
5	Direct Installation Program Materials and Labor	\$0		\$18	
6	Participant Costs (row 1 minus the sum of rows 2 through 5)	\$6,134		\$41,988	
		EDC	CSP	EDC	CSP
7	Program Design	\$0	\$0	\$0	\$0
8	Administration and Management	\$5,767	\$0	\$17,383	\$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)	\$5,767		\$17,383	
14	Total NPV TRC (sum of rows 1 and 13)	\$18,772		\$80,354	
15	Total NPV Lifetime Electric Energy Benefits	\$13,137		\$35,472	
16	Total NPV Lifetime Electric Capacity Benefits	\$8,280		\$31,120	
17	Total NPV Lifetime O&M Benefits	\$987		\$16,901	

Row	Cost Category*	PYTD (\$1,000)	P4TD (\$1,000)
18	Total NPV Lifetime Fossil Fuel Impacts	(\$267)	(\$3,681)
19	Total NPV Lifetime Water Impacts	\$2,369	\$9,445
20	Total NPV TRC Benefits (sum of rows 15 through 19)	\$24,505	\$89,531
21	TRC Benefit-Cost Ratio (row 20 divided by row 14)	1.31	1.11

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

Source: Guidehouse analysis

3.1.7 Status of Recommendations

The impact and process evaluation activities in PY15 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 Residential EE Evaluation Recommendations

Component	Evaluation Activity	Finding	Recommendation	EDC Status
Rebates and Marketplace	Impact	<p>In the tracking data analysis Guidehouse was unable to replicate reported savings for Ductless Heat Pumps, Air Source Heat Pumps, Duct Sealing & Duct Insulation, and Central AC.</p> <p>Tracking data currently claims the outdoor unit capacity for all indoor units instead of the indoor unit capacity(ies). This double-counts capacity and overstates savings for units with more than one indoor unit.</p> <p>Guidehouse also found through survey results that some DHP's replace gas furnaces, space heaters, electric wall heaters, and electric furnaces. The electric resistance-based heat baselines significantly increase savings.</p>	<p>Update calculations to use the indoor unit capacities to calculate savings.</p> <p>Collect replaced equipment type and use baseline efficiencies based on the baseline equipment type.</p>	In progress
Rebates and Marketplace	Impact	Guidehouse found an average of 42.22 kWh and 0.00049 kW of energy savings per can based on a customer survey in line with TRM measure 2.6.2.	Guidehouse recommends using savings of 42.22 kWh and 0.00049 kW per can. Guidehouse will continue collecting survey results and update this savings estimate going forward.	Under Consideration
Rebates and Marketplace	Impact	Ex ante demand savings for the variable speed pool pump measure are 1/100th of verified savings.	Update tracking data reporting decimal formatting to increase Rebates and Marketplace demand savings by 2.4%.	Under Consideration
Rebates and Marketplace	Impact	For ECM circulation fans, ex ante reduced energy demand factor is set to 0.11 rather than the TRM constant 0.116.	Use the TRM default of 0.116 to increase energy and demand measure savings by 5.5%.	Under Consideration
Rebates and Marketplace	Impact	Reported storage tank water heaters between 50 and 120 gallons use a UEF baseline of 0.92. TRM errata issued for PY15 provides updated equations to calculate the baseline UEF for these larger measures. This change reduced savings and the realization rate for Marketplace Heat Pump Water Heaters by 28%.	Update UEF baseline equation to use errata change.	Under Consideration
In-Home Assessment, Multifamily, Multifamily Income-Eligible	Impact	Ex ante applies a non-zero interactive effect (IE) to lighting in exterior spaces.	Set IE energy and demand to 0% for exterior spaces.	Under Consideration
New Construction	Impact	Residential New Construction reported summer peak demand savings use a method different than the method dictated by the TRM and calculate peak demand savings for a time period that does not align with Pennsylvania's defined peak demand period. Peak demand savings are being reported based on modeling software default values. The software, Ekotrope, calculates peak	<p>The current realization rate will remain applicable as long as the CSP's peak demand savings estimation methodology remains consistent.</p> <p>Peak demand savings from all other</p>	Under Consideration

Component	Evaluation Activity	Finding	Recommendation	EDC Status
		demand based on the default peak period of 6 p.m-7 p.m. daily. The software can custom define summer peak demand periods, but the custom peak periods have not been defined. Additionally, the TRM and regulatory guidance dictate that peak demand savings for HVAC and shell should be calculated based on building simulation estimated peak loads and HVAC efficiency. Together, these findings result in a reduction of peak demand savings of over 60%.	energy efficiency measures should be estimated external to Ekotrope using TRM prescriptive methods.	
Multifamily	Impact	After the PY14 evaluation, PECO and CMC increased quality control (QC) reviews of multifamily project implementation. Guidehouse's PY15 evaluation showed significantly higher installation rates, resulting in higher realization rates, indicating that increased QC is working.	Continuing the current QC process for Multifamily projects.	Implemented
Rebates and Marketplace- Rebates and Marketplace	Process	87% of Downstream respondents indicated they would be very likely to recommend the program, but only 6% of respondents heard about the program through word of mouth. Similarly, 74% of Marketplace respondents indicated they would be very likely to recommend the program, but only 4% of respondents heard about the program through word of mouth.	Consider leveraging participant willingness to recommend the program in marketing tactics, such as testimonies, referral incentives, and marketing materials touting participation offering a referral bonus to customers or provide marketing materials that they can use to advertise to friends and family (i.e., a PECO efficiency sticker on their equipment).	Under Consideration
Rebates and Marketplace- Downstream	Process	Fifty-one percent of respondents report interest in installing solar panels, but some (26%) reported that they are concerned about the price.	Continue to pursue a residential solar offering and refine incentives and marketing to achieve savings and participation goals for the remainder of Phase IV.	In Progress
Rebates and Marketplace- Marketplace	Process	Three respondents expressed frustration with PECO's Marketplace return policy, under which purchases are eligible for return within 30 days from date of purchase. Some items require an installation contractor and sometimes the contractor is not able to install the items until after the return window has closed, which can create issues if the contractor finds that the item needs to be returned or is not compatible with the customer's home.	Consider increasing the return window for equipment that may require an installation contractor (i.e., smart thermostat).	Under Consideration

Source: Guidehouse analysis

3.2 Income-Eligible EE Program

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

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

- Appliance Recycling:** The Appliance Recycling component focuses on responsibly recycling refrigerators, freezers, and window air conditioning units. The component serves both IE and market-rate customers. ARCA implemented the Appliance Recycling component. However, ARCA was unable to fulfill their obligations early in the program year, which resulted in the program being put on hold indefinitely.
- Single-Family:** The Single-Family component improves the energy efficiency of single-family homes for IE customers to help reduce their electric bills and make their homes more comfortable. CMC implements the Single-Family component. There are multiple pathways to receive program services. The Free Energy Checkup Program and Low-Income Usage Reduction Program (LIURP)²⁰ 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.

- Long-Term Savings:** The Long-Term Savings component is implemented as an overlay service through the Single-Family component to encourage the installation of long-term, comprehensive measures. All Long-Term Savings projects are Single-Family component participants, but not all Single-Family participants will be Long-Term Savings participants. As a result, both the Single-Family and Long-Term Savings component are evaluated and reported as a single component. CMC implements the Long-Term Savings component.

The Long-Term Savings component measures include insulation, air sealing, duct sealing, heat pumps, air conditioners, thermostats, and residential heat pump water heaters and solar water heaters. All measures are 100% subsidized.

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 Income-Eligible EE Program in PY15 by customer segment.

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

Parameter	Income-Eligible	Total
PY15 # Participants ¹	9,975	9,975

²⁰ LIURP funding is not part of the Act 129 program.

Parameter	Income-Eligible	Total
PYRTD MWh/yr	22,133	22,133
PYRTD MW/yr	1.98	1.98
PY15 Incentives (\$1,000)	8,824	8,824

1 Participant counts exclude IE single-family giveaways but include pilot participants. Savings and incentives from the IE single-family giveaways 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 Plan²¹ for PY15. The Income-Eligible EE Program gross impact evaluation included a comprehensive tracking database analysis of all TRM-based and IMP-based measures to confirm that reported savings align with TRM and IMP standards. Guidehouse was able to review all measures within the Income-Eligible EE Program. Guidehouse adjusted the verified savings based on discrepancies identified in the tracking database analysis.

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

Gross impact results for energy are presented in Table 3-19. and gross impact results for demand in Table 3-20.

Table 3-19. Income-Eligible EE Program Gross Impact Results for Energy

Component	PYRTD MWh/yr	Energy Realization Rate	Sample CV or Error Ratio	Relative Precision at 85% C.L.
Single-Family/ Long-Term Savings ¹	21,866	1.10	0.45	0.78
Appliance Recycling	267	1.11	0.17	0.02
Program Total²	22,133	1.10	0.46	0.88 [90% C.L.]

1 Single-Family and Long-Term Savings are reported together.

2 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 3-20. Income-Eligible EE Program Gross Impact Results for Demand

Component	PYRTD MW/yr	Demand Realization Rate	Sample CV or Error Ratio	Relative Precision at 85% C.L.
Single-Family/ Long-Term Savings ¹	1.90	1.03	0.52	0.78
Appliance Recycling	0.08	1.07	0.14	0.02
Program Total²	1.98	1.03	0.52	0.92 [90% C.L.]

1 Single-Family and Long-Term Savings are reported together.

²¹ Guidehouse, *Phase IV Evaluation Plan*.

2 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 3-21 and Table 3-22. The tracking database analysis is conducted annually while the verification ratio may be historical based on the evaluation plan.²² The TDR multiplied by the verification ratio represent the overall energy or demand realization rate.

Table 3-21. Income-Eligible Energy Ratios

Component	Energy TDR	Energy Verification Ratio	Energy Realization Rate
Single-Family/ Long-Term Savings	0.98	1.12	1.10
Appliance Recycling	1.08	1.03	1.11
Income-Eligible Total	0.98	1.12	1.10

Source: Guidehouse analysis

Table 3-22. Income-Eligible Demand Ratios

Component	Demand TDR	Demand Verification Ratio	Demand Realization Rate
Single-Family/ Long-Term Savings	0.92	1.11	1.03
Appliance Recycling	1.05	1.02	1.07
Income-Eligible Total	0.93	1.11	1.03

Source: Guidehouse analysis

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

- Tracking Database Analysis:** Guidehouse adjusted savings across a variety of measures, including faucet aerators, duct insulation, heat pump water heaters, and refrigerator recycling. The adjustment that had the largest impact on savings was a correction to the kit inputs for low flow faucet aerators. These updates resulted in an energy TDR of 0.94 and a demand TDR of 0.92 for the Income-Eligible EE Program. Appendix E contains further measure-level detail.

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.²³

3.2.3.1 HIM Research

Guidehouse did not evaluate HIMs for the Income-Eligible EE Program in PY15.

²² Guidehouse, *Phase IV Evaluation Plan*.

²³ Pennsylvania Statewide Evaluator, *Evaluation Framework for Pennsylvania*, https://www.puc.pa.gov/media/1584/swe-phaseiv_evaluation_framework071621.pdf.

3.2.4 Verified Savings Estimates

In Table 3-23., the realization rates and NTGRs determined by Guidehouse are applied to the reported energy and demand savings estimates to calculate the verified savings estimates for the Income-Eligible EE Program in PY15.

Table 3-23. Income-Eligible EE Program PY15 and P4TD Savings Summary

Savings Type	Energy (MWh/yr)	Demand (MW/yr)
PYRTD	22,133	1.98
PYVTD Gross	24,407	2.04
PYVTD Net	24,407	2.04
RTD	59,471	6.14
VTD Gross	58,002	5.82
VTD Net	58,002	5.82

Source: Guidehouse analysis

3.2.5 Process Evaluation

The PY15 process evaluation of the Income-Eligible EE Program included PECO program manager and CSP staff interviews for all components and a participant survey regarding the Single-Family component. This section summarizes the evaluation methods, data collection techniques, sample design, and key results related to the survey.

3.2.5.1 Methodology

The team interviewed the PECO program managers and CSP staff to understand the goals of the program in PY15, identify significant implementation changes, and identify areas of strength and areas of improvement. Guidehouse also conducted a survey of Single-Family and Long-Term Savings participants, as Table 3-24. outlines.

Table 3-24. Income-Eligible EE Program Process Activities by Component

Component	PM/CSP Interview	Survey	Survey Recipient
Single-Family	✓	✓	Participants in PECO's Single-Family Income-Eligible Program
Long-Term Savings	✓	✓	Participants in PECO's Single-Family Income-Eligible Program, flagged for Long-Term Savings
Appliance Recycling	✓	-	N/A

Source: Guidehouse analysis

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

As Table 3-25 presents, Guidehouse created target completes for the Single-Family Income Eligible- component based on eTRACK+ participation data. A sample design memo was reviewed and approved by the SWE prior to survey fielding.

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

Table 3-25. Income-Eligible Sample Targets and Completes

Component	Number Contacted	Target Completes	Actual Completes	Response Rate	Percentage Achieved
Single-Family Income-Eligible	4,200	50	157	3.7%	314%

Source: Guidehouse analysis

Guidehouse’s standard survey email outreach approach includes sending sampled customers an initial invitation email and up to two reminder emails. Guidehouse offered the first 100 customers who completed each survey a \$15 e-gift card through the Tango platform. The implementation of these efforts by each component is summarized in Table 3-26.

Table 3-26. Income-Eligible Survey Approach

Component	Incentive Offered
Single-Family Income-Eligible	\$15

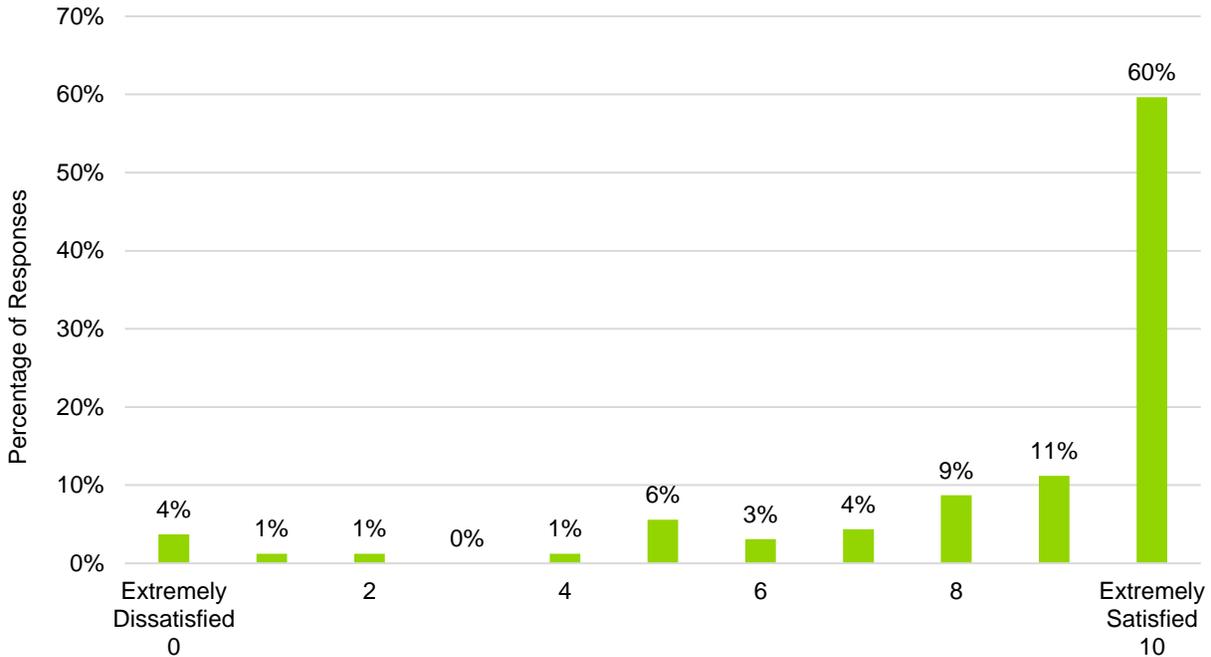
Source: Guidehouse analysis

3.2.5.2 Key Findings from Process Evaluation

Guidehouse presents key findings for the Single-Family Income-Eligible component as it was the only Income-Eligible component evaluated in PY15. The Long-Term Savings component consists of Single-Family Income-Eligible customers who are flagged as Long-Term Savings participants. While Long-Term Savings participants were included in the Single-Family Income-Eligible evaluation, Guidehouse did not receive any survey responses from Long-Term Savings participants. Appendix E provides key findings from all Income-Eligible EE Program components, though most components have no findings in PY15.

As Figure 3-7 shows, respondents were overall satisfied with PECO’s Income-Eligible EE Program. The Single-Family offer includes both in-home assessments (Free Energy Checkup) and energy saving kits for customers. Respondents who received only the assessment received a battery of questions requesting feedback on the Free Energy Checkup. Respondents who received an energy saving kit, but no assessment were only asked questions referencing the energy saving kits. Respondents who received both an assessment and a kit were asked about specific aspects of both the assessment and the kit. 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.” The average satisfaction score was 8.5 out of 10.

Figure 3-7. Single-Family Income-Eligible Satisfaction (n=161)



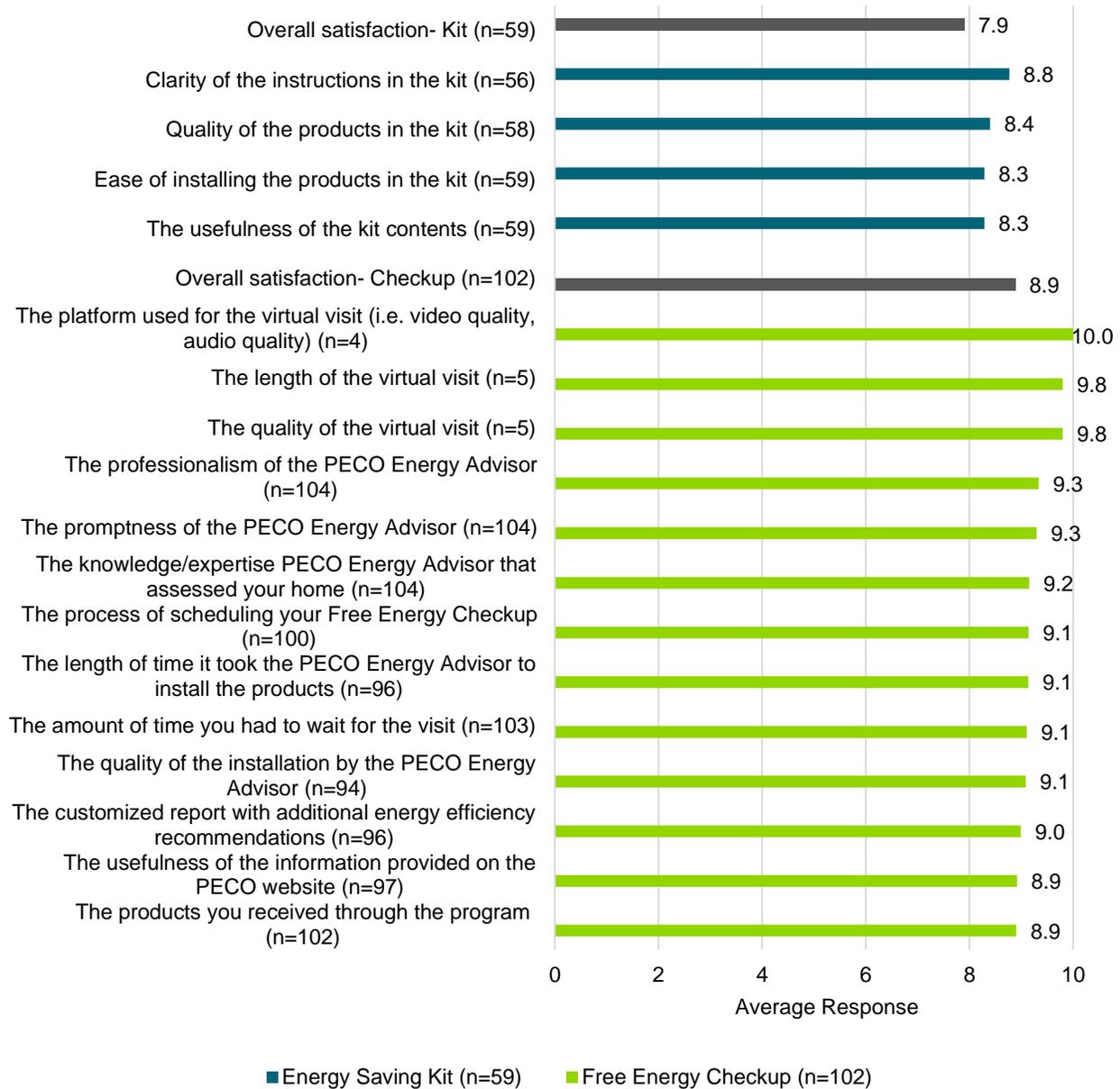
Respondents received the following question: “How would you rate your satisfaction with the Free Energy Checkup program overall?” (respondents who received an assessment only, or an assessment and a kit), or “How would you rate your satisfaction with the energy saving kit overall?” (respondents who received a kit only).

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

Source: Guidehouse analysis

Respondents were asked to rate their satisfaction with specific aspects of the checkups and the energy saving kits. Respondents who rated their satisfaction with any aspect of the component as a 5 out of 10 or lower were asked to explain their rating. Three respondents expressed the need for additional instructions to install kit measures, and 13 respondents (8% of respondents) were frustrated by broken/damaged measures or measures that are not useful to their household. Three checkup respondents (3% of respondents who received a free energy checkup) expressed frustration with improperly installed measures. Four respondents expressed frustration that they did not see bill savings following their participation. Finally, one respondent expressed frustration that Energy Advisors (CSP) could not answer questions about issues with their PECO electric service.

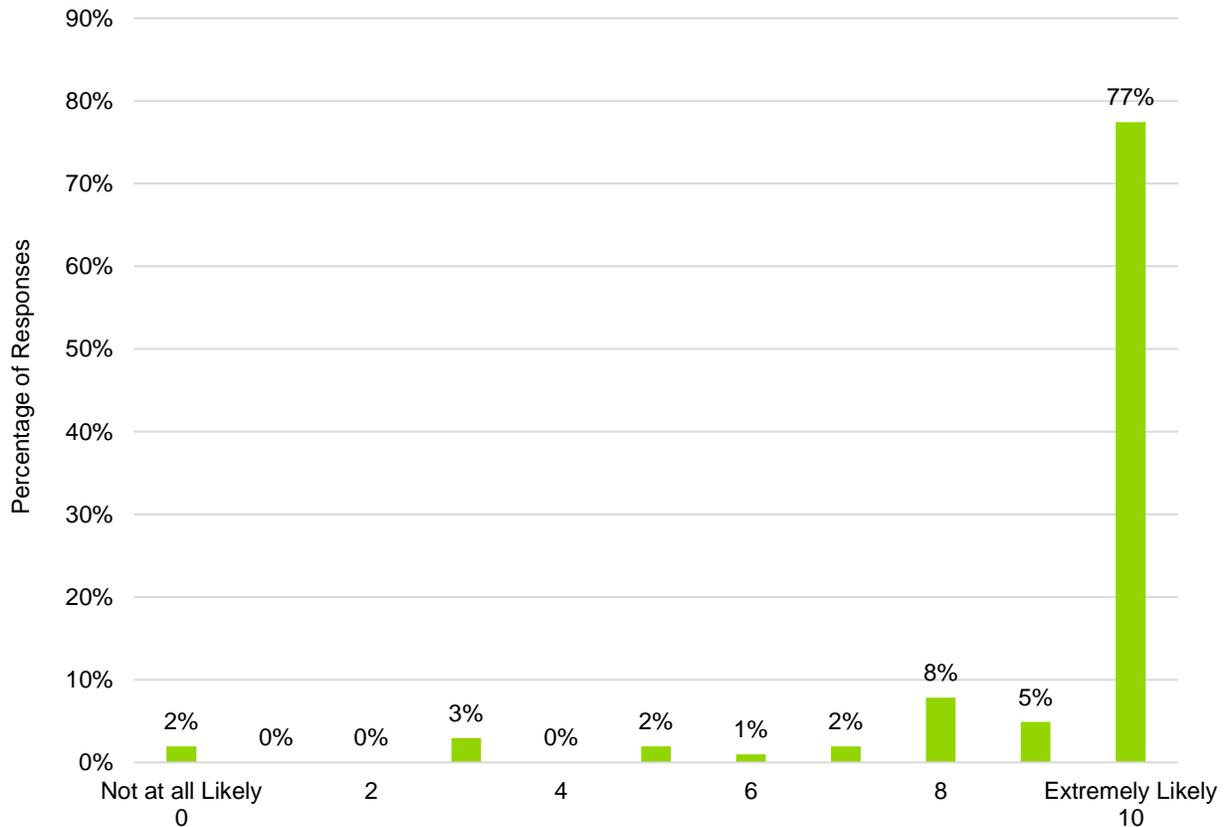
Figure 3-8. Satisfaction with Aspects of Free Energy Checkup and Energy Saving Kits



Source: Guidehouse analysis

The likelihood to recommend the component is high, as Figure 3-9. Single-Family shows, with most 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 for the Single-Family Income-Eligible component is 9.2 out of 10.

Figure 3-9. Single-Family Income-Eligible Likelihood to Recommend (n=102)



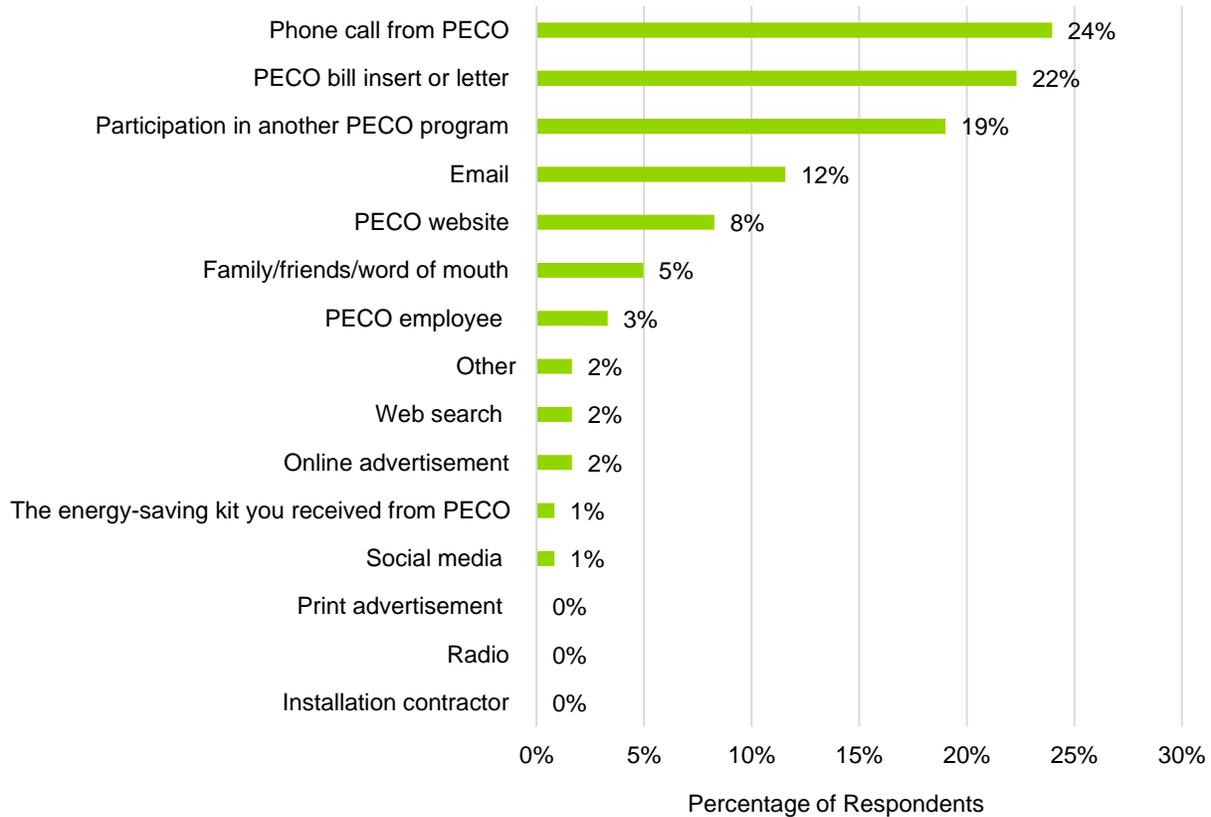
Respondents received the following question: “How likely are you to recommend PECO’s Free Energy Checkup program to others?”

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

Source: Guidehouse analysis

Figure 3-10 indicates that there is not one specific driver to respondents learning about the Income-Eligible EE Program. The most common information source for the Free Energy Checkup was a phone call from PECO (24%), followed by a PECO bill insert or letter (22%).

Figure 3-10. Sources of Single-Family Income-Eligible Component Awareness (n=104)



Respondents received the following question: “How did you learn about the Free Energy Checkup program? Select all that apply.”

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

Source: Guidehouse analysis

3.2.6 Program Finances and Cost-Effectiveness Reporting

Table 3-27 presents a detailed breakdown of program finances and cost-effectiveness. TRC benefits in Table 3-27 were calculated using gross verified impacts. NPV PY15 costs and benefits are expressed in 2023 dollars; Phase IV totals are in 2021 dollars.

Table 3-27. Summary of Program Finances – Gross Verified

Row	Cost Category*	PYTD (\$1,000)		P4TD (\$1,000)	
1	IMCs	\$6,173		\$15,626	
2	Rebates to Participants and Trade Allies	\$7,050		\$17,189	
3	Upstream/Midstream Incentives	\$0		\$0	
4	Material Cost for Self-Install Programs (EE&C Kits)	\$1,773		\$5,075	
5	Direct Installation Program Materials and Labor	\$0		\$12	
6	Participant Costs (row 1 minus the sum of rows 2 through 5)	(\$2,651)		(\$6,649)	
		EDC	CSP	EDC	CSP
7	Program Design	\$0	\$0	\$0	\$0

Row	Cost Category*	PYTD (\$1,000)		P4TD (\$1,000)	
8	Administration and Management	\$2,185	\$0	\$5,874	\$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)	\$2,185		\$5,874	
14	Total NPV TRC Costs (sum of rows 1 and 13)	\$8,358		\$21,500	
15	Total NPV Lifetime Electric Energy Benefits	\$7,821		\$19,034	
16	Total NPV Lifetime Electric Capacity Benefits	\$3,329		\$10,135	
17	Total NPV Lifetime O&M Benefits	\$387		\$3,212	
18	Total NPV Lifetime Fossil Fuel Impacts	(\$133)		(\$997)	
19	Total NPV Lifetime Water Impacts	\$21,579		\$50,779	
20	Total NPV TRC Benefits (sum of rows 15 through 19)	\$32,983		\$82,162	
21	TRC Benefit-Cost Ratio (row 20 divided by row 14)	3.95		3.82	

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

Source: Guidehouse analysis

Program financials and cost-effectiveness on a net savings basis are the same values as in Table 3-27 because verified net savings equal the verified gross savings for the Income-Eligible EE Program.

3.2.7 Status of Recommendations

The impact and process evaluation activities in PY15 led to the following findings and recommendations from Guidehouse to PECO (

Table 3-28), along with a summary of how PECO plans to address the recommendations in program delivery.

Table 3-28. Summary of IE EE Evaluation Recommendations

Component	Evaluation Activity	Finding	Recommendation	EDC Status
Single-Family Income-Eligible	Impact	Ex ante applies a non-zero IE to lighting in exterior spaces.	Set IE energy and demand to 0% for exterior spaces.	Under Consideration
Single-Family Income-Eligible	Impact	For low flow faucet aerators, reported savings used the space type of "Kitchen" for kit delivery rows; Guidehouse and SWE use "Unknown" for all kit delivery.	Use "Unknown" space type for kit delivery rows to increase reported Single-Family Income-Eligible energy savings by 2% and demand savings by 4%, which will better align the reported and verified savings.	Under Consideration
Single-Family Income-Eligible	Impact	Reported savings assume an average number of faucets per household to be equal to the number of aerators provided as part of the kit offering (one).	Guidehouse recommends using the TRM defaults if this site information is not collected.	Under Consideration
Single-Family Income-Eligible	Process	Three respondents expressed the need for additional instructions to install kit measures and 13 respondents (8% of respondents) were frustrated by broken/damaged measures or measures that are not useful to their household.	Consider providing instructional videos (via QR link) for installation of measures and how they can be useful in the home. Consider offering customers a line of communication to request a replacement if kit contents are damaged. Consider allowing customers to return measures (include or request a return label) or encouraging customers to share unused measures with a friend or neighbor rather than throwing them away.	Under Consideration
Single-Family Income-Eligible	Process	Three checkup respondents (3% of respondents who received a Free Energy Checkup) expressed frustration with improperly installed measures.	Consider setting up an automated follow-up email a couple weeks after the checkup with information on who to contact if participants have an issue. Consider also leaving contact information after the visit in case participants experience an issue.	Under Consideration
Single-Family Income-Eligible	Process	Four respondents expressed frustration that they did not see bill savings.	As bill savings are not a goal of the program, consider avoiding language that may imply that customers would see bill savings from their enrollment in this program. Instead, consider including messaging on increased comfort and improved energy efficiency.	Under Consideration
Single-Family Income-Eligible	Process	One respondent expressed frustration that Energy Advisors (CSP) could not answer questions about issues with their PECO electric service.	Consider providing an FAQ sheet for Energy Advisors to be able to answer common questions about the program and PECO more broadly, including who to contact at PECO for further information.	Under Consideration

Source: Guidehouse analysis

3.3 Residential HER Program

The objective of the Residential 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. Oracle implements the HER program 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.²⁴ During PY15, approximately 215,000 households received HERs across six active residential cohorts, with reports paused for five legacy residential cohorts.

3.3.1 Participation and Reported Savings by Customer Segment

Table 3-29. presents the participation counts, reported energy and demand savings, and incentive payments for the Residential HER Program in PY15 by customer segment. Participants are defined as HER recipients that have savings in at least one month during the program year.

Table 3-29. Residential HER Program Participation and Reported Impacts

Parameter	Residential (Non-IE)	Total
PY15 # Participants	214,617	214,617
PYRTD MWh/yr	21,810	21,810
PYRTD MW/yr	3.55	3.55
PY15 Incentives (\$1,000)	-	-

Source: Guidehouse analysis

3.3.2 Gross Impact Evaluation

Guidehouse evaluated savings for the six active residential HER cohorts in PY15. 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. Table 3-30. and Table 3-31. present evaluation results.

²⁴ 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 PY15, five residential cohorts active in Phase III or previously in Phase IV were not sent reports and thus do not claim savings.

Table 3-30. 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	21,810	0.99	-	-

Source: Guidehouse analysis

Table 3-31. 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	3.55	1.65	-	-

Source: Guidehouse analysis

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

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

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.²⁵

3.3.4 Verified Savings Estimates

In Table 3-32., the realization rates and NTGRs determined by Guidehouse are applied to the reported energy and demand savings estimates to calculate the verified savings estimates for the Residential HER Program in PY15.

²⁵ Pennsylvania Statewide Evaluator, *Evaluation Framework for Pennsylvania*, https://www.puc.pa.gov/media/1584/swe-phaseiv_evaluation_framework071621.pdf.

Table 3-32. Residential HER Program PY15 and P4TD Savings Summary

Savings Type	Energy (MWh/yr)	Demand (MW/yr)
PYRTD	21,810	3.55
PYVTD Gross	21,546	5.85
PYVTD Net	21,546	5.85
RTD	79,647	12.96
VTD Gross	79,148	16.79
VTD Net	79,148	16.79

Source: Guidehouse analysis

3.3.5 Process Evaluation

As described in the Phase IV Evaluation Plan²⁶ approved by the SWE, Guidehouse did not conduct in-depth process evaluation activities for the Residential HER Program in PY15. 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

Table 3-33. presents a detailed breakdown of program finances and cost-effectiveness. TRC benefits in Table 3-33. were calculated using gross verified impacts. NPV PY15 costs and benefits are expressed in 2023 dollars; Phase IV totals are in 2021 dollars.

Table 3-33. 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	\$1,777	\$0	\$5,784	\$0
9	Marketing	\$0	\$0	\$0	\$0
10	Program Delivery	\$0	\$0	\$0	\$0
11	EDC Evaluation Costs	\$0		\$0	
12	SWE Audit Costs	\$0		\$0	
13	Program Overhead Costs (sum of rows 7 through 12)	\$1,777		\$5,784	
14	Total NPV TRC Costs (sum of rows 1 and 13)	\$1,777		\$5,784	
15	Total NPV Lifetime Electric Energy Benefits	\$2,485		\$6,034	
16	Total NPV Lifetime Electric Capacity Benefits	\$4,439		\$8,817	

²⁶ Guidehouse, Phase IV Evaluation Plan.

Row	Cost Category*	PYTD (\$1,000)	P4TD (\$1,000)
17	Total NPV Lifetime O&M Benefits	\$0	\$0
18	Total NPV Lifetime Fossil Fuel Impacts	\$0	\$0
19	Total NPV Lifetime Water Impacts	\$0	\$0
20	Total NPV TRC Benefits (sum of rows 15 through 19)	\$6,925	\$14,851
21	TRC Benefit-Cost Ratio (row 20 divided by row 14)	3.90	2.57

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

Source: Guidehouse analysis

Program financials and cost-effectiveness on a net savings basis are the same values as in Table 3-33. because verified net savings equal the verified gross savings for the Residential HER Program.

3.3.7 Status of Recommendations

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

3.4 Income-Eligible HER Program

The Income-Eligible HER Program objective is to 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. Oracle implements the Income-Eligible HER program 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 toward low-cost and no-cost recommendations. The full content of HERs serves to encourage customers to reduce their consumption and enhance engagement and general satisfaction. The reports are sent to targeted cohorts of customers on an opt-out basis. During PY15, approximately 39,000 households received HERs for the two active IE cohorts.²⁷

3.4.1 Participation and Reported Savings by Customer Segment

Table 3-34. presents the participation counts, reported energy and demand savings, and incentive payments for the Income-Eligible HER Program in PY15 by customer segment. Participants are defined as HER recipients that have savings in at least one month during the program year.

Table 3-34. Income-Eligible HER Program Participation and Reported Impacts

Parameter	Income-Eligible	Total
PY15 # Participants	39,429	39,429
PYRTD MWh/yr	(83)	(83)
PYRTD MW/yr	(0.01)	(0.01)
PY15 Incentives (\$1,000)	-	-

Source: Guidehouse analysis

3.4.2 Gross Impact Evaluation

Guidehouse evaluated savings for two Income-Eligible HER cohorts. 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. Table 3-35. and Table 3-36 present evaluation results.

Table 3-35. 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	(83)	2.87	-	-

Source: Guidehouse analysis

²⁷ For PY15, one IE cohort was not sent reports until approximately halfway through the program year.

Table 3-36. 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	(0.01)	9.43	-	-

Source: Guidehouse analysis

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

- Guidehouse leveraged summer 2024 peak-hour metering data to conduct the peak demand analysis. Differences in data sources can drive discrepancies in reported and verified savings in either direction (e.g., using hourly data may provide a more accurate estimate of savings).
- Approximately 16% of the population of active HER recipients are in the IE cohort, all of which are in their first or third year of exposure. While measured savings typically trend upward in the first 3 years of exposure, savings for IE cohorts are highly variable and often statistically insignificant due to small group size and other potential influences on energy usage, such as income-based billing programs. Additionally, negative peak demand impacts in PY15 are contributed by a single wave in their first 2 months of exposure, before meaningful savings are expected to accrue. The legacy wave active in PY15 was reactivated after the summer months, but still achieved statistically significant peak demand savings.
- Income-Eligible 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. Savings for the legacy IE cohort in PY15 were statistically insignificant for seven months of the program year. For the new IE cohort, impacts varied by month but represented statistically significant increases in consumption in approximately half of the months in which they were treated.

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 Income-Eligible HER Program as per guidance from the SWE’s Evaluation Framework.²⁸

3.4.4 Verified Savings Estimates

In Table 3-37., the realization rates and NTGRs determined by Guidehouse are applied to the reported energy and demand savings estimates to calculate the verified savings estimates for the Income-Eligible HER Program in PY15.

²⁸ Pennsylvania Statewide Evaluator, *Evaluation Framework for Pennsylvania*, https://www.puc.pa.gov/media/1584/swe-phaseiv_evaluation_framework071621.pdf.

Table 3-37. Income-Eligible HER Program PY15 and P4TD Savings Summary

Savings Type	Energy (MWh/yr)	Demand (MW/yr)
PYRTD	(83)	(0.01)
PYVTD Gross	(237)	(0.13)
PYVTD Net	(237)	(0.13)
RTD	1,957	0.32
VTD Gross	1,667	(0.08)
VTD Net	1,667	(0.08)

Source: Guidehouse analysis

3.4.5 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 Income-Eligible HER Program in PY15. 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

Table 3-38. presents a detailed breakdown of program finances and cost-effectiveness. TRC benefits in Table 3-38. were calculated using gross verified impacts. NPV PY15 costs and benefits are expressed in 2023 dollars; Phase IV totals are in 2021 dollars.

Table 3-38. 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	\$25	\$0	\$186	\$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)	\$25		\$186	
14	Total NPV TRC Costs (sum of rows 1 and 13)	\$25		\$186	
15	Total NPV Lifetime Electric Energy Benefits	\$20		\$121	
16	Total NPV Lifetime Electric Capacity Benefits	\$39		\$94	
17	Total NPV Lifetime O&M Benefits	\$0		\$0	

²⁹ Guidehouse, Phase IV Evaluation Plan.

Row	Cost Category*	PYTD (\$1,000)	P4TD (\$1,000)
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)	\$60	\$215
21	TRC Benefit-Cost Ratio (row 20 divided by row 14)	2.43	1.16

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

Source: Guidehouse analysis

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

3.4.7 Status of Recommendations

The impact evaluation activities in PY15 led to the following finding and recommendation from Guidehouse to PECO, along with a summary of how PECO plans to address the recommendations in program delivery.

Table 3-39. Summary of IE HER Evaluation Recommendations

Component	Evaluation Activity	Finding	Recommendation	EDC Status
Income-Eligible HER	Impact	The IE HER program had overall negative savings in PY15.	Continue monitoring savings for the waves and consider adjusting the treatment schedule based on the performance throughout PY16.	In progress

Source: Guidehouse analysis

3.5 Non-Residential EE Program

The Non-Residential EE Program offers an array of opportunities to assist C&I customers in reducing their energy consumption and associated energy costs. The program encompasses a variety of energy efficiency components and measures to achieve this goal. Common measures within the Non-Residential EE Program include efficient lighting equipment, lighting controls, HVAC equipment, HVAC RCx, variable frequency drives (VFDs), refrigeration, and building automation systems, among others. New for PY15, the program added measures for solar photovoltaics (PV) savings and Building Operator Certification (BOC) training. DNV implements the Non-Residential EE Program, which is made up of four components:

- **Downstream Rebates:** The Downstream Rebates component, including Combined Heat and Power (CHP), includes both custom measures and prescriptive measures described by the TRM.³⁰ Baselines may be established as existing equipment (in situ), code minimum efficiency, or by using custom comparisons for custom projects. Downstream Rebates projects typically involve working directly with customers or with their contractors on potential projects and filling out an application for program incentives.
- **Midstream Rebates “Instant Discounts”:**³¹ The Midstream Rebates component involves working directly with distributors to incentivize efficient equipment by reducing the sale price at the point of sale (POS) for customers. Midstream Rebates measures are all prescriptive, with baselines predefined by the TRM and IMP documents. Midstream Rebates also encompasses an LED aggregation pathway (which captures savings from manufacturer and national distributor direct-to-consumer transactions that did not go through the POS pathway. In Phase IV, most Midstream Rebates participation goes through the POS pathway. The Midstream component includes more than lighting, but non-lighting participation accounts for only approximately 0.01% of energy savings, less than 0.05% of Midstream measure lines, and less than 0.002% of units incentivized through the Midstream program.
- **Small Business Direct Install:** The Small Business Direct Install component offers rebates to small businesses for the direct installation of energy efficiency measures to improve overall energy performance. Typical measure offerings include efficient lighting and lighting controls, refrigeration lighting, door gaskets, and efficient motors on refrigerators and freezers.
- **New Construction:** New Construction is the smallest component, targeting customers at the time of building design, before construction or major renovations. Implementing ECMs at the time of construction or renovation is often the most time 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

³⁰ Pennsylvania Public Utility Commission, *Technical Reference Manual*, <https://www.puc.pa.gov/filing-resources/issues-laws-regulations/act-129/technical-reference-manual/>.

³¹ “Midstream” is industry standard nomenclature used to describe this type of project in which incentives are provided at the distributor level and reflects the historical name for PECO’s Midstream Rebates component. The name of PECO’s Midstream Rebates component was changed in Phase IV to “Instant Discounts.” These two terms, Midstream Rebates and Instant Discounts, are used interchangeably throughout this report.

building must be compared with modern energy efficiency codes. Baselines for New Construction projects are established by city, county, and state energy efficiency codes.

3.5.1 Participation and Reported Savings by Customer Segment

Table 3-40. presents the participation counts, reported energy and demand savings, and incentive payments for the Non-Residential EE Program in PY15 by customer segment.

Table 3-40. 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
PY15 # Participants ¹	7,059	1,062	810	334	15	9,280
PYRTD MWh/yr	158,899	81,752	18,775	23,142	475	283,043
PYRTD MW/yr	34.43	13.26	4.29	4.30	-	56.28
PY15 Incentives (\$1,000)	33,768	11,208	5,504	3,911	104	54,495

¹ Participant counts include Comprehensive Project Pilot participants.

For the Non-Residential Program, 3,192 MWh and 0.01 MW of reported savings are unverified in PY15. These unverified savings are included in reported savings values and excluded from verified savings values.

Source: Guidehouse analysis

3.5.2 Gross Impact Evaluation

Guidehouse conducted the gross impact evaluation for the Non-Residential EE Program following the general approach outlined in its Evaluation Plan³² for PY15. In PY15, the Non-Residential EE Program gross impact evaluation included both a tracking database analysis of all prescriptive measures and project-specific M&V activities for a sample of projects from the Downstream Rebates, Midstream Rebates, and New Construction components.

Guidehouse also reviewed all RCx projects within the Downstream Rebates component to confirm savings calculations methods and the availability of post-measure data. Of the 33 total RCx projects, 29 of which used IPMVP Option C regression modeling, Guidehouse found four PY15 projects that lacked 12 months of post-measure data. These four projects were extracted and isolated as “unverified savings” until PY16 in line with a PY15 guidance memo issued by the SWE.³³ These projects will be considered as part of the PY16 population and subject to sampling as part of Guidehouse’s evaluation of the Downstream Rebates component in PY16. While unverified savings are included as part of reported savings in this report and excluded from verified savings, TDR and realization rates are shown relative to reported savings excluding unverified savings.

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

³² Guidehouse, *Phase IV Evaluation Plan*.

³³ In August 2023, SWE issued a guidance memo requiring all projects using IPMVP Option C, trend data, billing data, or AMI data, from pathways that typically would follow IPMVP Option C, to have at least 12 months of post-measure data. If 12 months of post-measure data would not be available for evaluation, those measures must be passed on as “unverified savings” until the following program year and evaluation.

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

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

- **Downstream Rebates:** The evaluation team conducted project-specific verification activities for a sample of 44 projects from the Downstream Rebates component in PY15.
- **Midstream Rebates:** The evaluation team conducted project-specific verification activities for a sample of 89 projects from the Midstream Rebates component in PY15.
- **Small Business Direct Install:** The evaluation team applied a combination of tracking database analysis results and PY14 verification ratio to the PY15 reported savings.
- **New Construction:** The evaluation team conducted project-specific verification activities for a sample of 13 projects from the New Construction component in PY15.

All samples were designed and implemented to meet the targets set in Guidehouse's sample design memo.³⁴ Table 3-41 outlines the PY15 impact evaluation targets and completions. Additional details of the impact evaluation completed in PY15 can be found in 4.2 Appendix G.

Table 3-41. Non-Residential Project Count by Evaluation Method

Component	Verification Level	Evaluation Target ¹	Number of Projects Evaluated
Downstream Rebates	Tracking Database Analysis	914	914
	Engineering Desk Review Only	0	10
	Phone Verification	36	23
	Onsite Verification	0	11
	Total Sampled Projects	36	44
Midstream Rebates	Tracking Database Analysis	11,862	11,862
	Engineering Desk Review Only	0	31
	Phone Verification	86	58
	Onsite Verification	0	0
	Total Sampled Projects	86	89
New Construction	Tracking Database Analysis	93	93
	Engineering Desk Review Only	0	2
	Phone Verification	13	9
	Onsite Verification	0	2
	Total Sampled Projects	13	13

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

Source: Guidehouse analysis

³⁴ Guidehouse, *PECO PY15 Nonresidential Impact Sample Design Memo Draft_6.27.2024*, dated June 27, 2024.

Table 3-42 and Table 3-43 present the PY15 evaluation realization rates and statistical relative precision for energy and demand, respectively.

Table 3-42. Non-Residential EE Program Gross Impact Results for Energy

Component	PYRTD MWh/yr	Energy Realization Rate	Sample CV or Error Ratio	Relative Precision at 85% C.L.
Downstream Rebates ¹	84,445	0.93	0.27	0.06
Midstream Rebates	162,967	1.04	0.57	0.09
Small Business Direct Install	23,054	0.97	0.19	0.06
New Construction	12,577	0.99	0.09	0.04
Program Total	283,043	0.99	0.46	0.06 [90% C.L.]

¹ For the Non-Residential Downstream Rebates component, 3,192 MWh of reported savings are unverified in PY15. These unverified savings are included in reported savings values and excluded from verified savings values and accompanying realization rates.

Note: Guidehouse conducted tracking database analysis for all components and primary data collection and analysis for the Downstream Rebates, Midstream Rebates, and New Construction components in PY15. Guidehouse applied the verification ratio from PY14 to the PY15 adjusted database savings for the Small Business Direct Install component.

Source: Guidehouse analysis

Table 3-43. Non-Residential EE Program Gross Impact Results for Demand

Component	PYRTD MW/yr	Demand Realization Rate	Sample CV or Error Ratio	Relative Precision at 85% C.L.
Downstream Rebates ¹	13.75	0.99	0.28	0.06
Midstream Rebates	34.93	1.05	0.58	0.09
Small Business Direct Install	5.54	0.93	0.27	0.08
New Construction	2.06	0.97	0.12	0.05
Program Total	56.28	1.02	0.49	0.07 [90% C.L.]

¹ For the Non-Residential Downstream Rebates component, 0.01 MW of reported savings are unverified in PY15. These unverified savings are included in reported savings values and excluded from verified savings values and accompanying realization rates.

Note: Guidehouse conducted tracking database analysis for all components and primary data collection and analysis for the Downstream Rebates, Midstream Rebates, and New Construction components in PY15. Guidehouse applied the verification ratio from PY14 to the PY15 adjusted database savings for the Small Business Direct Install component.

Source: Guidehouse analysis

The introduction to Section 3 describes the two-step evaluation method that results in the ratios that Table 3-44 and Table 3-45 show. The tracking database analysis is conducted annually while the verification ratio may be historical based on the evaluation plan.³⁵ The TDR and the verification ratio together represent the overall energy or demand realization rate. Unverified savings are subtracted from reported savings before the tracking database review step and therefore the TDR and realization rates shown are relative to reported savings excluding unverified savings.

Table 3-44. Non-Residential Energy Ratios

Component	Energy TDR	Energy Verification Ratio	Energy Realization Rate
Downstream Rebates	1.01	0.93	0.93

³⁵ Guidehouse, *Phase IV Evaluation Plan*.

Component	Energy TDR	Energy Verification Ratio	Energy Realization Rate
Midstream Rebates	1.00	1.04	1.04
Small Business Direct Install ¹	1.00	0.98	0.97
New Construction	0.97	1.01	0.99
Non-Residential Total	1.00	0.99	0.99

¹ The Small Business Direct Install verification ratio is from the PY14 analysis.

Source: Guidehouse analysis

Table 3-45. Non-Residential Demand Ratios

Component	Demand TDR	Demand Verification Ratio	Demand Realization Rate
Downstream Rebates	1.00	0.99	0.99
Midstream Rebates	1.00	1.06	1.05
Small Business Direct Install ¹	1.00	0.93	0.93
New Construction	0.97	1.00	0.97
Non-Residential Total	1.00	1.03	1.02

¹ The Small Business Direct Install verification ratio is from the PY14 analysis.

Source: Guidehouse analysis

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

3.5.2.1 Downstream Rebates

As illustrated by the ratios in Table 3-44 and Table 3-45, the Downstream Rebates realization rates were predominantly driven by the site-specific verification activities rather than the tracking database analysis. The site-specific verification activities most resulted in updating TRM-deemed parameters to site-specific values. Twenty-nine of the 44 sampled Downstream Rebates projects were lighting projects. 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 trend data. Updates to input parameters affected six of the 29 lighting projects. Updates to HOU were the most influential change for four of these six projects, with two increasing energy savings and two decreasing energy savings relative to the ex-ante savings estimates. Guidehouse also updated the CFs for these projects, with two projects experiencing increased CFs, and therefore increased demand savings, and two experiencing a significant decrease in the CF and demand savings. At the component level, these updates decreased both energy and demand savings.

One extremely large project included a typo for the wattage of the pre-existing fixtures, adding an extra zero. The reported baseline was 1,000 watts, instead of 100 watts, which inflated reported savings approximately tenfold. The Guidehouse team corrected this typo, resulting in 9% energy and demand realization rates for this specific project.

Guidehouse’s tracking data analysis identified several discrepancies with small overall impact on component-level realization rates. 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 value of 0.99. This was an early finding that Guidehouse reported to PECO and the CSP was able to fix the error partway through the year. For Evaporator Fan Controllers, the tracking database analysis identified that the reported energy

and demand savings did not include the fan motor efficiency and the load factor in the savings equations. Correcting this caused a threefold increase in the energy and demand realization rates for this measure. Lastly, for Floating Head Pressure Controls and High-Efficiency Evaporator Fan Motors for Walk-In or Reach-In Refrigerated Cases, the TRM provides a methodology to calculate motor input wattage from motor horsepower. The reported savings did not follow this algorithm, instead reporting horsepower and input wattages that did not agree.

3.5.2.2 Midstream Rebates

The Midstream Rebates component is built to streamline and simplify participation for customers. As such, minimal information is collected at the POS for the purchased energy efficient equipment, such as light bulbs and fixtures. Because limited information is collected at the POS, reported equipment HOU are assumed and deemed based on the building type identified through an address lookup. During evaluation, 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 89 sampled Midstream Rebates projects, updated HOU were the most significant change to energy savings for 15 projects,³⁶ updated lighting control types caused the most significant change to energy savings for five projects,³⁶ and updated heating or cooling types for two projects. For demand savings, updated CFs caused the most significant change for 15 projects, updated lighting control types caused the most significant change for five projects, and updated heating or cooling types for two projects.

In PY14, Guidehouse's tracking data analysis identified that the implementer assumed all fixtures and lamps purchased through the Midstream Rebates component were installed in comfort cooled spaces due to limited data collection. As a result of this assumption, lamps installed in exterior areas were incorrectly awarded extra savings. This was fixed partway through the PY15 evaluation year, but 820 projects were recorded prior to the fix. This change causes a 16% reduction in savings for the 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 Rebates component.

Guidehouse identified the space cooling type issue through tracking database analysis and confirmed them with engineering evaluations of sampled projects. For the Midstream Rebates component overall, the changes to HOU and CFs and their corresponding changes to energy and demand savings outweighed the other changes to savings, resulting in the realization rates found in Table 3-44 and Table 3-45.

Partway through the PY15 program year, the EDC and CSP identified an anomalous vendor in the tracking data³⁷ and took actions to rectify violations of the program rules.³⁸ Because the rigor

³⁶ Three projects overlap between the 15 projects that had HOU as the most influential factor and the five projects that had control type changes as the most influential factor; these three projects had HOU and control type changes as very influential factors.

³⁷ PECO Midstream Program rules dictate that participating customers purchasing fixtures must have the fixtures installed within 60 days of purchase transactions. One vendor in PY15 had been actively advertising and pursuing customers without planned projects and did not verify that installation of purchased fixtures occurred within the 60-day window.

³⁸ The EDC and CSP actively contacted each of the vendor's customers to assess whether their participation complied with program rules. Projects that were not in compliance were reversed and removed from the population tracking data.

of this review was limited to this one vendor, Guidehouse deemed this vendor to have been treated uniquely from other participating vendors. Therefore, projects from this vendor may not be representative of typical participating projects from the greater population, and projects from the general population may not be representative of projects from this specific vendor. Due to this uniqueness and lack of representativeness, Guidehouse created an additional sampling stratum specific to this vendor for the Midstream Rebates component evaluation.

3.5.2.3 Small Business Direct Install

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 the demand savings were incorrectly calculated for a portion of the Door Gasket for Walk-in and Reach-in measure. Thirty-three projects were using a kW/door savings value of 0.032, which corresponds to reach-in cooler systems. The TRM deemed kW/door savings value is 0.027 for walk-in coolers. For the PY15 analysis, Guidehouse applied strata-level verification ratios from PY14, resulting in an energy verification ratio of 0.98 and a demand verification ratio of 0.93.

3.5.2.4 New Construction

Guidehouse's tracking database analysis identified discrepancies that had a substantial impact on component-level savings and realization rates. The tracking database analysis revealed that eight projects were using lighting power density (LPD) greater than the baseline assigned in Table 3-12 in the PA TRM. Using a higher LPD led to overestimates of baseline wattage. Adjusting the LPD and recalculating the baseline wattage for these projects decreased or eliminated the energy and demand savings for some measures.

3.5.3 Net Impact Evaluation

As described in the Phase IV Evaluation Plan for PY15 and in Table 3-2, Guidehouse continued NTG research for the Non-Residential New Construction component, known to customers as PECO's Ways to Save program. The team did not receive enough responses to the New Construction NTG survey in PY14 and proposed to field additional surveys in PY15 to improve survey completion counts. The evaluation team used the NTG values established in PY13 for the Midstream Rebates component and values established in Phase III for the Small Business Direct Install component. Table 3-47. summarizes the component-level NTGR results for the Non-Residential New Construction component evaluated in PY14-PY15.

3.5.3.1 Methodology

Guidehouse followed the SWE's Evaluation Framework³⁹ for conducting NTG research and analysis for the Non-Residential EE Program. The SWE guidance included detail on gathering feedback from participants in the Non-Residential New Construction component of the program using self-reported customer surveys. This survey was part of the process evaluation survey efforts detailed in Section 3.5.5 and approved by the SWE prior to fielding.

The following describes the general methodology for estimating the Non-Residential EE Program NTGR including definitions of free ridership and spillover and how they are used to calculate the final NTGR. See Section G.1.2 Net Impact Evaluation and Section G.4.2 Net

³⁹ Pennsylvania Statewide Evaluator, *Evaluation Framework for Pennsylvania*, https://www.puc.pa.gov/media/1584/swe-phaseiv_evaluation_framework071621.pdf.

Impact Evaluation for further detail on the methodology and algorithms used to estimate component-level NTGRs in PY15:

- 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 1.0.
- Spillover:** The self-reported spillover 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 spillover result.

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

Equation 3-2. NTGR Equation

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

Where:

Free Ridership quantifies the percentage of savings (reduction in energy consumption or demand) from participants who would have implemented the measure in the absence of the program or component

Spillover quantifies the percentage reduction in energy consumption or demand (that is, additional savings) caused by the presence of the utility program; spillover savings happen when customers invest in additional energy efficient measures or activities without receiving a financial incentive from the program or component

3.5.3.2 NTG Results

Guidehouse completed surveys with nine New Construction component participants (four in PY14 and five in PY15). 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 3-46 shows the NTG results of the Non-Residential New Construction component.

Table 3-46. Non-Residential Program NTG Survey Sample Targets and Completes

Component	Program Year	Number Contacted	Target Completes	Actual Completes	Response Rate	Percentage Achieved
New Construction	PY14	44	17 (Census)	4	9%	24%
	PY15	70	17 (Census)	5	7%	29%
	Total	114	17 (Census)	9	8%	53%

Source: Guidehouse analysis

Table 3-47. Non-Residential EE Program Net Impact Evaluation Results

Component	PYVTD	Free Ridership	Spillover	NTGR	Relative Precision (@ 85% CL)
New Construction	12,396	0.74	0.04	0.30	1.18

Source: Guidehouse analysis

Free ridership increased 15% from PY11 (from 0.59 in PY11 to 0.74 in PY15) for the New Construction component.

3.5.4 Verified Savings Estimates

In Table 3-48., realization rates and NTGRs determined by Guidehouse are applied to the reported energy and demand savings estimates to calculate the verified net savings estimates for the Non-Residential EE Program in PY15.

Table 3-48. Non-Residential EE Program PY15 and P4TD Savings Summary

Savings Type	Energy (MWh/yr)	Demand (MW/yr)
PYRTD	283,043	56.28
PYVTD Gross ¹	280,317	57.61
PYVTD Net ¹	195,715	40.51
RTD	626,346	122.45
VTD Gross	634,833	123.21
VTD Net	433,573	84.86

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

Source: Guidehouse analysis

3.5.5 Process Evaluation

The PY15 process evaluation of the Non-Residential EE Program included PECO program manager and CSP staff interviews and a survey for participants of the New Construction component. This section summarizes the evaluation methods, data collection techniques, sample design, and key results related to the survey.

3.5.5.1 Methodology

The team interviewed the PECO program managers and CSP staff to understand the goals of the program in PY15, identify significant implementation changes, and identify areas of strength and areas of improvement. Guidehouse also conducted a survey of New Construction participants, as Table 3-49. outlines. The survey assessed customer satisfaction, likeliness to recommend the program to others (also known as net promoter score), and program awareness. The survey was fielded in conjunction with the NTG survey to reduce burden on the participant base. The survey is a continuation of the PY14 evaluation for the New Construction component, as the PY14 survey received an insufficient number of responses to conduct an evaluation. Survey responses described throughout include both PY14 and PY15 responses.

Table 3-49. Non-Residential EE Program Process Activities by Component

Component	PM/CSP Interview	Survey	Survey Recipient
Downstream Rebates	✓	-	N/A
Midstream Rebates	✓	-	N/A
Small Business Direct Install	✓	-	N/A
New Construction	✓	✓	Participant

Source: Guidehouse analysis

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

As Table 3-50. presents across PY14 and PY15, Guidehouse created target completes for the New Construction component based on eTRACK+ participation data. A sample design memo was reviewed and approved by the SWE prior to survey fielding. In PY14, Guidehouse took a census approach to surveying participants. The target completes listed below were determined in PY15 for the PY14 and PY15 survey results. For the process evaluation, Guidehouse used only survey completes⁴⁰ 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.

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

Table 3-50. Non-Residential Sample Targets and Completes

Component	Stratum	Number Contacted	Target Completes	Actual Completes	Response Rate	Percentage Achieved
New Construction	Very high impact (project savings ≥ 1,000 MWh) ¹	2	1 (census)	0	0%	0%
	High impact (150 MWh ≤ project savings < 1,000 MWh)	17	5	4	24%	80%
	Low impact (10 MWh ≤ project savings < 150 MWh)	56	7	5	9%	71%
	Very low impact (project savings < 10 MWh)	25	0	0	0%	100%
	Total		100	13	9	9%

1 Any projects greater than 500 MWh in the very high impact strata and attempted a census.

Source: Guidehouse analysis

Guidehouse anticipated that the New Construction component may not meet its target completes and took extra steps to bolster response rates and survey completes. These steps

⁴⁰ 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.

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 a \$100 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 want to complete the survey did not receive a second or third phone call, if applicable.
- **PECO reminder:** In PY14, 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. In PY15, Guidehouse provided PECO an email template and the list of customers (name and email only) from all strata. Prior to the initial survey invitation from Guidehouse, PECO sent an email to the first wave of customers surveyed encouraging them to complete the survey. PECO also sent an email to the second wave of customers surveyed after they received the initial invite from Guidehouse, reminding them to complete the survey.

Table 3-51. summarizes the implementation of these efforts.

Table 3-51. Non-Residential Survey Approach

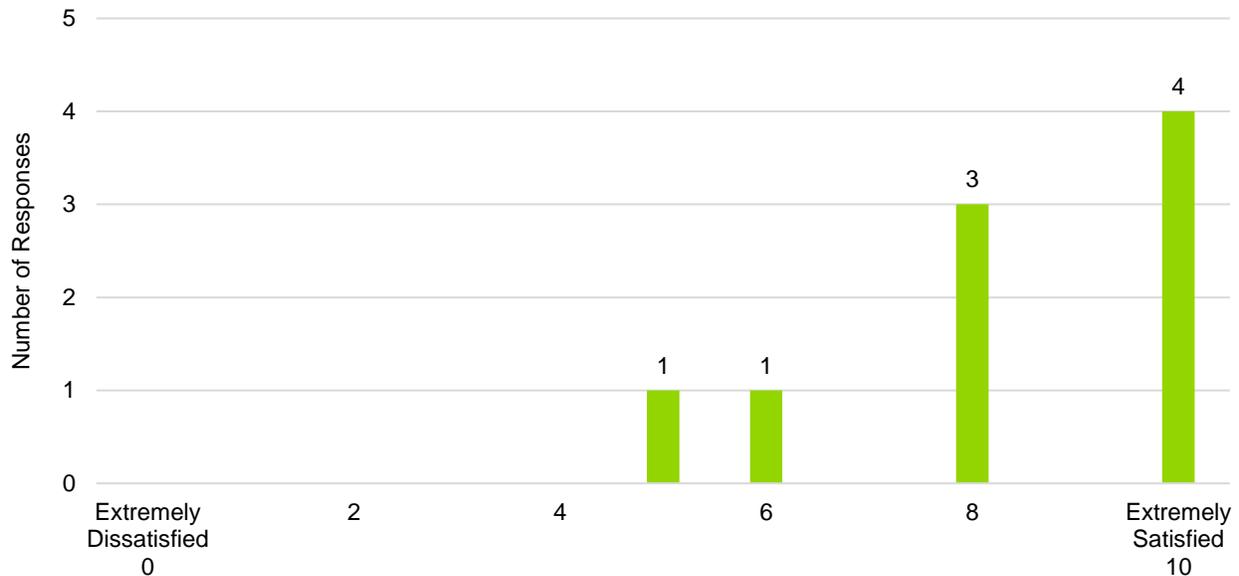
Component	Percentage of Total Target Achieved	Incentive Offered	Phone Calls	PECO Email
New Construction	69%	\$100	Up to three phone calls per participant	Yes

Source: Guidehouse analysis

3.5.5.2 Key Findings from Process Evaluation

As Figure 3-11 shows, respondents were overall satisfied with PECO’s Non-Residential EE Program New Construction component. Four out of nine respondents listed their satisfaction as a 10 out of 10, using a scale where 0 is “extremely dissatisfied” and 10 is “extremely satisfied.”

Figure 3-11. Non-Residential New Construction Component Overall Satisfaction (n=9)



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

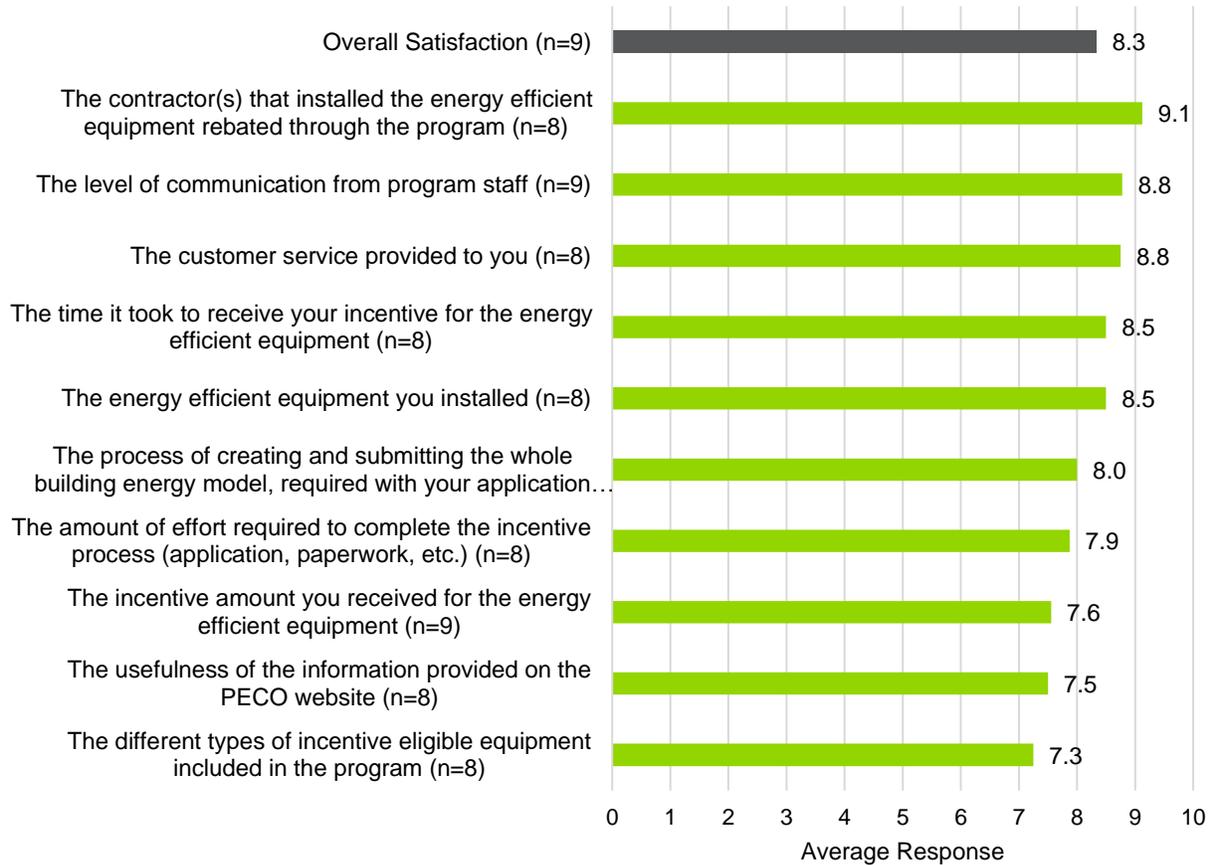
Guidehouse excluded “don’t know” responses from analysis.

Source: Guidehouse analysis

The mean satisfaction score for Non-Residential New Construction reflects high levels of satisfaction, as Figure 3-12 shows. The mean satisfaction for the component overall is 8.3 out of 10, using a scale where 0 is “extremely dissatisfied” and 10 is “extremely satisfied.”

Respondents reported the highest satisfaction with aspects related to staff interaction: the contractor(s) that installed the equipment (9.1 out of 10, n=8); the level of communication from program staff (8.8, n=9); and the customer service provided (8.8, n=8). Respondents reported the lowest satisfaction with the different types of incentive-eligible equipment (7.3, n=8), the usefulness of the information on the website (7.5, n=8), and the incentive amount (7.6, n=9).

Figure 3-12. Non-Residential New Construction Component Satisfaction (n=9)



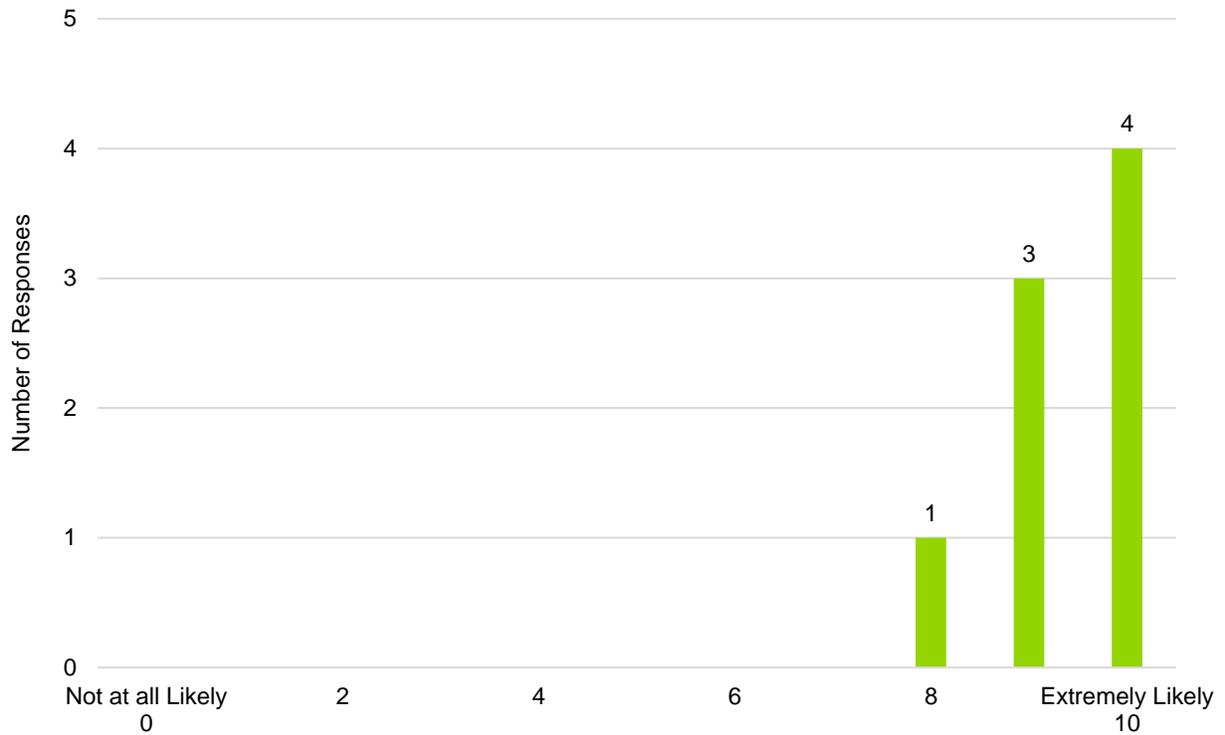
Respondents received the following question: “How would you rate your satisfaction with PECO Ways to Save overall?”

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

Source: Guidehouse analysis

The mean likelihood to recommend PECO’s Non-Residential New Construction is high, as Figure 3-13 shows, 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 PY14 and PY15 is 9.4 out of 10.

Figure 3-13. Non-Residential New Construction Component Likelihood to Recommend (n=8)

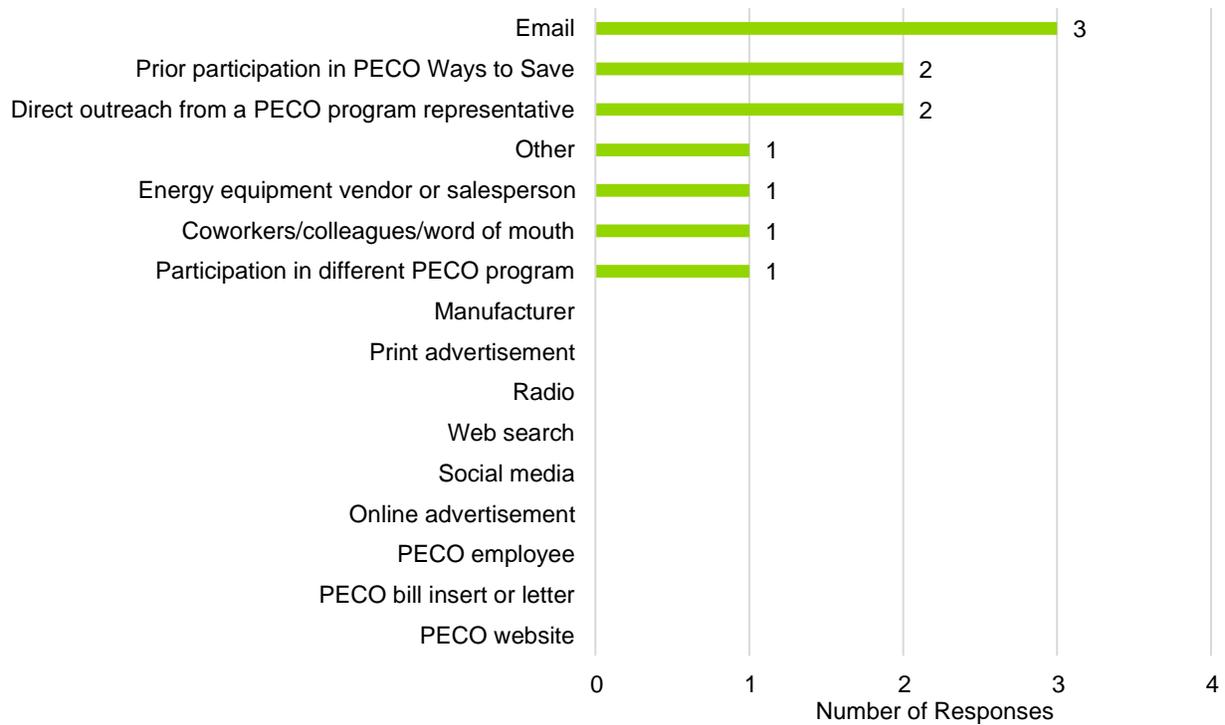


Respondents received the following question: “How likely are you to recommend PECO Ways to Save to others?” Guidehouse excluded “don’t know” responses from analysis.

Source: Guidehouse analysis

Figure 3-14 indicates that there is not one single way that respondents learn about the Non-Residential New Construction. The most common information source is emails received from PECO (three respondents), prior program participation (two respondents), and direct outreach from a PECO representative for New Construction (two respondents).

Figure 3-14. Sources of Non-Residential New Construction Component Awareness (n=9)



Respondents received the following question: “How did you learn about PECO Ways to Save? Select all that apply.” Guidehouse excluded “don’t know” responses from analysis.

Source: Guidehouse analysis

Detailed findings are presented by component in 4.2Appendix G.

3.5.6 Program Finances and Cost-Effectiveness Reporting

Table 3-52 presents a detailed breakdown of program finances and cost-effectiveness. TRC benefits in Table 3-52 were calculated using gross verified impacts. NPV PY15 costs and benefits are expressed in 2023 dollars; Phase IV totals are in 2021 dollars.

Table 3-52. Summary of Program Finances – Gross Verified

Row	Cost Category*	PYTD (\$1,000)		P4TD (\$1,000)	
1	IMCs	\$85,141		\$271,819	
2	Rebates to Participants and Trade Allies	\$12,429		\$34,301	
3	Upstream/Midstream Incentives	\$31,358		\$54,719	
4	Material Cost for Self-Install Programs (EE&C Kits)	\$0		\$0	
5	Direct Installation Program Materials and Labor	\$10,707		\$15,628	
6	Participant Costs (row 1 minus the sum of rows 2 through 5)	\$30,646		\$167,172	
		EDC	CSP	EDC	CSP
7	Program Design	\$0	\$0	\$0	\$0
8	Administration and Management	\$14,157	\$0	\$34,267	\$0

Row	Cost Category*	PYTD (\$1,000)		P4TD (\$1,000)	
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)	\$14,157		\$34,267	
14	Total NPV TRC Costs (sum of rows 1 and 13)	\$99,298		\$306,086	
15	Total NPV Lifetime Electric Energy Benefits	\$75,151		\$175,846	
16	Total NPV Lifetime Electric Capacity Benefits	\$72,446		\$149,486	
17	Total NPV Lifetime O&M Benefits	\$17,417		\$32,626	
18	Total NPV Lifetime Fossil Fuel Impacts	(\$9,540)		(\$25,879)	
19	Total NPV Lifetime Water Impacts	\$0		\$0	
20	Total NPV TRC Benefits (sum of rows 15 through 19)	\$155,474		\$332,079	
21	TRC Benefit-Cost Ratio (row 20 divided by row 14)	1.57		1.08	

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

Source: Guidehouse analysis

Table 3-53. presents program financials and cost-effectiveness on a net savings basis. Guidehouse conducted primary NTGR data collection and analysis for the Non-Residential Downstream Rebates component in PY15. For the other program components, Guidehouse applied NTGRs from the most recent analysis year. Table 2-5 summarizes the NTGRs.

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

Table 3-53. Summary of Program Finances – Net Verified

Row	Cost Category*	PYTD (\$1,000)		P4TD (\$1,000)	
1	IMCs	\$59,445		\$185,112	
2	Rebates to Participants and Trade Allies	\$12,429		\$34,301	
3	Upstream/Midstream Incentives	\$31,358		\$54,719	
4	Material Cost for Self-Install Programs (EE&C Kits)	\$0		\$0	
5	Direct Installation Program Materials and Labor	\$10,707		\$15,628	
6	Participant Costs (row 1 minus the sum of rows 2 through 5)	\$4,950		\$80,464	
		EDC	CSP	EDC	CSP
7	Program Design	\$0	\$0	\$0	\$0
8	Administration and Management	\$14,157	\$0	\$34,267	\$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)	\$14,157		\$34,267	

Row	Cost Category*	PYTD (\$1,000)	P4TD (\$1,000)
14	Total NPV TRC Costs (sum of rows 1 and 13)	\$73,602	\$219,379
15	Total NPV Lifetime Electric Energy Benefits	\$52,470	\$119,782
16	Total NPV Lifetime Electric Capacity Benefits	\$50,581	\$102,386
17	Total NPV Lifetime O&M Benefits	\$12,160	\$22,498
18	Total NPV Lifetime Fossil Fuel Impacts	(\$6,661)	(\$17,420)
19	Total NPV Lifetime Water Impacts	\$0	\$0
20	Total NPV TRC Benefits (sum of rows 15 through 19)	\$108,551	\$227,245
21	TRC Benefit-Cost Ratio (row 20 divided by row 14)	1.47	1.04

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

Source: Guidehouse analysis

3.5.7 Status of Recommendations

The impact and process evaluation activities in PY15 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 3-54. Summary of Non-Residential EE Evaluation Recommendations

Component	Evaluation Activity	Finding	Recommendation	EDC Status
Downstream Rebates	Impact	One extra-large project, PRJ-03604, included a typo in the baseline fixture wattage, reporting 1000 W fixtures instead of the pre-existing baseline 100 W fixtures, being replaced by 13 W LEDs. This resulted in a 9% realization rate for this project and reduced program project and program savings by 3.4 GWh and 390 kW. This project was an extra-large census project, so this realization rate was not extrapolated to any other projects.	Thoroughly review ex ante calculations so that the project fixtures, lighting power densities, and savings magnitudes align with expectations, prior to finalizing the project savings estimate. Create an automated flag for additional review if the efficient fixture wattage is less than 10% of the baseline fixture wattage.	In Progress
Downstream Rebates	Impact	For the TRM measure Controls: Evaporator Fan Controllers (Section 3.5.3), the ex-ante estimates calculated the $kW = HP * 0.746$. The correct equation per the TRM is $kW = HP * 0.746 / n * LF$ where n is the efficiency of the fan and LF is the load factor. Correcting this caused the energy and demand realization rates to be 3.0 for these nine measures.	Use TRM equations in Section 3.5.3 including the fan efficiency.	Implemented
Downstream Rebates	Impact	For some projects and measures, including Controls: Floating Head Pressure Controls (Section 3.5.4) and High-Efficiency Evaporator Fan Motors for Walk-In or Reach-In Refrigerated Cases, the ex-ante horsepower and kW do not correspond to the same power. Using the horsepower nameplate values leads to variability in realization rates. The overall energy realization rate was 1.4 across the 14 measures in the sample as a result of this finding.	Use consistent values across columns that report the same efficiency metric in different units. Remove values that are not used in calculations.	In Progress
Downstream Rebates	Impact	For some RCx project calculations, Baltimore weather files are used instead of those local to PECO service territory. Affected projects were PRJ-03987, PRJ-25055, and PRJ-35010.	Use TMY3 weather data that is close to project sites (likely Philadelphia).	Implemented
Downstream Rebates	Impact	PRJ-05698-2023 implemented controls that allowed HVAC equipment to be shut down or turned back during holidays. Ex ante savings calculations assumed 10-11 holidays per year, and that the HVAC system would be set back for all of them. The actual holiday schedule was confirmed via a combination of site interviews and review of AMI data. Guidehouse found that the system was not automated and had to be manually pre-set for each individual holiday to deactivate the HVAC for that one day, and that was only done for 4-5 holidays per year. For PRJ-00512-2021, ex ante savings assumed 24/7/365 operation for a chiller plant. A site interview confirmed the plant is only operational April to October.	Guidehouse recommends confirming operational parameters with sites via site contact interviews and by reviewing site AMI data, including HOU and holidays.	Under Consideration

Component	Evaluation Activity	Finding	Recommendation	EDC Status
Downstream Rebates	Impact	PRJ-25045-2023 ex ante savings calculations listed all incentivized equipment as freezers. Site interviews revealed a mix of coolers and freezers, which reduced the savings.	Confirm installed equipment matches savings calculations before finalizing ex ante savings.	Implemented
Downstream Rebates	Impact	PRJ-35010-2024 appeared to repurpose an existing calculation tool but may not have updated calculations or inputs. The project is for a building that does not have an air-side economizer, but calculations were for a building with one. Additionally, the calculations appeared to include a few oversights, affecting differences in reported versus verified savings: minimum outside air is fixed for this building, but this was not accounted for; latent cooling was not included in reported savings calculations; actual trend data was not used for fan speed or return air temperature inputs; and fan affinity laws were not used for fan power.	Carefully review ex ante calculations to verify they are representative of the participating building. Avoid repurposing existing calculators that may not be good fits for the current project. When repurposing calculators, review all assumptions in comparison with the active project. Have HVAC calculations reviewed for quality by an HVAC expert to promote the use of HVAC calculation best practices.	Implemented
Downstream Rebates	Impact	PRJ-02085 ex ante savings do not account for load factor or efficiency in VFD calculations.	Apply all TRM parameters to the VFD projects.	Implemented
Downstream Rebates	Impact	For the lighting project PRJ-35164-2024, the savings provided in the lighting application did not match the savings in the program database.	Cross-reference the savings database with individual project files to promote congruency.	In Progress
Midstream Rebates	Impact	Two projects, ORD-25765-B6P5W8-3854616008 and ORD-17900-Z9S7Y7-4237501703, did not receive any fixtures and did not have a plan in place to install any. ORD-24992-D3G4X8-7392701300 only installed 10 of 49 incentivized fixtures and had no plan or gave no indication that remaining fixtures were to be installed in the future. All three of these projects were from the same vendor.	Guidehouse recommends thorough review and reiteration of program rules with all new and existing vendors. Additionally, Guidehouse recommends reviewing the sales trends and patterns of vendors to identify any anomalous or suspicious trends. Vendors lacking brick-and-mortar physical locations should receive extra review and QA/QC.	In Progress
Downstream Rebates	Impact	Solar measures cannot be identified on the measures tab in the eTRACK+ data.	Use the Measure Name or Measure Category fields to identify solar PV projects.	Implemented
Downstream Rebates	Impact	In the tracking data, some measures associated with New Construction projects were labeled as Downstream Rebates projects despite other measures for the same project being labeled as New Construction.	All measures from individual projects should be assigned the same program component. If additional measures are part of a separate program component, they should receive a unique Job ID under that program component.	Implemented
Midstream Rebates	Impact	306 individual midstream Job IDs are associated with multiple invoices pertaining to multiple Premises, Customer IDs, and Bill Accounts. Examples include ORD-17059-D0K2T2-5411001101 and ORD-25976-D0L6D9-512222007.	Separate invoices serving separate Premises, Bill Accounts, or Customer IDs should be given separate project numbers. A single project (Job ID) should pertain to a single Premise and a single Customer.	Implemented

Component	Evaluation Activity	Finding	Recommendation	EDC Status
New Construction	Process	Respondents reported the highest satisfaction with aspects related to component staff interaction: the contractor(s) that installed the equipment (9.1 out of 10, n=8); the level of communication from component staff (8.8, n=9); and the customer service provided (8.8, n=8). Respondents reported the lowest satisfaction with the types of incentive-eligible equipment (7.3, n=8), the usefulness of the information on the website (7.5, n=8), and the incentive amount (7.6, n=9).	Involve PECO Energy Experts as early as possible with potential participants. Energy Experts can guide participants, helping them to maximize incentive amounts and understand all options available to them.	In Progress

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 PY15. The columns in Table 4-1. are adapted from the Direct Program Cost categories in the Commission’s EE&C Plan template⁴¹ 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.⁴²

Table 4-1. PY15 Program and Portfolio Total Finances (\$1,000)

Program	Incentives	Non-Incentives	Total Cost
Residential	\$6,871	\$5,767	\$12,638
Income-Eligible	\$8,824	\$2,185	\$11,009
Residential HER	\$0	\$1,777	\$1,777
Income-Eligible HER	\$0	\$25	\$25
Non-Residential	\$54,495	\$14,157	\$68,652
Common Portfolio Costs¹			\$10,327
Portfolio Total	\$70,189	\$23,911	\$104,427
SWE Costs²	-	-	-
Portfolio Total	\$70,189	\$23,911	\$104,427

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	\$20,567	\$17,382	\$37,950
Income-Eligible	\$20,748	\$5,874	\$26,621
Residential HER	\$0	\$5,784	\$5,784
Income-Eligible HER	\$0	\$186	\$186
Non-Residential	\$104,797	\$34,267	\$139,064
Common Portfolio Costs¹			\$31,940
Portfolio Total	\$146,113	\$63,494	\$241,546
SWE Costs²	-	-	-

⁴¹ Pennsylvania Public Utility Commission, *State of Pennsylvania Act 129 Energy Efficiency Conservation Plan Template*, September 9, 2020, <https://www.puc.pa.gov/pcdocs/1676672.docx>.

⁴² 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	\$146,113	\$63,494	\$241,546

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 verify that the electric rate classes that finance the programs are the rate classes that receive the direct energy conservation benefits. Cost recovery is governed by tariffed rate class, so it is necessarily tied to the way customers are metered and charged for electric service. Readers should be mindful of the differences between Table 4-3. and Section 2.3. For example, the IE customer segment is a subset of PECO’s residential tariff(s) and therefore not listed in Table 4-3..

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

Cost-Recovery Sector	Rate Classes Included ¹	PY15 Spending (\$1,000)	P4TD Spending (\$1,000)
Residential	R, RH, and CAP	\$29,374	\$84,175
Small C&I	GS	\$51,330	\$93,740
Large C&I	PD, HT, and EP	\$23,556	\$62,789
Municipal	SLE, AL, and TLCL	\$167	\$843
Portfolio Total	All	\$104,427	\$241,547

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 in-person multifamily site inspections at 18 multifamily complexes 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 Table A-1 shows their findings.

Table A-1. PY15 Residential Multifamily Site Visit Summary

Stratum	Completed Site Visits	Onsite Tasks	Summary of Findings, Updates, and Impacts
Residential and Income-Eligible Multifamily – Standard and High Impact	18	Verify installation of measures, including quantity of measures installed (nightlights, advanced power strips, and ENERGY STAR lighting) and any issues with installation.	The site visits resulted in very small 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 13 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, Table A-2.

Table A-2. PY15 Non-Residential Site Visit Summary

Component	Update from Onsite	Type of Project	Onsite Tasks	Summary of Findings, Updates, and Impacts
New Construction	No	Lighting + HVAC	Review building EMS to confirm operating schedules, temperature setpoints and setbacks, and lighting/HVAC system controls/configuration.	The evaluator accepted the ex-ante savings without any adjustment. The system configurations observed onsite were in line with project documentation. The evaluator compared actual annual consumption acquired onsite with proposed eQuest modeled consumption. The actual was within 2% of the modeled consumption thereby validating the model.
Downstream Rebates	Yes	RCX	Verify system component scheduling via the building automation system (BAS) and acquire trend data.	The investigation of the BAS required a system scheduling adjustment. The project engineer confirmed with the BAS and the site engineer that building holiday scheduling was not as extensive as was claimed. This was confirmed by analyzing trend data gathered onsite.
Downstream Rebates	Yes	Lighting	Verify fixture type and quantities, model numbers, wattages, facility type, and hours of operation.	Ex ante calculations used the TRM deemed HOU and CF values for School/University for all line items. The evaluator split out the fixtures into site-specific usage groups based on information gathered onsite and from customer interviews. There is a significant reduction in peak demand savings because most of the fixtures reportedly do not operate much during the peak coincident period.

Component	Update from Onsite	Type of Project	Onsite Tasks	Summary of Findings, Updates, and Impacts
Downstream Rebates	Yes	Lighting	Verify fixture quantities, model numbers, wattages, controls, building and space types, equipment operating hours, and space conditioning. Confirm the fixture models and quantities controlled by the occupancy sensors.	Exterior lighting HOU was verified during site visit to substantially differ (>10%) from TRM values, leading to a savings adjustment.
Downstream Rebates	No	Lighting	Verify fixture quantities, types, wattages, HOU, and controls.	No adjustments were made to ex ante savings calculations based on onsite findings. Guidehouse verified a sample of streetlight locations and operational criteria during the site visit.
Downstream Rebates	Yes	Solar	Review production data from the site to compare against modeled savings/generation data, as well as gather additional trend data.	It was found that the solar panels installed on site are different from the spec sheet received in the project documentation, leading to a savings adjustment.
Downstream Rebates	Yes	RCX	Gather trend data, document BAS scheduling of HVAC equipment, and confirm controls integration	The project engineer determined that the project documentation accounted for equipment or controls that were not present at the facility (air-side economizers, ventilation control configuration). Onsite also revealed that occupancy had changed significantly from project baseline and performance period, which inflated ex ante savings (determined by regression model). Project engineer gathered trend data used to update savings calculations.
New Construction	Yes	Lighting	Verify the fixture models and quantities, presence of occupancy sensors, facility type and spaces where the fixtures were installed, HOU, and the heating and cooling type(s).	Slight change in HOU resulting from onsite interview with customer.
Downstream Rebates	Yes	HVAC	Obtain fan speed trend data, document readings from VFD screens for kW load of each fan, note kW and speed for each unit, clarify why no HVAC savings are claimed, verify/document motor and VFD nameplates.	Trend data and loading information obtained from the onsite led to savings adjustment. Onsite also confirmed that two fans listed as standby in ex ante calculations were actually active.
Downstream Rebates	Yes	HVAC	Obtain nameplate and efficiency details for incentivized equipment. Obtain trend data for equipment, or document screenshots of schedules if unavailable. Investigate if any recent changes have been made to the building that would affect billing energy usage.	Trend data acquired led to savings adjustment. Ex ante calculations used an average load instead of measured values.

Component	Update from Onsite	Type of Project	Onsite Tasks	Summary of Findings, Updates, and Impacts
Downstream Rebates	Yes	Lighting	Confirm claimed baseline fixture wattage.	Baseline lights were confirmed to be an order of magnitude lower than what was listed in ex ante savings calculations.
Downstream Rebates	Yes	Custom	Clarify the baseline system used to compare for savings. Confirm no other factors would affect usage at the site.	System confirmed as described in project documentation. Project engineer confirmed details of the unique energy efficiency measure and verified calculation approach.
Downstream Rebates	Yes	Lighting	Confirm lighting installation and operation and site meter number. Determine HOU based on building schedule.	Site visit found two exterior lights not installed, controls discrepancies, and minor HOU discrepancies.

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 8% of total portfolio energy savings and 9% of total portfolio demand savings. Oracle implements the HER programs.

B.1 Billing Data Management

Guidehouse used monthly billing data from Oracle to perform the energy savings analysis. 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 (June 1, 2023) 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.⁴³
- 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,⁴⁴ 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.⁴⁵ 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.

⁴³ Pennsylvania Statewide Evaluator, "Section 6.1.4 Data Management," *Evaluation Framework for Pennsylvania*, https://www.puc.pa.gov/media/1584/swe-phaseiv_evaluation_framework071621.pdf.

⁴⁴ Pennsylvania Statewide Evaluator, "Section 6.1.4.1 Outlier Detection and Removal," *Evaluation Framework for Pennsylvania*, https://www.puc.pa.gov/media/1584/swe-phaseiv_evaluation_framework071621.pdf.

⁴⁵ Pennsylvania Statewide Evaluator, "Section 6.1.5 Model Specification," *Evaluation Framework for Pennsylvania*, https://www.puc.pa.gov/media/1584/swe-phaseiv_evaluation_framework071621.pdf.

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.⁴⁶ The precisions in

⁴⁶ Pennsylvania Statewide Evaluator, *Evaluation Framework for Pennsylvania*, https://www.puc.pa.gov/media/1584/swe-phaseiv_evaluation_framework071621.pdf.

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 1		Wave 2		Wave 4		Wave 5 Dual Fuel		Wave 6 Dual Fuel		Wave 6 Electric Only		Wave 7 IE		Wave 8 Low Income	
	ATE	Std. Err.	ATE	Std. Err.	ATE	Std. Err.	ATE	Std. Err.	ATE	Std. Err.	ATE	Std. Err.	ATE	Std. Err.	ATE	Std. Err.
Jun 2023	-0.378	0.152	-1.07	0.25	-0.288	0.118	-0.115	0.231	-0.654	0.384	-0.276	0.211	-0.242	0.108	0.000	0.000
Jul 2023	-0.485	0.170	-1.23	0.28	-0.447	0.143	-0.401	0.277	-0.859	0.480	-0.386	0.256	-0.384	0.135	0.226	0.100
Aug 2023	-0.379	0.170	-1.13	0.27	-0.453	0.137	-0.418	0.264	-0.968	0.462	-0.451	0.247	-0.273	0.132	0.214	0.097
Sep 2023	-0.293	0.145	-0.94	0.23	-0.326	0.109	-0.092	0.211	-1.199	0.390	-0.422	0.206	-0.153	0.105	0.164	0.081
Oct 2023	-0.328	0.132	-0.66	0.19	-0.211	0.086	-0.044	0.174	-1.132	0.315	-0.471	0.189	-0.034	0.095	0.149	0.081
Nov 2023	-0.668	0.188	-0.71	0.24	-0.265	0.112	0.090	0.198	-0.895	0.351	-0.679	0.260	-0.095	0.142	-0.048	0.117
Dec 2023	-0.967	0.224	-1.01	0.29	-0.253	0.133	0.102	0.224	-0.896	0.404	-0.873	0.311	-0.108	0.169	0.121	0.135
Jan 2024	-1.053	0.251	-1.27	0.32	-0.267	0.144	0.097	0.240	-0.969	0.421	-1.031	0.344	-0.152	0.187	0.027	0.149
Feb 2024	-0.850	0.233	-1.16	0.30	-0.298	0.134	0.122	0.222	-0.776	0.415	-1.195	0.322	-0.204	0.174	0.001	0.141
Mar 2024	-0.714	0.190	-0.89	0.25	-0.235	0.113	0.027	0.204	-0.646	0.356	-1.161	0.261	-0.249	0.146	0.047	0.118
Apr 2024	-0.520	0.152	-0.77	0.22	-0.252	0.097	-0.012	0.185	-0.429	0.331	-1.020	0.209	-0.265	0.111	0.003	0.092
May 2024	-0.326	0.150	-0.80	0.24	-0.379	0.107	-0.037	0.204	-0.401	0.375	-0.645	0.205	-0.261	0.101	-0.079	0.084

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 1		Wave 2		Wave 4		Wave 5 Dual Fuel		Wave 6 Dual Fuel		Wave 6 Electric Only		Wave 7 IE		Wave 8 Low Income	
	% Savings	Abs. Prec.	% Savings	Abs. Prec.	% Savings	Abs. Prec.	% Savings	Abs. Prec.	% Savings	Abs. Prec.	% Savings	Abs. Prec.	% Savings	Abs. Prec.	% Savings	Abs. Prec.
Jun 2023	1.25%	0.98%	1.90%	0.88%	0.93%	0.75%	0.36%	1.43%	1.33%	1.53%	0.70%	1.05%	1.18%	1.03%	0.00%	0.00%
Jul 2023	1.30%	0.89%	1.76%	0.79%	1.07%	0.67%	0.92%	1.25%	1.36%	1.49%	0.78%	1.02%	1.36%	0.94%	-0.77%	0.67%
Aug 2023	1.08%	0.94%	1.70%	0.81%	1.14%	0.67%	1.01%	1.25%	1.60%	1.50%	0.95%	1.02%	1.01%	0.96%	-0.75%	0.67%
Sep 2023	0.97%	0.93%	1.71%	0.83%	1.05%	0.69%	0.29%	1.30%	2.46%	1.57%	1.07%	1.02%	0.72%	0.96%	-0.73%	0.70%
Oct 2023	1.10%	0.87%	1.46%	0.84%	0.92%	0.74%	0.20%	1.53%	3.20%	1.74%	1.37%	1.08%	0.21%	1.12%	-0.80%	0.85%
Nov 2023	1.47%	0.81%	1.22%	0.81%	1.02%	0.84%	-0.38%	1.64%	2.39%	1.84%	1.48%	1.11%	0.48%	1.41%	0.20%	0.96%
Dec 2023	1.71%	0.78%	1.45%	0.81%	0.85%	0.88%	-0.38%	1.64%	2.13%	1.88%	1.58%	1.11%	0.48%	1.46%	-0.44%	0.96%
Jan 2024	1.64%	0.77%	1.69%	0.83%	0.88%	0.93%	-0.36%	1.73%	2.27%	1.93%	1.70%	1.12%	0.64%	1.53%	-0.09%	0.98%
Feb 2024	1.52%	0.81%	1.73%	0.88%	1.08%	0.95%	-0.50%	1.77%	1.98%	2.08%	2.17%	1.14%	0.91%	1.53%	-0.01%	1.00%
Mar 2024	1.61%	0.84%	1.61%	0.88%	0.95%	0.90%	-0.12%	1.79%	1.84%	1.99%	2.55%	1.13%	1.26%	1.45%	-0.20%	0.98%
Apr 2024	1.53%	0.88%	1.60%	0.88%	1.10%	0.83%	0.06%	1.67%	1.25%	1.89%	2.69%	1.08%	1.53%	1.26%	-0.01%	0.91%
May 2024	1.10%	0.99%	1.58%	0.94%	1.40%	0.77%	0.14%	1.46%	0.93%	1.70%	1.73%	1.08%	1.41%	1.07%	0.39%	0.81%

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.⁴⁷ 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 1	Wave 2	Wave 4	Wave 5 Dual Fuel	Wave 6 Dual Fuel	Wave 6 Electric Only	Wave 7 IE	Wave 8 Low Income	Program Total
Jun 2023	19,715	26,191	140,754	11,628	4,154	12,113	16,768	0	231,323
Jul 2023	19,617	26,075	140,127	11,567	4,136	11,988	16,619	22,629	252,758
Aug 2023	19,520	25,968	139,541	11,528	4,108	11,893	16,440	22,275	251,273
Sep 2023	19,422	25,860	138,947	11,487	4,080	11,788	16,259	21,942	249,785
Oct 2023	19,349	25,778	138,449	11,448	4,058	11,717	16,105	21,661	248,565
Nov 2023	19,294	25,696	137,920	11,400	4,044	11,637	15,931	21,315	247,237
Dec 2023	19,232	25,631	137,464	11,367	4,033	11,571	15,778	21,010	246,086
Jan 2024	19,163	25,551	137,090	11,339	4,018	11,509	15,659	20,784	245,113
Feb 2024	19,089	25,485	136,613	11,308	4,003	11,441	15,525	20,539	244,003
Mar 2024	19,050	25,432	136,325	11,276	3,995	11,400	15,420	20,337	243,235
Apr 2024	18,991	25,358	135,882	11,237	3,983	11,331	15,293	20,095	242,170
May 2024	18,891	25,261	135,255	11,185	3,960	11,229	15,151	19,838	240,770

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.⁴⁸ 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

⁴⁷ Pennsylvania Statewide Evaluator, "Section 6.1.1.2 Opt-Outs and Account Closures," *Evaluation Framework for Pennsylvania*, https://www.puc.pa.gov/media/1584/swe-phaseiv_evaluation_framework071621.pdf.

⁴⁸ Pennsylvania Statewide Evaluator, "Section 6.1.8 Dual Participation Analysis," *Evaluation Framework for Pennsylvania*, https://www.puc.pa.gov/media/1584/swe-phaseiv_evaluation_framework071621.pdf.

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. 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%	Wave 8
2	1.50%	
3	2.25%	Wave 7
4 and beyond	3.00%	Wave 1, Wave 2, Wave 3, Wave 4, Wave 5D, Wave 6D, Wave 6E

Source: Phase IV Evaluation Framework Section 6.1.8.2

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

Table B-5. HER Double-Counting Savings Adjustments

HER Wave	Downstream Adjustment (MWh)	Upstream Adjustment (MWh)	Total Adjustment (MWh)
Wave 1	793	99	891
Wave 2	1,423	231	1,654
Wave 4	445	451	896
Wave 5 – Dual Fuel	95	5	100
Wave 6 – Dual Fuel	95	34	128
Wave 6 – Electric Only	123	87	210
Wave 7 – IE	0	27	27
Wave 8 – Low Income	0	-4	-4

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,⁴⁹ 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 2.7.3.⁵⁰ Guidehouse used the default decay rate of 31.3% to calculate

⁴⁹ Pennsylvania Statewide Evaluator, “Section 6.1.9 Incremental Annual Accounting and Measure Life,” *Evaluation Framework for Pennsylvania*, https://www.puc.pa.gov/media/1584/swe-phaseiv_evaluation_framework071621.pdf.

⁵⁰ Pennsylvania Public Utility Commission, *Technical Reference Manual*, <https://www.puc.pa.gov/filing-resources/issues-laws-regulations/act-129/technical-reference-manual/>.

monthly persistence based on Average Treatment Effect (ATE) from prior program years and proportionate to estimated savings net-of--uplift from the current program year. Table B-6. contains the monthly persistence reductions for all active cohorts.

Table B-6. HER Persistence (MWh)

Month	Wave 1	Wave 2	Wave 4	Wave 5 Dual Fuel	Wave 6 Dual Fuel	Wave 6 Electric Only	Wave 7 IE	Wave 8 Low Income	Program Total
Jun 2023	68	284	133	25	29	33	86	0	658
Jul 2023	99	341	214	101	40	51	139	0	985
Aug 2023	69	307	216	105	45	59	98	0	900
Sep 2023	46	235	149	20	55	51	53	0	608
Oct 2023	55	157	98	8	53	59	12	0	443
Nov 2023	142	165	119	-25	39	83	32	0	556
Dec 2023	223	262	117	-29	41	110	37	0	760
Jan 2024	246	340	124	-35	44	133	51	0	904
Feb 2024	180	286	129	-38	32	144	64	0	798
Mar 2024	158	228	109	-16	28	148	83	0	739
Apr 2024	104	183	112	-6	17	125	84	0	620
May 2024	56	198	175	0	16	80	85	0	612

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 1	Wave 2	Wave 4	Wave 5 Dual Fuel	Wave 6 Dual Fuel	Wave 6 Electric Only	Wave 7 IE	Wave 8 Low Income	Program Total
Jun 2023	82	427	1,014	8	42	54	33	0	1,660
Jul 2023	119	512	1,624	34	59	83	54	-157	2,327
Aug 2023	83	462	1,642	35	67	96	38	-146	2,276
Sep 2023	55	353	1,130	7	81	83	20	-107	1,622
Oct 2023	67	236	745	3	78	95	5	-100	1,130
Nov 2023	172	249	906	-8	58	135	12	30	1,553
Dec 2023	269	393	887	-9	60	178	14	-78	1,715
Jan 2024	297	510	944	-11	65	214	20	-17	2,023
Feb 2024	218	430	979	-13	48	232	25	-1	1,918
Mar 2024	191	342	829	-5	42	239	33	-29	1,641
Apr 2024	125	274	855	-2	25	202	33	-2	1,511
May 2024	68	298	1,333	0	24	129	34	48	1,933

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 6.1.6.⁵¹ The methodology is bipartite, composed of a regression model that estimates hourly kW savings and a proportional conversion factor that accounts for uplift and persistence, by month.

Guidehouse used a simple difference regression model leveraging hourly interval data for peak hours to estimate gross average kW savings by month. Peak hours are defined as 2 p.m. to 6 p.m. on non-holiday weekdays during June through August of 2024.

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 PY15.
- Drop meter reads that occur after an account's inactive date.
- Remove customers with multiple service points if applicable.
- Remove exact duplicate meter reads by account.
- Remove estimated reads when an actual read is available for the same interval.
- Drop meter reads that occur after an account's inactive date.
- Remove outlier reads, defined as observations greater than or less than four standard deviations from the mean peak hourly usage (done separately for each cohort).
- Drop zero usage meter reads; missing reads are shown as zero usage and if kept can incorrectly reduce average hourly kW.
- Average the peak hourly reads to create a mean daily kW value, by account and read date.
- Remove averaged account-date observations that incorporate less than three of the four possible peak hourly meter reads.

⁵¹ Pennsylvania Statewide Evaluator, "Section 6.1.6 Peak Demand Impacts," *Evaluation Framework for Pennsylvania*, https://www.puc.pa.gov/media/1584/swe-phaseiv_evaluation_framework071621.pdf.

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 1		Wave 2		Wave 4		Wave 5 Dual Fuel		Wave 6 Dual Fuel		Wave 6 Electric Only		Wave 7 IE		Wave 8 Low Income	
	Est.	Std. Err.	Est.	Std. Err.	Est.	Std. Err.	Est.	Std. Err.	Est.	Std. Err.	Est.	Std. Err.	Est.	Std. Err.	Est.	Std. Err.
Jun 2023	-0.0318	0.0125	-0.0502	0.0205	-0.0277	0.0086	0.0049	0.0182	-0.0459	0.0353	-0.0299	0.0186	-0.0199	0.0083	0.0000	0.0000
Jul 2023	-0.0442	0.0167	-0.0456	0.0263	-0.0438	0.0122	-0.0264	0.0236	-0.0414	0.0441	-0.0115	0.0243	-0.0281	0.0119	0.0098	0.0105
Aug 2023	-0.0374	0.0140	-0.0395	0.0228	-0.0387	0.0102	-0.0057	0.0205	-0.0553	0.0387	-0.0172	0.0210	-0.0228	0.0101	0.0103	0.0091

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. 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 1	4,084	891	3,192	1,445	1,747	0.28
Wave 2	9,127	1,654	7,472	2,986	4,487	0.60
Wave 4	15,480	896	14,584	1,696	12,887	4.28
Wave 5 – Dual Fuel	248	100	148	111	37	0.02
Wave 6 – Dual Fuel	1,216	128	1,088	440	648	0.10
Wave 6 – Electric Only	3,027	210	2,817	1,077	1,740	0.13
Wave 7 – IE	1,178	27	1,151	829	322	0.11
Wave 8 – Low Income	-563	-4	-559	0	-559	-0.22

Source: Guidehouse analysis

Appendix C. PY15 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 PY15 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	1,660	10,027
Residential Total		1,660	10,027
Single-Family/Long-Term Savings	Income-Eligible	24,109	55,333
Appliance Recycling	Income-Eligible	298	2,669
Income-Eligible Total		24,407	58,002
Income-Eligible HER	Income-Eligible	(237)	1,667
Portfolio Total		25,830	69,695

Source: Guidehouse analysis

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

D.1 Program- and Component-Level Impacts Summary

Table D-1 presents a summary of energy impacts by program and component through PY15.

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	32,801	25,419	21,623	89,086	80,486	54,897
Appliance Recycling	1,046	1,219	650	18,640	20,005	10,610
In-Home Assessment	8,206	8,221	7,640	15,669	14,964	13,805
New Construction	3,392	3,390	1,864	7,932	7,974	5,162
Multifamily	1,360	1,303	1,069	6,481	5,185	4,672
Multifamily Income-Eligible	1,809	1,660	1,660	11,329	10,027	10,027
Residential Total	48,613	41,211	34,506	149,137	138,641	99,172
Single-Family	21,866	24,109	24,109	56,878	55,333	55,333
Appliance Recycling	267	298	298	2,593	2,669	2,669
Income-Eligible Total	22,133	24,407	24,407	59,471	58,002	58,002
Residential HER	21,810	21,546	21,546	79,647	79,148	79,148
Income-Eligible HER	(83)	(237)	(237)	1,957	1,667	1,667
Downstream Rebates	84,445	75,779	54,729	271,159	262,059	177,823
Midstream Rebates	162,967	169,690	117,086	294,389	312,967	215,947
Small Business Direct Install	23,054	22,453	20,167	35,957	34,844	31,221
New Construction	12,577	12,396	3,732	24,841	24,963	8,582
Non-Residential Total	283,043	280,317	195,715	626,346	634,833	433,573
Portfolio Total	375,516	367,245	275,936	916,557	912,290	671,561

Note: For the Non-Residential Downstream Rebates component, 3,192 MWh of reported savings are unverified in PY15. These unverified savings are included in reported savings values and excluded from verified savings values.

Source: Guidehouse analysis

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

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

Program and Component	PYRTD (MW/yr)	PYVTD Gross (MW/yr)	PYVTD Net (MW/yr)	RTD (MW/yr)	VTD Gross (MW/yr)	VTD Net (MW/yr)
Rebates and Marketplace	3.23	3.18	2.40	13.00	13.25	8.96
Appliance Recycling	0.21	0.24	0.12	3.88	4.09	2.08
In-Home Assessment	0.60	0.58	0.53	1.50	1.39	1.28
New Construction	0.84	0.31	0.17	2.70	1.54	1.07
Multifamily	0.17	0.16	0.13	0.93	0.75	0.68

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 Income-Eligible	0.29	0.27	0.27	1.32	1.14	1.14
Residential Total	5.34	4.74	3.63	23.33	22.15	15.20
Single-Family	1.90	1.95	1.95	5.52	5.18	5.18
Appliance Recycling	0.08	0.08	0.08	0.62	0.64	0.64
Income-Eligible Total	1.98	2.04	2.04	6.14	5.82	5.82
Residential HER	3.55	5.85	5.85	12.96	16.79	16.79
Income-Eligible HER	(0.01)	(0.13)	(0.13)	0.32	(0.08)	(0.08)
Downstream Rebates	13.75	13.64	9.86	48.12	45.39	31.14
Midstream Rebates	34.93	36.80	25.39	62.04	65.85	45.44
Small Business Direct Install	5.54	5.16	4.66	7.97	7.47	6.73
New Construction	2.06	2.00	0.60	4.32	4.50	1.54
Non-Residential Total	56.28	57.61	40.51	122.45	123.21	84.86
Portfolio Total	67.14	70.11	51.90	165.19	167.88	122.58

Note: For the Non-Residential Downstream Rebates component, 0.01 MW of reported savings are unverified in PY15. These unverified savings are included in reported savings values and excluded from verified savings values.

Source: Guidehouse analysis

D.2 Program-Level Cost-Effectiveness Summary

Table D-3. shows the TRC ratios by program and for the portfolio. The benefits in Table D-3. were calculated using gross verified impacts. Costs and benefits are expressed in 2023 dollars.

Table D-3. PY15 Gross TRC Ratios by Program (\$1,000)¹

Program	TRC NPV Benefits	TRC NPV Costs	TRC Ratio	TRC Net Benefits (Benefits – Costs)
Residential	\$29,268	\$21,299	1.37	\$7,968
Income-Eligible	\$32,983	\$8,358	3.95	\$24,625
HER	\$6,925	\$1,777	3.90	\$5,148
Income-Eligible HER	\$60	\$25	2.43	\$35
Residential Subtotal	\$69,235	\$31,459	2.20	\$37,776
Non-Residential Subtotal	\$155,474	\$99,298	1.57	\$56,176
Common Portfolio Costs		\$10,327		
Portfolio Total	\$224,709	\$141,084	1.59	\$83,625

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 PY15 cost-effectiveness using net verified savings to calculate benefits.

Table D-4. PY15 Net TRC Ratios by Program (\$1,000)¹

Program	TRC NPV Benefits	TRC NPV Costs	TRC Ratio	TRC Net Benefits (Benefits – Costs)
Residential	\$24,505	\$18,772	1.31	\$5,733
Income-Eligible	\$32,983	\$8,358	3.95	\$24,625

Program	TRC NPV Benefits	TRC NPV Costs	TRC Ratio	TRC Net Benefits (Benefits – Costs)
HER	\$6,925	\$1,777	3.90	\$5,148
Income-Eligible HER	\$60	\$25	2.43	\$35
Residential Subtotal	\$64,473	\$28,931	2.23	\$35,541
Non-Residential Subtotal	\$108,551	\$73,602	1.47	\$34,949
Common Portfolio Costs		\$10,327		
Portfolio Total	\$173,023	\$112,860	1.53	\$60,163

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	\$123,835	\$105,616	1.17	\$18,219
Income-Eligible	\$82,162	\$21,500	3.82	\$60,662
HER	\$14,851	\$5,784	2.57	\$9,067
Income-Eligible HER	\$215	\$186	1.15	\$29
Residential Subtotal	\$221,063	\$133,087	1.66	\$87,976
Non-Residential Subtotal	\$332,078	\$306,087	1.08	\$25,992
Common Portfolio Costs		\$31,940		
Portfolio Total	\$553,142	\$471,113	1.17	\$82,028

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	\$89,258	\$80,354	1.11	\$8,905
Income-Eligible	\$82,162	\$21,500	3.82	\$60,662
HER	\$14,851	\$5,784	2.57	\$9,067
Income-Eligible HER	\$215	\$186	1.15	\$29
Residential Subtotal	\$186,486	\$107,825	1.73	\$78,662
Non-Residential Subtotal	\$227,245	\$219,379	1.04	\$7,866
Common Portfolio Costs		\$31,940		
Portfolio Total	\$413,731	\$359,143	1.15	\$54,588

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

Source: PECO and CSP tracking data

D.3 HIM NTG

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 HIMs studied in PY15.⁵²

Table D-7. HIM NTG

HIM	Free Ridership	Spillover	NTGR
Central AC and Heat Pump – <i>Downstream Rebates</i>	0.38	0.01	0.63
Advanced Power Strips – <i>Marketplace</i>	0.17	0.00	0.83
Purifiers and Dehumidifiers – <i>Marketplace</i>	0.13	0.29	1.15
Furnace Fans – <i>Downstream Rebates</i>	0.61	0.12	0.51
Smart Thermostats – <i>Marketplace</i>	0.35	0.09	0.74
Purifiers and Dehumidifiers - <i>Downstream Rebates</i>	0.35	0.17	0.82

Source: Guidehouse analysis

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

Table D-8. presents PY15 expenditures, by program, compared with the budget estimates set forth in the EE&C Plan⁵³ for PY15. All the dollars in Table D-8. are presented in 2023 nominal dollars.

Table D-8. Comparison of PY15 Expenditures with Phase IV EE&C Plan (\$1,000)

Program	PY15 Budget from EE&C Plan	PY15 Actual Expenditures	Ratio (Actual/Plan)
Residential	\$15,650	\$12,638	0.81
Income-Eligible	\$8,330	\$11,009	1.32
Residential HER	\$1,910	\$1,777	0.93
Income-Eligible HER	\$80	\$25	0.31
Non-Residential	\$60,960	\$68,652	1.13
Portfolio Total	\$86,930	\$94,100	1.08

Sources: Guidehouse analysis, PECO EE&C Plan

Table D-9. presents P4TD expenditures, by program, compared with the budget estimates set forth in the EE&C Plan through PY15. Phase IV dollar totals in Table D-9. are presented in nominal dollars.

⁵² 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>.

⁵³ PECO, PECO Program Years 13 to 17 Act 129 2024, <https://www.puc.pa.gov/pdocs/1834379.pdf>.

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

Program	Phase IV Budget from EE&C Plan through PY15	P4TD Actual Expenditures	Ratio (Actual/Plan)
Residential	\$44,920	\$37,950	0.84
Income-Eligible	\$25,320	\$26,622	1.05
Residential HER	\$5,950	\$5,784	0.97
Income-Eligible HER	\$280	\$186	0.66
Non-Residential	\$149,780	\$139,065	0.93
Portfolio Total	\$226,250	\$209,607	0.93

Sources: Guidehouse analysis, PECO EE&C Plan

Table D-10. compares PY15 verified gross program savings with the energy savings projections set forth in the EE&C Plan.

Table D-10. Comparison of PY15 Actual Program Savings with EE&C Plan Projections

Program	EE&C Plan Projections for PY15 (MWh)	PY15 VTD Gross MWh Savings	Ratio (Actual/Plan)
Residential	48,314	41,211	0.85
Income-Eligible	16,597	24,407	1.47
Residential HER	22,234	21,546	0.97
Income-Eligible HER	938	(237)	(0.25)
Non-Residential	267,261	280,317	1.05
Portfolio Total	355,343	367,245	1.03

Note: For the Non-Residential Downstream Rebates component, 3,192 MWh of reported savings are unverified in PY15. These unverified savings are included in reported savings values and excluded from verified savings values.

Sources: Guidehouse analysis, PECO EE&C Plan

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

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

Program	EE&C Plan Projections through PY15 (MWh)	VTD Gross MWh Savings	Ratio (Actual/Plan)
Residential	138,001	138,641	1.00
Income-Eligible	50,875	58,002	1.14
Residential HER	69,188	79,148	1.14
Income-Eligible HER	3,289	1,667	0.51
Non-Residential	675,598	634,833	0.94
Portfolio Total	936,948	912,290	0.97

Note: For the Non-Residential Downstream Rebates component, 3,192 MWh of reported savings are unverified in PY15. These unverified savings are included in reported savings values and excluded from verified savings values.

Sources: Guidehouse analysis, PECO EE&C Plan

Appendix E. Residential and Income-Eligible EE Programs

This appendix details the evaluation methods and activities Guidehouse deployed in PY15 for select Residential and Income-Eligible 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 pathways to receive product rebates: Downstream, Marketplace, and Point of Purchase. According to the Phase IV plan, this component will account for 54% of Residential EE Program energy savings, 44% of Residential EE Program demand savings, 8% of total portfolio energy savings, and 6% of portfolio demand savings. CLEAResult implements the Phase IV Rebates and Marketplace component.

E.1.1 Gross Impact Evaluation

Guidehouse conducted two activities to verify savings for this component: a tracking database analysis for all measures outlined in the PA TRM⁵⁴ and latest IMPs using a combination of TRM default values and EDC-provided data and online surveys to verify installation characteristics of measures. As part of the tracking database analysis, 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 savings⁵⁵. 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.

⁵⁴ Pennsylvania Public Utility Commission, *Technical Reference Manual*, <https://www.puc.pa.gov/filing-resources/issues-laws-regulations/act-129/technical-reference-manual/>.

⁵⁵ Guidehouse, *Phase IV Evaluation Plan*.

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
ECM Circulation Fans	2.4%	1.05	1.05	Updated energy demand factors from 0.11 to TRM deemed 0.116.
Heat Pump Water Heater	1.2%	0.71	0.72	Reported units between 50 and 120 gallons use a UEF baseline of 0.92. TRM errata issued for PY15 provides updated equations to calculate UEF base for these larger measures.
Variable Speed Pool Pump	0.4%	1.00	99.48	Reported demand savings are 1/100th of verified savings due to CF conversion.

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

Source: Guidehouse analysis

Guidehouse conducted an online survey of sampled recipients in PY15, as described in Section 3.1.2. The surveys included specific questions the customer could answer based on common knowledge of the equipment they purchased. Savings were recalculated based on the customer responses in the surveys. Guidehouse used surveys to evaluate savings for the Downstream Rebates, Online Marketplace, and Spray Foam measures from the Point of Purchase delivery pathways. Findings from the survey are detailed in Section 3.1.2.

As

Table E-2 presents, Guidehouse exceeded the sample response targets as a result of higher-than-expected survey participation for the Downstream delivery pathway. However, for the Marketplace delivery pathway, Guidehouse did not meet sample targets for two of the three measure types. 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 e-gift card through the Tango platform.
- **Additional sample:** Guidehouse contacted additional randomly selected customers, beyond the initial random sample
- **Additional reminders:** Guidehouse sent additional reminders, beyond the typical two reminders, to all sampled customers

The Smart Thermostat measure did not meet sample targets due to a lower-than-expected response rate, despite the additional steps. The Advanced Power Strip measure included only a small population size. Guidehouse did not sample, instead contacting everyone who purchased an Advanced Power Strip through the Marketplace pathway. The small population size and a low response rate combined led to Guidehouse not meeting sample targets for the Advanced Power Strip measure.

Table E-2. Rebates and Marketplace Sample Project Count

Delivery Pathway	Target Count	Achieved Count
Downstream		
Central A/C and Heat Pumps ¹	10	8
Ductless Heat Pumps ¹		5
Furnace Fans	6	10
Refrigerators and Freezers	8	11
Clothes Washers and Dryers	6	14
Purifiers and Dehumidifiers	6	14
Heat Pump Water Heaters	8	10
Other	6	12
Variable Speed Pool Pumps	6	7
Marketplace		
Smart Thermostats	36	33
Advanced Power Strips	8	2
Purifiers and Dehumidifiers	8	8
Point of Purchase		
Canned Spray Foam ²	80	25

1 The initial sample design combined ductless heat pumps and air source heat pumps into one stratum. Guidehouse conducted post-hoc stratification to separate ductless heat pumps into their own strata to accommodate differences between air source heat pumps and ductless heat pumps data quality and evaluated results.

2 Spray Foam target completes and actual completes are based on numbers of cans.

Source: Guidehouse analysis

For the Downstream and Marketplace pathways and the Canned Spray Foam measures, new verification ratios were created for PY15. For all Point of Purchase measures other than Canned Spray Foam, the results of the tracking database analysis were combined with the PY14 verification ratios to determine final verified gross savings. This, combined with the survey results, led to the Rebates and Marketplace component overall realization rates.

E.1.2 Net Impact Evaluation

Guidehouse conducted NTG research for the Downstream and Marketplace delivery pathways of the Rebates and Marketplace component in PY15. The team sent online surveys to PECO customers who participated in the Rebates and Marketplace program in PY15. The team received 93 valid NTG survey completes from Downstream participants and 44 valid NTG survey completes from Marketplace shoppers.⁵⁶ See Section 3.1.5 for information on the PY15 surveying effort.

E.1.2.1 Estimating Free Ridership

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

⁵⁶ NTG survey completes differ slightly from the Process survey complete counts below due to three respondents (two Downstream and one Marketplace) answering the NTG battery of questions but dropping out of the survey prior to completing all process questions.

downstream rebates and instant discounts through an online marketplace, so Guidehouse asked intention and influence questions specific to both delivery pathways.

Intention

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

Downstream Delivery Pathway

The survey response options gathering feedback on intention in the PY15 Rebates and Marketplace component Downstream delivery pathway include:

HVAC

- Without the program, would not have installed the energy efficient HVAC equipment
- Without the program, would have installed less efficient HVAC equipment
- Without the program, would have installed the same energy efficient HVAC equipment
- Without the program, would have installed more efficient HVAC equipment

Appliances

- Without the program, would not have purchased the new energy efficient appliance
- Without the program, would have repaired the old appliance
- Without the program, would have purchased a used appliance
- Without the program, would have purchased a less efficient appliance
- Without the program, would have purchased the same energy efficient appliance

Smart Thermostats

- Without the program, would not have purchased the smart thermostat
- Without the program, would have purchased a manual or programmable thermostat
- Without the program, would have purchased the same smart thermostat

The first outcome (not purchased or installed the appliance or equipment) indicates zero free ridership and thus results in an intention score of 0.00. The outcome (would have purchased or installed the same appliance or equipment) indicates total free ridership, or an intention score of 0.50. The other options indicate partial free ridership and are scored according to the Downstream algorithm.

Marketplace Delivery Pathway

The response options gathering feedback on intention in the PY15 Rebates and Marketplace component, Marketplace delivery pathway include:⁵⁷

Smart Thermostats

- Without the online marketplace, would not have purchased a smart thermostat

⁵⁷ Guidehouse adjusted the counterfactual intention questions for the Marketplace delivery pathway to align with the program design. The question of “what you would have done without the program” refers to “what would you have done if the online marketplace was not available” so options could include purchasing the equipment through another retail outlet. If these other retail outlets allow for a PECO incentive, customer could pursue those incentives and still be considered a free rider in the online marketplace.

- Without the online marketplace, would have postponed purchasing a smart thermostat
- Without the online marketplace, would have purchased a manual or programmable thermostat elsewhere
- Without the online marketplace, would have purchased a smart thermostat elsewhere

Smart Power Strips

- Without the online marketplace, would not have purchased a smart power strip
- Without the online marketplace, would have postponed purchasing a smart power strip
- Without the online marketplace, would have purchased a normal power strip elsewhere
- Without the online marketplace, would have purchased a smart power strip elsewhere

Appliances/Fans

- Without the online marketplace, would not have purchased an energy efficient appliance or fan
- Without the online marketplace, would have postponed purchasing an energy efficient appliance or fan
- Without the online marketplace, would have purchased an energy efficient appliance or fan elsewhere

The first outcome (not purchased the equipment) indicates zero free ridership and thus results in an intention score of 0.00. The outcome (would have purchased the same equipment elsewhere) indicates total free ridership, or an intention score of 0.50. The other options indicate partial free ridership and are scored according to the Marketplace algorithm.

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

Scoring of Intention Assessment in Residential Programs

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

Table E-3. Intention Scoring for the Residential Rebates and Marketplace Component

Measure	Response	Intention Score
Downstream Delivery Pathway		
HVAC	Would not have installed the energy efficient HVAC equipment	0.00
	Would have installed less efficient HVAC equipment	0.25
	Would have installed the same energy efficient HVAC equipment	0.50
	Would have installed more efficient HVAC equipment	0.50
Appliances	Would not have purchased the new energy efficient appliance	0.00
	Would have repaired the old appliance	0.00
	Would have purchased a used appliance	0.00
	Would have purchased a less efficient appliance	0.25
Thermostats	Would have purchased the same energy efficient appliance	0.50
	Would not have purchased the smart thermostat	0.00

Measure	Response	Intention Score
	Would have purchased a manual or programmable thermostat	0.00
	Would have purchased the same smart thermostat	0.50
Marketplace Delivery Pathway		
	Would not have purchased a smart thermostat	0.00
Smart Thermostats	Would have postponed purchasing a smart thermostat	0.25
	Would have purchased a manual or programmable thermostat elsewhere	0.00
	Would have purchased a smart thermostat elsewhere	0.50
Smart Power Strip	Not installed the measure	0.00
	Installed a less energy efficient measure	0.25
	Installed a measure with the same energy efficiency	0.50
	Installed a more energy efficient measure	0.50
Appliances	Not installed the measure	0.00
	Installed a less energy efficient measure	0.25
	Installed a measure with the same energy efficiency	0.50
	Installed a more energy efficient measure	0.50

Source: Guidehouse analysis

Influence

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

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

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

Table E-4. Influence Ratings for Residential Rebate Programs

Influence Element	Not at all Influential	1-2	3-4	5-6	7-8	Extremely Influential	9-10	Refused
Downstream Delivery Pathway	0	1-2	3-4	5-6	7-8	9-10	NA	
Program Educational Materials & Marketing	0	1-2	3-4	5-6	7-8	9-10	NA	
PECO Incentive	0	1-2	3-4	5-6	7-8	9-10	NA	
PECO Staff	0	1-2	3-4	5-6	7-8	9-10	NA	
Installation Contractor (if applicable)	0	1-2	3-4	5-6	7-8	9-10	NA	
Marketplace Delivery Pathway	0	1-2	3-4	5-6	7-8	9-10	NA	
Rebate or Discount Offered by PECO	0	1-2	3-4	5-6	7-8	9-10	NA	
PECO Marketing Material or Bill Insert	0	1-2	3-4	5-6	7-8	9-10	NA	
PECO Advertising (online or television)	0	1-2	3-4	5-6	7-8	9-10	NA	

Source: SWE Framework

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

Table E-5. Influence Scoring for Residential Rebate Programs

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

Note: Guidehouse shifted from a 1-5 scale in Phase III to a 0-10 scale in Phase IV and adjusted the scoring based on professional judgment.

Source: SWE Framework

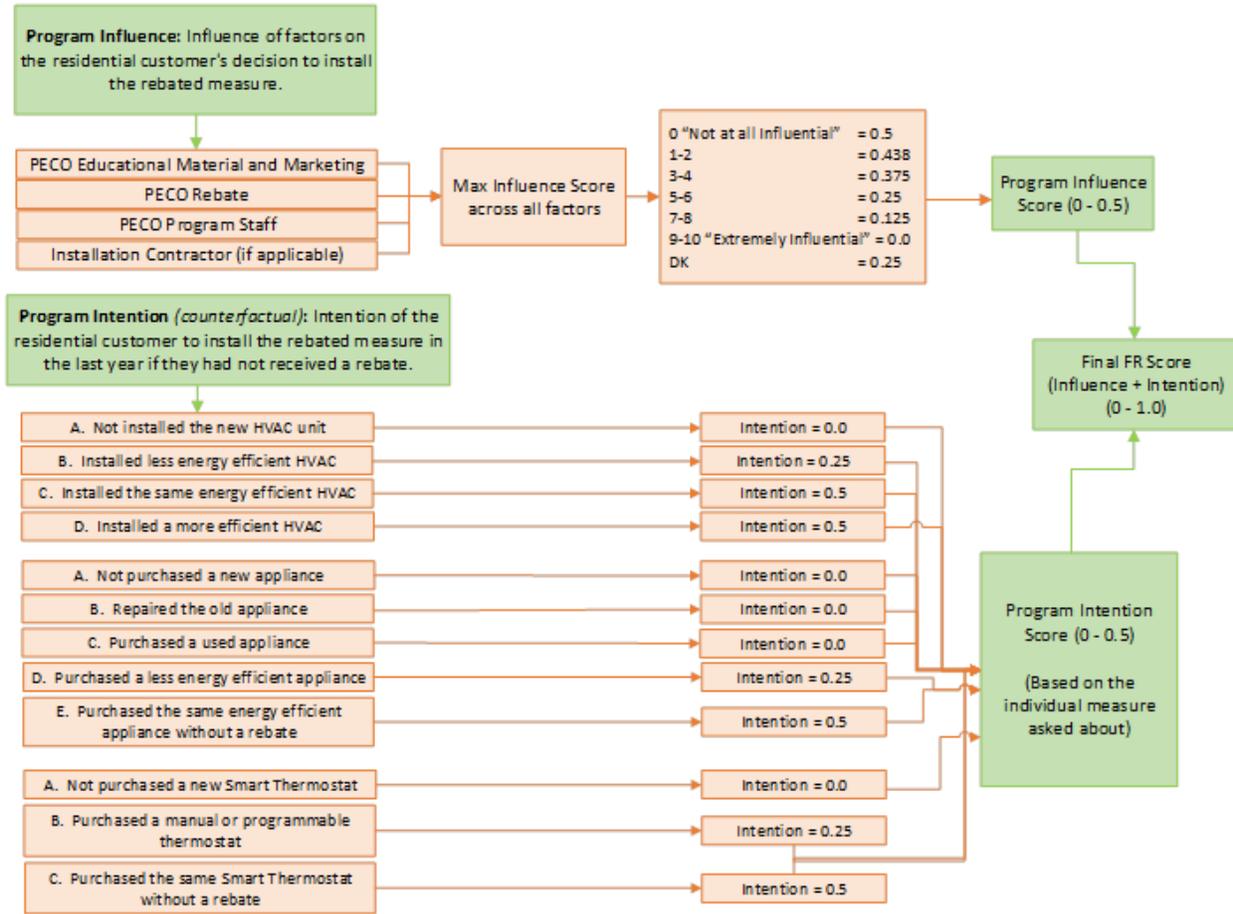
Total Free Ridership Score

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

Free Ridership Algorithms

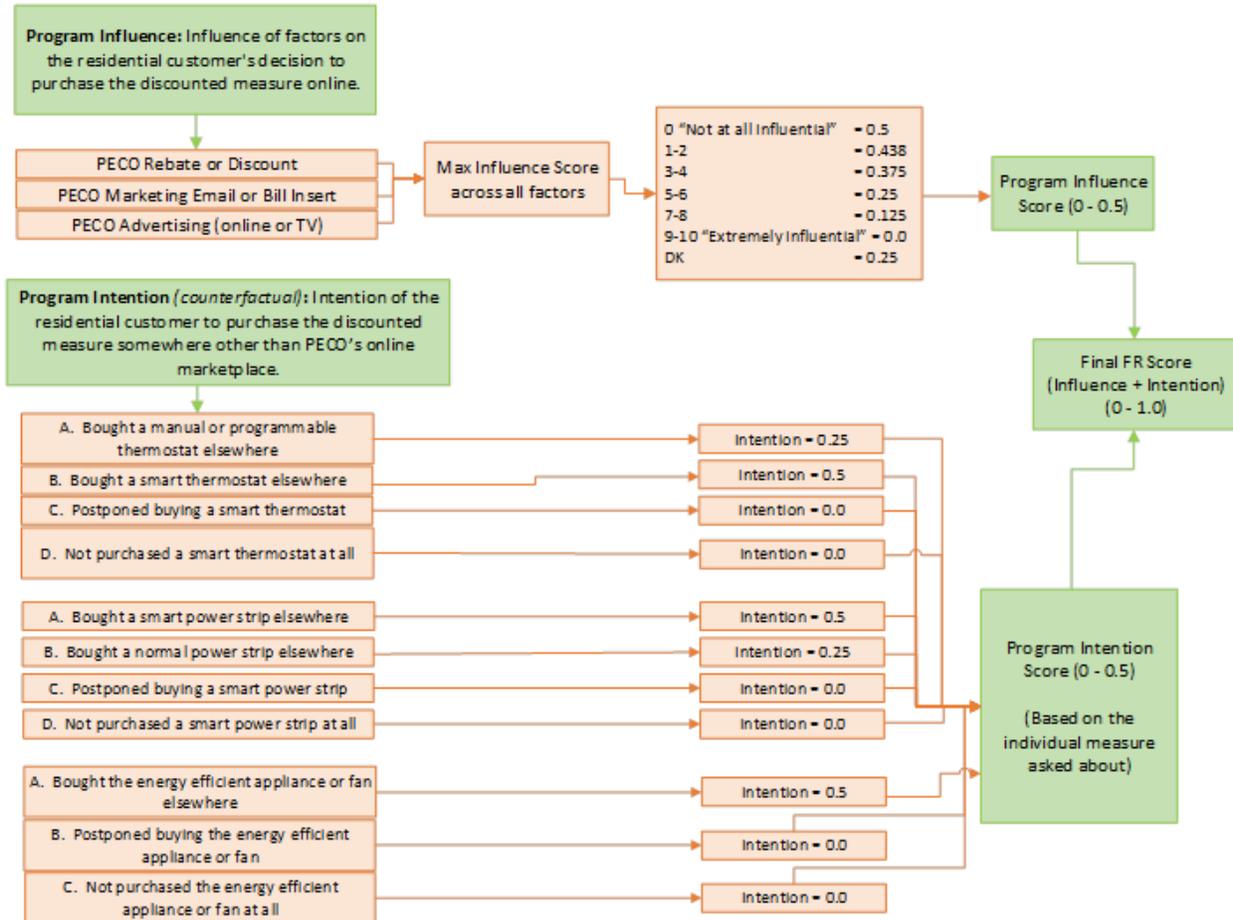
The following diagrams detail the algorithms used to estimate free ridership using self-reported survey responses for the Downstream and Marketplace delivery pathways.

Figure E-1. Free Ridership Algorithm – Downstream Delivery Pathway



Source: Guidehouse analysis

Figure E-2. Free Ridership Algorithm – Marketplace Delivery Pathway



Source: Guidehouse analysis

E.1.2.2 Estimating Participant Spillover

The participant spillover battery of questions assesses, for each participant, the number and description of non-incentivized energy-efficient equipment installed since program participation, and the program's influence on the participant's decision to install those technologies. This section summarizes the spillover approach for the Residential Rebates and Marketplace component in PY15.

Assessment of Program Influence on Residential Measures

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

- A rating of 8, 9, or 10 = 1.0 (full savings attributed to the program)
- A rating of 3, 4, 5, 6, or 7 = 0.5 (half of the savings attributed to the program)

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

Downstream survey participants reported installing numerous ENERGY STAR equipment, including refrigerators, freezers, dishwashers, clothes washers and dryers, and room air conditioners, as well as additional attic insulation, spray foam insulation, and new efficient windows, none of which received a program rebate. The most common reason given for not pursuing the rebate was the respondent “did not know they could.”

Respondents to the Marketplace survey also reported purchasing additional energy efficient equipment without pursuing a rebate. Equipment also included ENERGY STAR refrigerators, clothes washers and dryers, HVAC tune-ups, an ASHP, and a Wi-Fi-enabled thermostat.

Assessment of Energy Savings for Residential Spillover

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

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

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

For each of the above categories, Guidehouse will then complete the following tasks:

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

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

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

$$\sum \text{Participant SO (population)} = ((\sum_{i=1}^n [\text{Participant SO (sample)}]) / (\text{Sample } n)) \times \text{Population } N$$

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

$$\% \text{ Participant SO} = ((\sum_{i=1}^n [\text{Participant SO (population)}]) / (\text{Program Savings})) \times 100$$

E.1.2.3 Estimating the NTGR

Estimate the final NTGR score using Equation E-1.

Equation E-1. NTG Equation

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

Where:

Free Ridership is the estimated savings that would have occurred even if the program did not exist

Spillover is the estimated savings occurring outside of the program but directly influenced by the program

Market Effects is the estimated savings occurring in the Residential market due to general knowledge and education around energy efficiency, not to be double counted with spillover (not applicable in PY15)

E.1.3 Process Evaluation

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

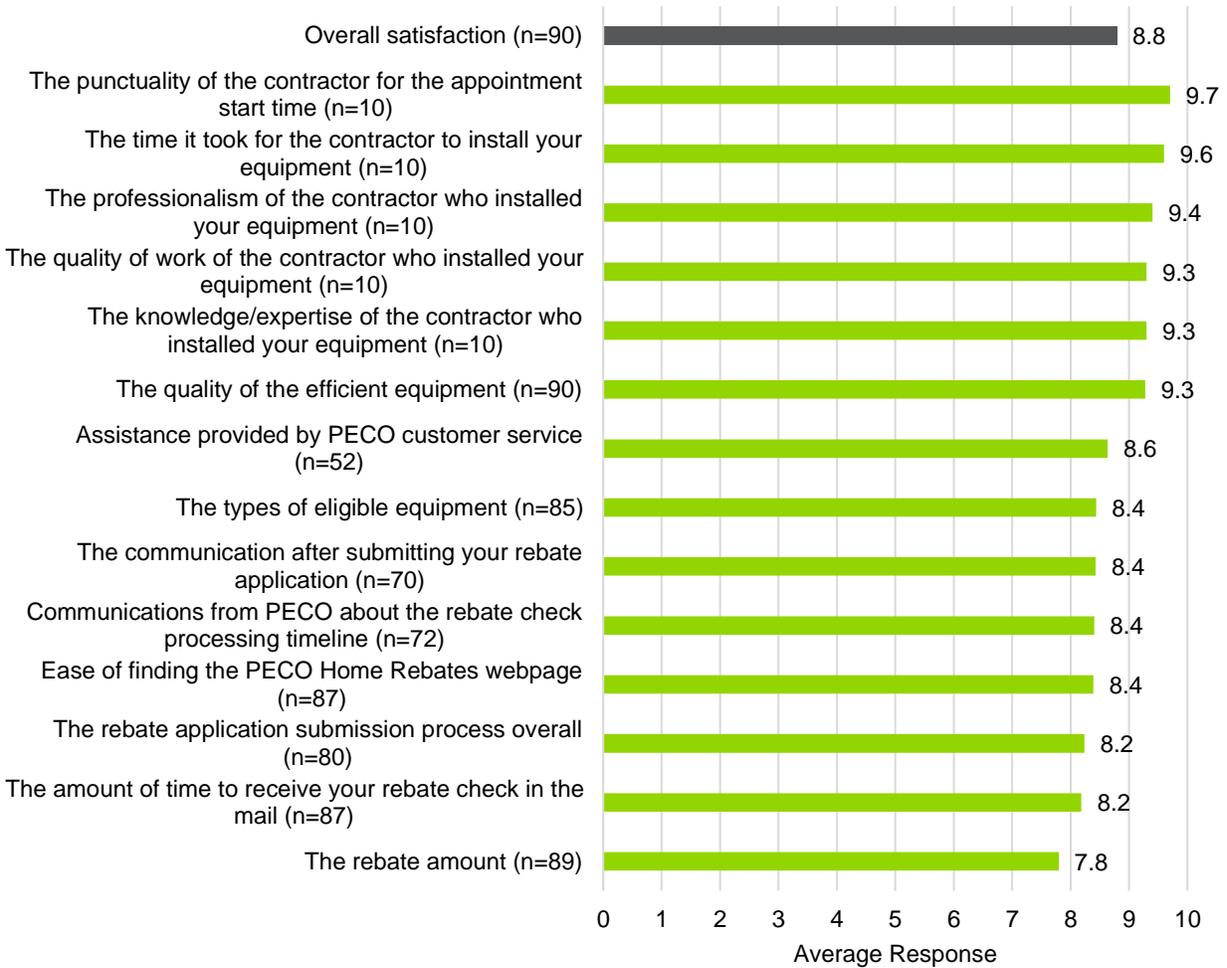
Guidehouse contacted 1,017 customers who purchased items from PECO's Marketplace and 910 customers who received a rebate through the Downstream pathway to conduct the process evaluation for this component. Forty-three Marketplace pathway customers replied to the Marketplace survey resulting in a 4% response rate. Ninety-one Downstream pathway customers replied to the Downstream survey resulting in a 10% response rate.

Guidehouse removed "don't know" responses from analysis for most questions. Therefore, n values may vary between questions.

Respondents reported satisfaction levels for the Downstream and Marketplace pathways overall, 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 Downstream pathway overall is 8.8 out of 10 (n=90) and the Marketplace pathway is 8.2 out of 10 (n=43).

Respondents also provided satisfaction scores for aspects of each pathway. For the Downstream pathway, respondents provided the highest satisfaction scores for the punctuality of the contractor for the appointment start time (9.7 out of 10; n=72) and the time it took for the contractor to install the equipment (9.6 out of 10; n=87), as Figure E-3 shows.

Figure E-3. Downstream Pathway Satisfaction



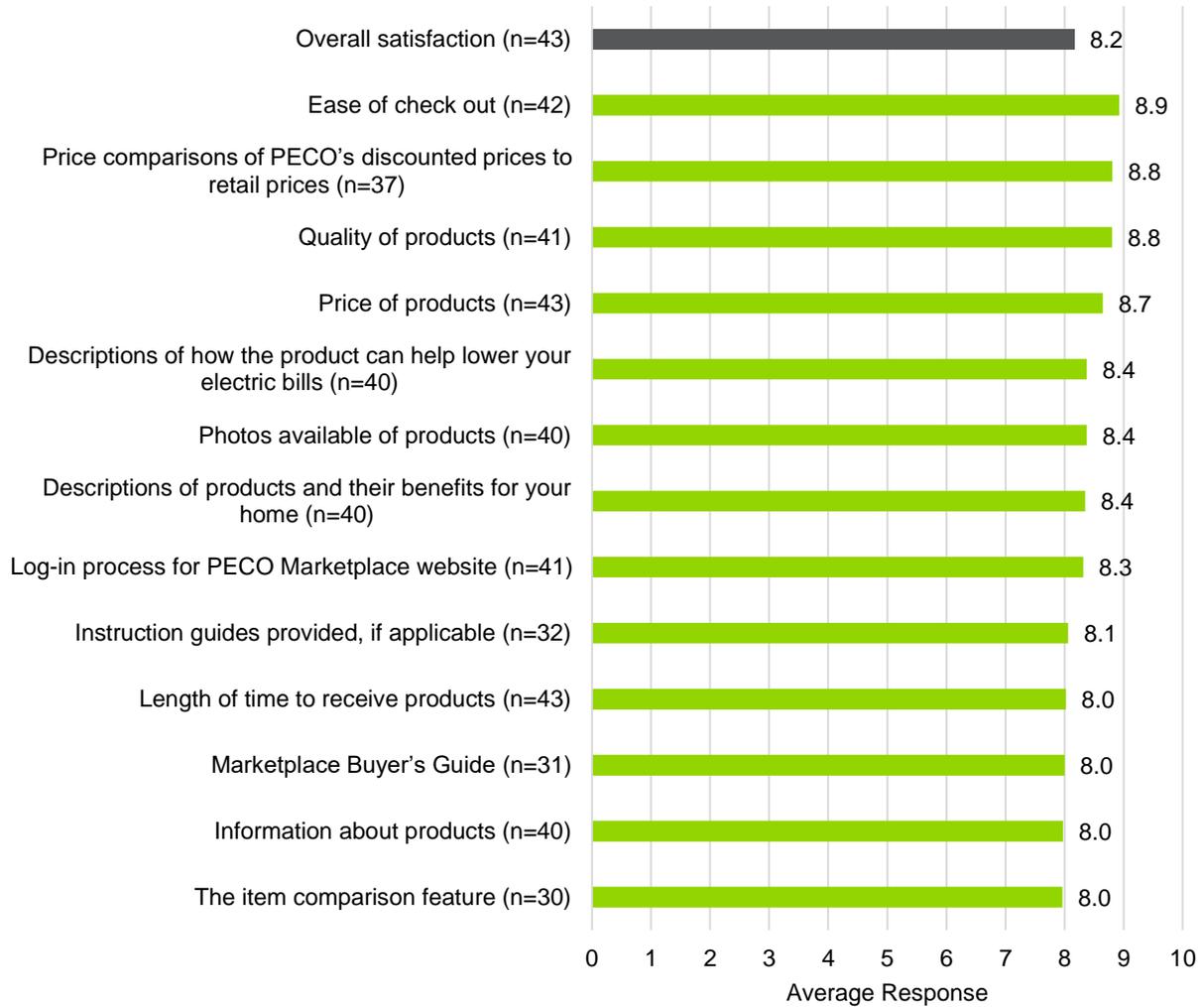
Respondents received the following questions: “How would you rate your satisfaction with the PECO Home Rebates program overall?” and “How would you rate your satisfaction with the following aspects of the PECO Home Rebates program?”

Note: The pathway is referred to as “PECO Home Rebates Program” as this is a more familiar name for customers.

Source: Guidehouse analysis

For the Marketplace pathway, respondents provided the highest satisfaction scores for the punctuality of the ease of check out (8.9 out of 10; n=42), the price comparisons of PECO’s discounted prices to retail prices (8.8 out of 10; n=37), and the quality of products (8.8 out of 10; n=41), as Figure E-4 shows.

Figure E-4. Marketplace Pathway Satisfaction



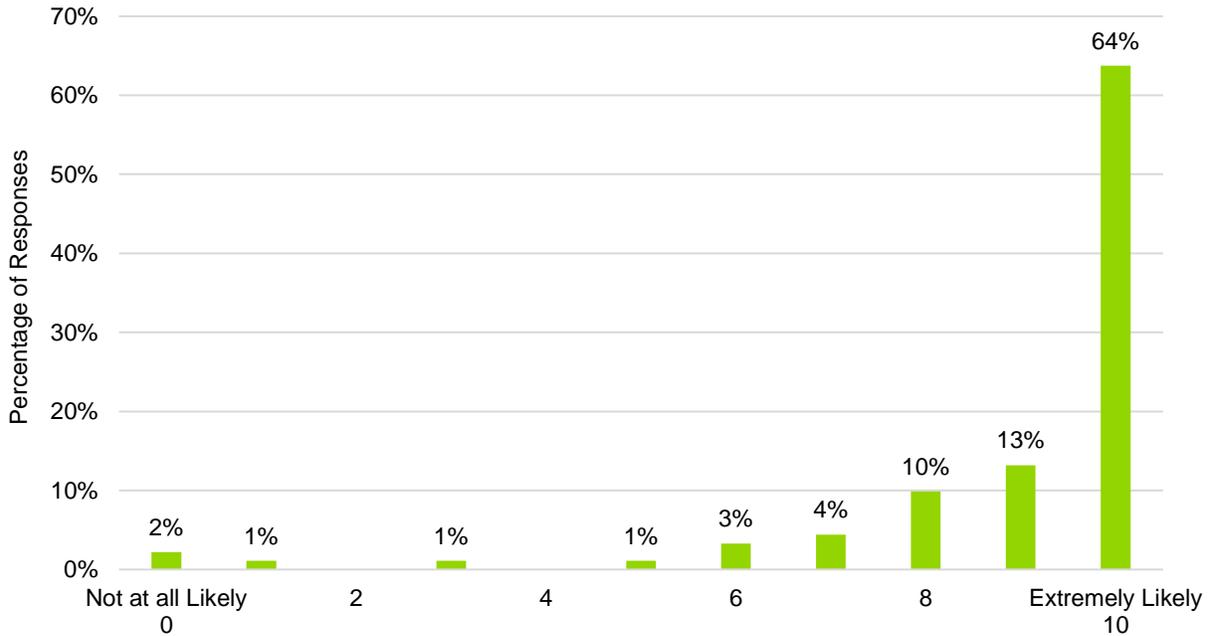
Respondents received the following questions: “How would you rate your satisfaction with PECO Marketplace overall?” and “How would you rate your satisfaction with the following aspects of PECO Marketplace?”

Note: The pathway is referred to throughout the survey as “PECO Marketplace” as this is a more familiar name for customers.

Source: Guidehouse analysis

As Figure E-5 and Figure E-6 show, over half of respondents rated their likelihood to recommend the PECO Downstream pathway to others as 10 out of 10 for both the Downstream and the Marketplace pathways. Respondents were asked to use a scale of 0 to 10 where 0 is “not at all likely” and 10 is “extremely likely.” Guidehouse excluded any “don’t know” responses from analysis.

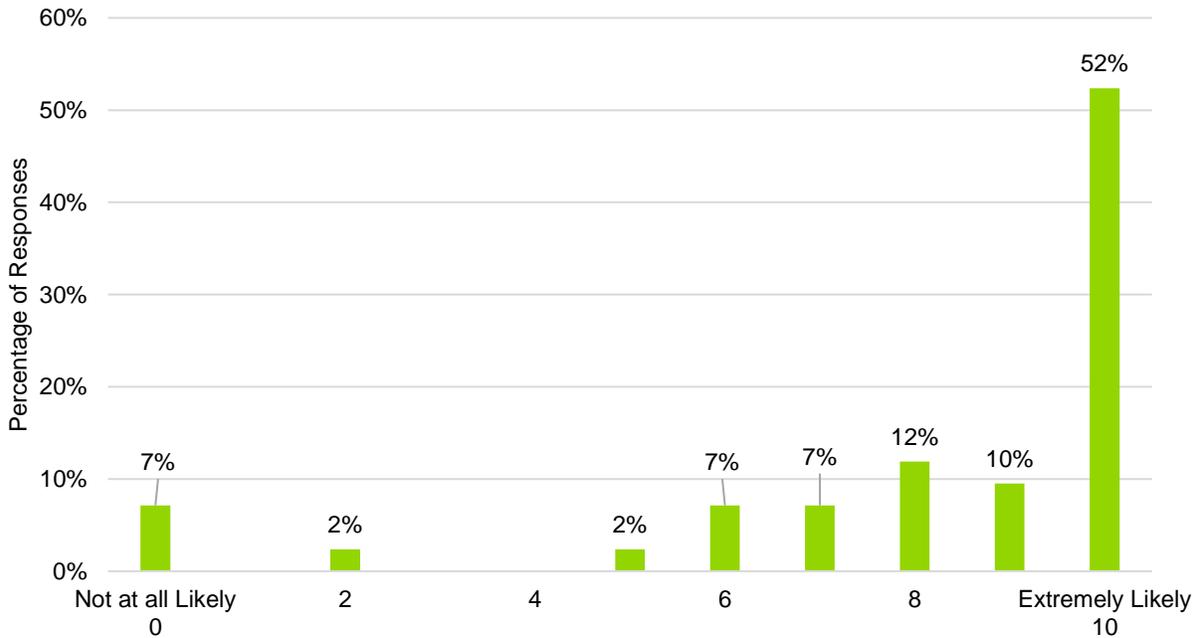
Figure E-5. Likelihood of Recommending PECO’s Downstream Pathway (n=91)



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

Source: Guidehouse analysis

Figure E-6. Likelihood of Recommending PECO’s Marketplace (n=43)

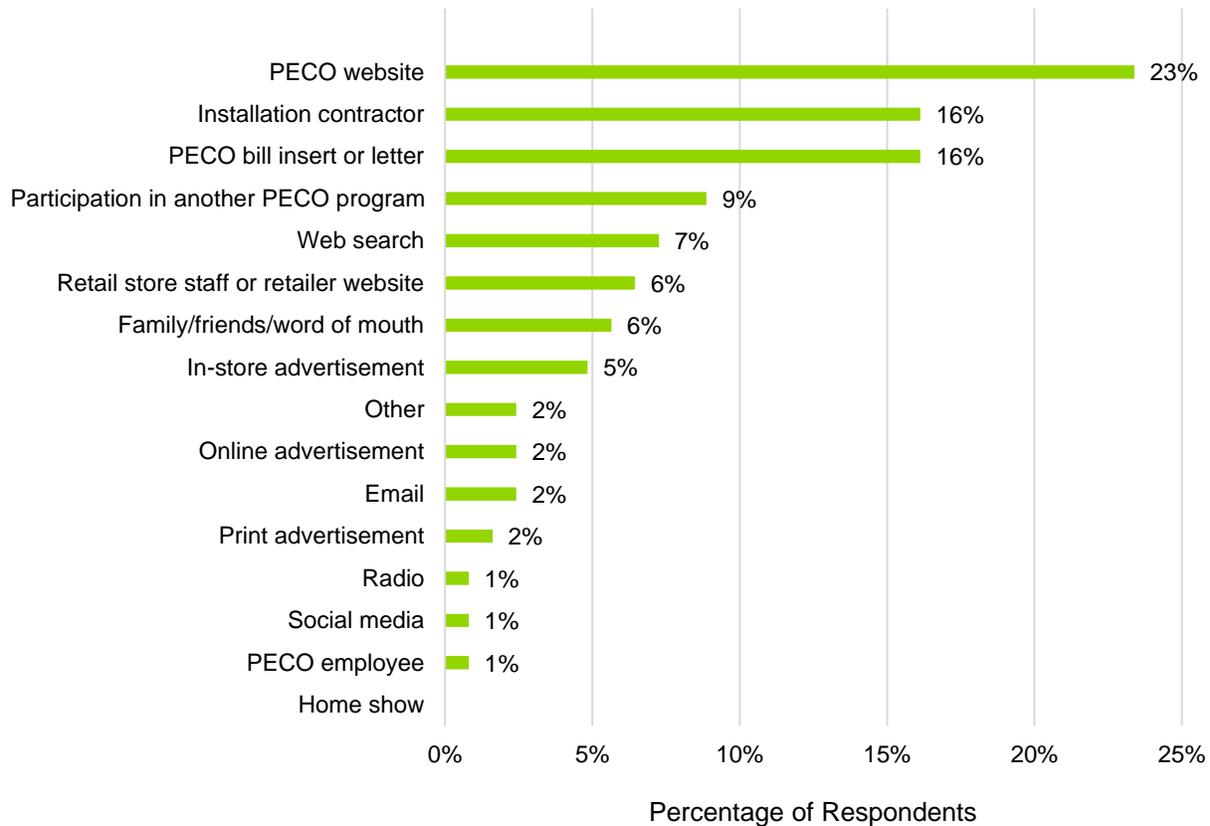


Respondents received the following question: “How likely are you to recommend PECO Marketplace to others?”

Source: Guidehouse analysis

Rebate respondents were asked how they learned about the PECO Downstream pathway. Respondents reported primarily learning about the pathway through the PECO website, installation contractor, or a PECO bill insert (Figure E-7).

Figure E-7. Awareness of PECO’s Downstream Pathway (n=91)

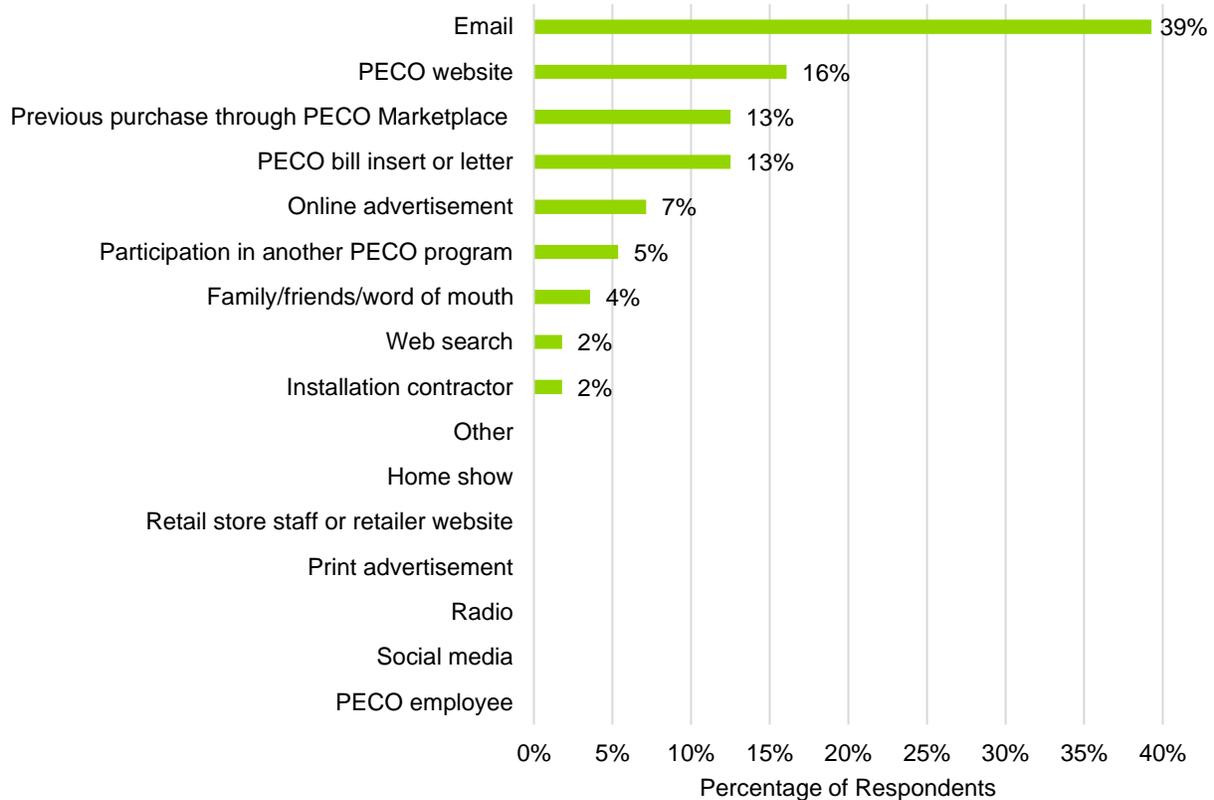


Respondents received the following question: “How did you learn about the PECO Home Rebates program? Select all that apply.”

Source: Guidehouse analysis

Marketplace respondents were asked how they learned about the PECO Marketplace pathway. Respondents reported primarily learning about the pathway through email, the PECO website, a previous purchase through PECO Marketplace, or a PECO bill insert (Figure E-8).

Figure E-8. Awareness of PECO’s Marketplace Pathway (n=43)



Respondents received the following question: “How did you learn about PECO Marketplace? 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 16% of Residential EE Program energy savings, 16% of Residential EE Program demand savings, 13% of Income-Eligible EE Program energy savings, 14% of Income-Eligible EE Program demand savings, 3% of total portfolio energy savings, and 3% of total portfolio demand savings. ARCA implemented the Appliance Recycling component.

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-6 presents 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-6. 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	1.8%	1.17	1.17	Unable to recreate reported savings from the information provided
Refrigerator Recycling (IE)	1.1%	1.10	1.10	Unable to recreate reported savings from the information provided

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

E.2.2 Net Impact Evaluation

As described in the Phase IV Evaluation Plan⁵⁸ approved by the SWE, Guidehouse did not conduct NTG research for this component in PY15.

E.2.3 Process Evaluation

As described in the Phase IV Evaluation Plan⁵⁹ approved by the SWE, Guidehouse did not conduct in-depth process activities for this component in PY15. 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.

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,⁶⁰ this component is planned to account for 13% of Residential EE Program energy savings, 9% of Residential EE Program demand savings, 2% of total portfolio energy savings, and 1% of portfolio demand savings. CLEAResult implements the In-Home Assessment component.

E.3.1 Gross Impact Evaluation

Guidehouse conducted a tracking database analysis for this component and applied verification ratios from PY14. 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. Guidehouse applied no significant changes from the tracking database analysis.

⁵⁸ Guidehouse, *Phase IV Evaluation Plan*.

⁵⁹ Guidehouse, *Phase IV Evaluation Plan*.

⁶⁰ Guidehouse, *Phase IV Evaluation Plan*.

Guidehouse conducted an online survey of sampled recipients in PY14. 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. These results produced the PY14 verification ratios that were combined with the results of the PY15 tracking database analysis to determine final verified gross savings.

E.3.2 Net Impact Evaluation

As described in the Phase IV Evaluation Plan⁶¹ approved by the SWE, Guidehouse did not conduct NTG research for this component in PY15.

E.3.3 Process Evaluation

Guidehouse did not conduct an in-depth process evaluation for this component in PY15. 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.

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,⁶² this component is planned to account for 6% of Residential EE Program energy savings, 22% of Residential EE Program demand savings, 1% of total portfolio energy savings, and 3% of total portfolio demand savings. PSD implements the New Construction component.

E.4.1 Gross Impact Evaluation

In PY15, Guidehouse conducted a tracking database analysis for all measures outlined in the PA TRM and latest IMPs using a combination of TRM default values and EDC-provided data. Guidehouse also performed engineering desk reviews for a sample of projects.

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 savings for these measures equaled the reported savings.⁶³

In PY15, Guidehouse conducted file reviews, performed building simulation modeling using Ekotrope software, and utilized TRM algorithms to determine gross impact results. The

⁶¹ Guidehouse, *Phase IV Evaluation Plan*.

⁶² Guidehouse, *Phase IV Evaluation Plan*.

⁶³ Guidehouse, *Phase IV Evaluation Plan*.

evaluation team reviewed the energy models for each sampled site for quality assurance and performed supplemental TRM-based calculations outside of the energy models to generate the total peak demand savings, as required by the Phase IV TRM. Refer to Section 3.1.2 for key evaluation findings, results, and conclusions for these components.

Guidehouse reviewed Ekotrope building simulation models for each of the sites selected within the sample and compared estimated savings in the model to the savings reported in the database. The TRM defines the annual energy savings as the difference between the baseline (PECO reference home) and the as-built simulation results. The current version of the TRM allows for the total energy savings to be calculated within the building simulation software.

The TRM dictates that cooling peak demand savings be calculated using the baseline and efficient homes' corresponding peak load and the homes' cooling efficiencies. The evaluation team calculated the verified cooling demand savings by applying the CF defined in the TRM Volume 1 (0.424 for Philadelphia). The TRM allows for additional demand savings for other end uses to be calculated using algorithms from the applicable measures elsewhere in the TRM. The evaluation team utilized the Ekotrope model inputs to apply TRM-deemed savings, TRM algorithms, and engineering best practices to calculate demand savings associated with appliances such as refrigerators, clothes dryers, clothes washers, dishwashers, and low flow fixtures. Guidehouse combined the peak cooling demand savings and the additional appliance demand savings to generate the total verified demand savings. The total verified energy and demand savings were compared with the reported savings to determine the realization rates.

The evaluation review revealed that the tracked demand savings were copied directly from the demand savings output by the energy model. As discussed earlier, the TRM requires demand savings to be claimed using the algorithms defined in the TRM. Overall, the methodology described results in a reduction in verified demand savings compared with the tracking data.

As Table E-7 presents, Guidehouse stratified the sample by measure type, as described in the Sample Design Memo.⁶⁴ Guidehouse exceeded the sample target.

Table E-7. Residential New Construction Sample Project Count

Stratum	Target Count	Achieved Count
Multifamily	5	6
Single-Family	8	11
Smart Thermostats	5	5
Townhouse & Duplex	8	10
Total Sampled Projects	26	32

Source: Guidehouse analysis

E.4.2 Net Impact Evaluation

As described in the Phase IV Evaluation Plan⁶⁵ approved by the SWE, Guidehouse did not conduct NTG research for this component in PY15.

⁶⁴ Guidehouse, *PECO PY15 Residential Impact Sample Design Memo Draft*.

⁶⁵ Guidehouse, *Phase IV Evaluation Plan*.

E.4.4 Process Evaluation

As described in the Phase IV Evaluation Plan⁶⁶ approved by the SWE, Guidehouse did not conduct in-depth process activities for this component in PY15. 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.

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 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,⁶⁷ this component is planned to account for 11% of Residential EE Program energy savings, 9% of Residential EE Program demand savings, 21% of Income-Eligible EE Program energy savings, 16% of Income-Eligible EE Program demand savings, 3% of total portfolio energy savings, and 2% of total portfolio demand savings. CMC implements the Multifamily component for both the Residential and Income-Eligible customers.

E.5.1 Gross Impact Evaluation

Guidehouse conducted two activities to verify savings for this component: tracking database analysis and onsite verification of installed equipment for 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.

Guidehouse conducted onsite evaluations of sampled recipients in PY15, 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-8. presents, Guidehouse stratified the sample by savings at the Building ID level, as described in the Sample Design Memo.⁶⁸ Overall, Guidehouse exceeded the sample targets as a result of more onsites completed than expected for the Multifamily Income-Eligible strata.

Table E-8. Multifamily Sample Project Count

Stratum	Target Count	Achieved Count
Income-Eligible – High impact (project savings ≥ 35 MWh)	4	5
Income-Eligible (35 MWh > project savings > 0.9 MWh)	4	5
Income-Eligible – Extra Small (project savings <0.9 MWh)	0	0
Multifamily – High Impact (project savings > 35 MWh)	4	4
Multifamily (35 MWh > project savings > 0.9 MWh)	4	4

⁶⁶ Guidehouse, Guidehouse, *Phase IV Evaluation Plan*.

⁶⁷ Guidehouse, Guidehouse, *Phase IV Evaluation Plan*.

⁶⁸ Guidehouse, *PECO PY15 Residential Impact Sample Design Memo Draft*.

Stratum	Target Count	Achieved Count
Multifamily – Extra Small (project savings <0.9 MWh)	0	0
Total Sampled Projects	16	18

Source: Guidehouse analysis

E.5.2 Net Impact Evaluation

As described in the Phase IV Evaluation Plan⁶⁹ approved by the SWE, Guidehouse did not conduct NTG research for this component in PY15.

E.5.3 Process Evaluation

As described in the Phase IV Evaluation Plan⁷⁰ approved by the SWE, Guidehouse did not conduct in-depth process activities for this component in PY15. 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.

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

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

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

According to the Phase IV Evaluation Plan,⁷¹ the Single-Family Income-Eligible component is planned to account for 58% of Income-Eligible EE Program energy savings, 65% of Income Eligible- EE Program demand savings, 3% of total portfolio energy savings, and 3% of portfolio demand savings. CMC implements the Single-Family component.

The Long-Term Savings component is implemented as an overlay service through the Single-family component to encourage the installation of long-term, comprehensive measures. The Long-Term Savings component measures include insulation, air sealing, duct sealing, heat pumps, air conditioners, thermostats, window repairs, and residential heat pump water heaters and solar water heaters. According to the Phase IV Evaluation -Plan,⁷² this component is planned to account for 7% of Income-Eligible EE Program energy savings, 5% of Income

⁶⁹ Guidehouse, *Phase IV Evaluation Plan*.

⁷⁰ Guidehouse, *Phase IV Evaluation Plan*.

⁷¹ Guidehouse, *Phase IV Evaluation Plan*.

⁷² Guidehouse, *Phase IV Evaluation Plan*.

Eligible- EE Program demand savings, 0.4% of total portfolio energy savings, and 0.3% of total portfolio demand savings. CMC implements the Long-Term Savings component.

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-9. illustrates the factors that led to variation between the reported and adjusted database savings and impacted the observed realization rates reported in Section 3.2.2.

Table E-9. 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
Low Flow Faucet Aerators	9.4%	0.43	0.44	Reported savings assume an average number of faucets per household to be equal to the number of aerators provided as part of the kit offering (one). Reported savings using the space type of "Kitchen" for kit delivery rows, Guidehouse and SWE use "Unknown" for all kit delivery.
Insulation	3.5%	1.14	0.72	Unable to recreate reported savings from the information provided.
Air Sealing	1.1%	1.05	1.05	Unable to recreate reported savings from the information provided.

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. Savings were recalculated based on the customer responses in the surveys. These results produced the PY14 verification ratios that were combined with the results of the PY15 tracking database analysis to determine final verified gross savings.

E.6.2 Net Impact Evaluation

Guidehouse did not conduct NTG research for Income-Eligible components as per the SWE's Evaluation Framework.⁷³

E.6.3 Process Evaluation

Income-Eligible EE Program process evaluation activities and findings are discussed in Section 3.2.5. This section describes additional insights from process evaluation activities conducted for the Single-Family Income-Eligible component specifically. Some Single-Family Income-Eligible customers are flagged as Long-Term Savings participants following their participation. These participants are included in these results.

⁷³ Pennsylvania Statewide Evaluator, *Evaluation Framework for Pennsylvania*, https://www.puc.pa.gov/media/1584/swe-phaseiv_evaluation_framework071621.pdf.

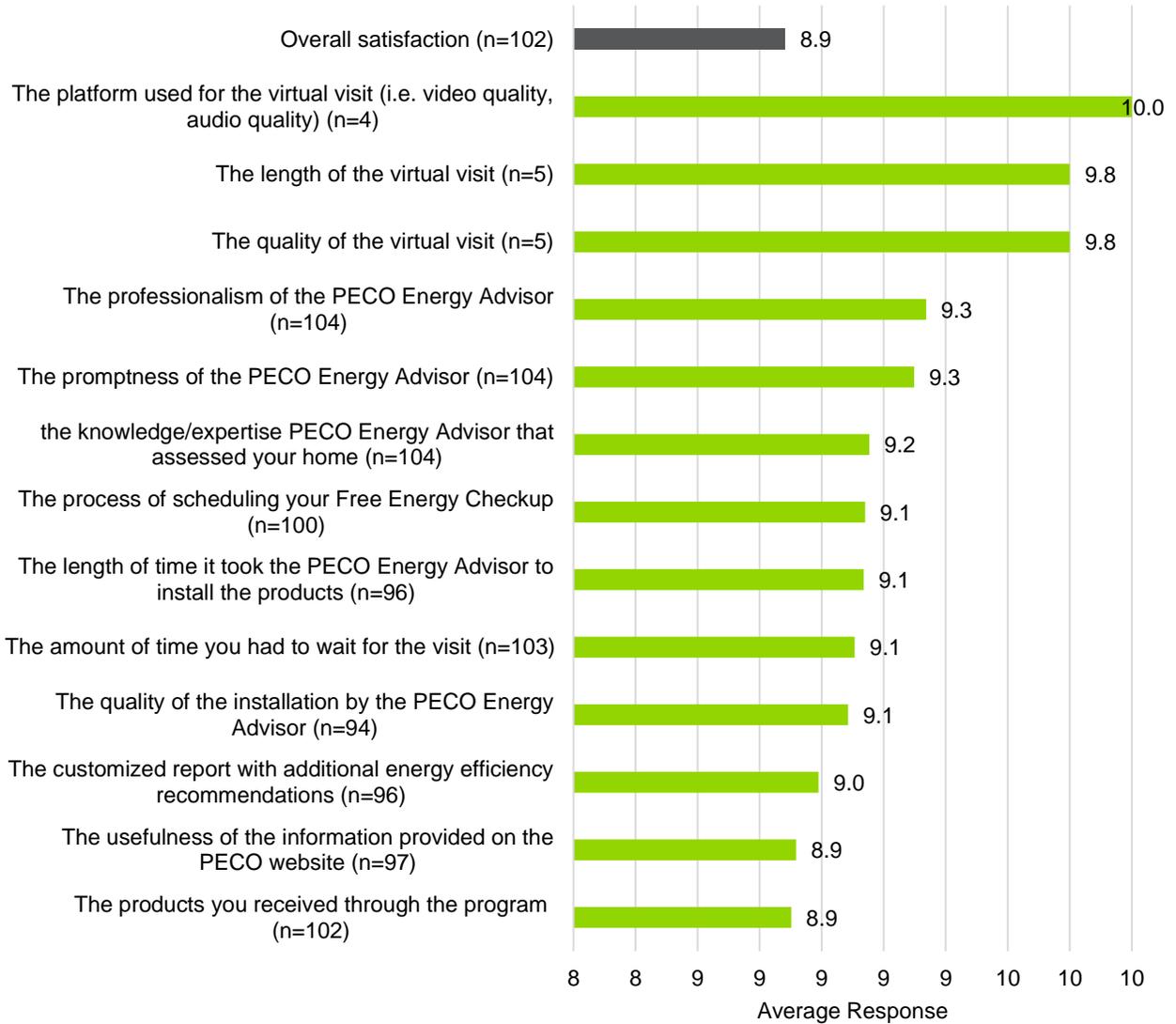
Guidehouse contacted 4,200 customers who participated in the Single-Family Income-Eligible component during PY15 to conduct the process evaluation for this component. One hundred fifty-seven participants replied to the survey resulting in a 4% response rate.

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

Several questions measured respondent satisfaction levels with aspects of the Single-Family Income-Eligible component, as well as the Single-Family Income-Eligible 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 8.5 out of 10 as Figure 3-7 shows.

Respondents also rated their satisfaction with 17 aspects of the component, as Figure E-9 shows. For in-person Free Energy Checkups, the professionalism of the PECO Energy Advisor received the highest mean satisfaction score of 10.0. The products received through the program received the lowest mean score of 8.9.

Figure E-9. Single-Family Income-Eligible Component Satisfaction – Free Energy Checkup

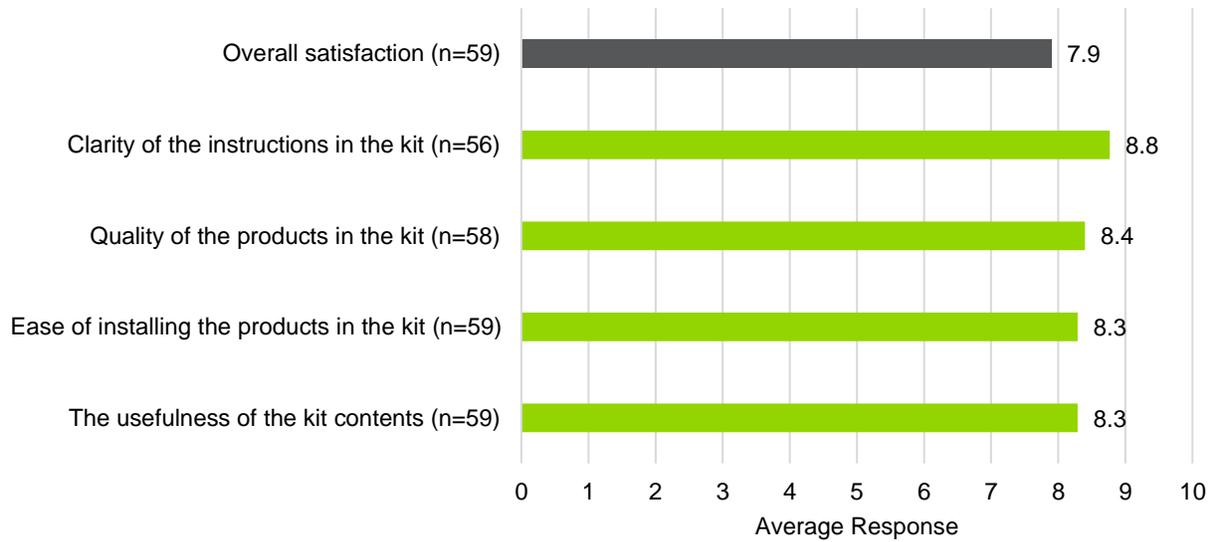


Respondents received the following questions: “How would you rate your satisfaction with the Free Energy Checkup overall?” and “How would you rate your satisfaction with the following aspects of the Free Energy Checkup?”

Source: Guidehouse analysis

For energy saving kit recipients, the clarity of the instructions in the kit received the highest mean satisfaction score of 8.8, and the usefulness of the kit contents received the lowest mean score of 8.3.

Figure E-10. Single-Family Income-Eligible Component Satisfaction – Energy Saving Kits

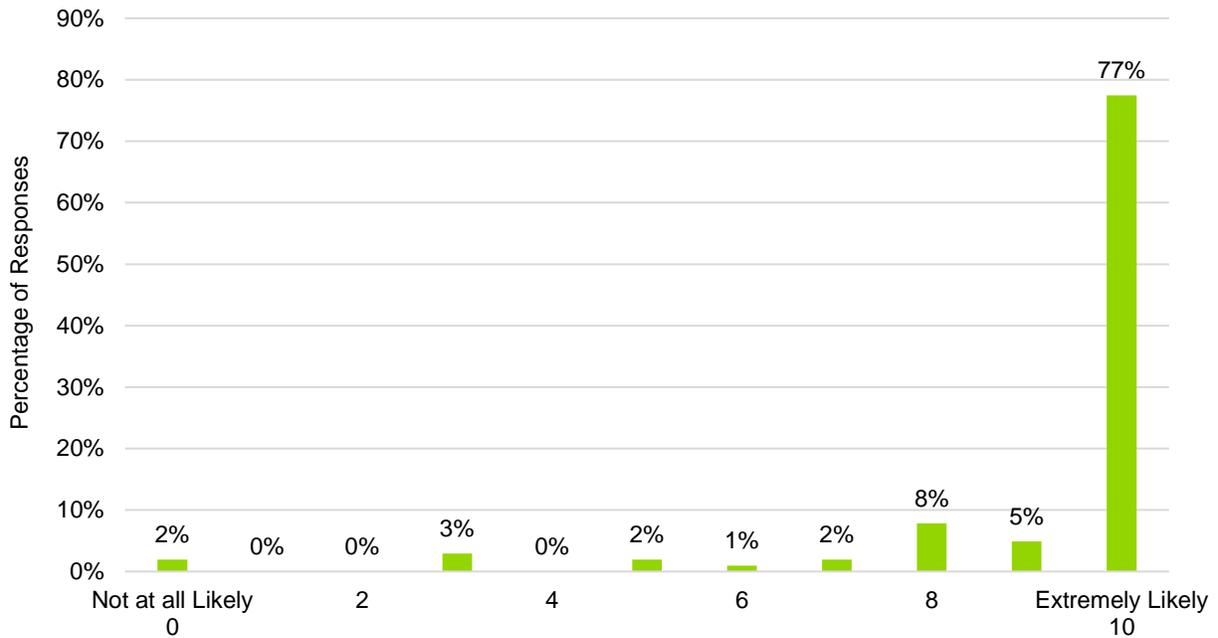


Respondents received the following questions: “How would you rate your satisfaction with the energy saving kit overall?” and “How would you rate your satisfaction with the following aspects of the energy saving kit?”

Source: Guidehouse analysis

On average, respondents rated their likelihood to recommend the Free Energy Checkup to others as 9.2 out of 10 (scale of 0 to 10, where 0 is “not at all likely” and 10 is “extremely likely”), with 77% of respondents indicating they are extremely likely to recommend the component (Figure E-11). Guidehouse excluded “don’t know” responses from analysis.

Figure E-11. Likelihood of Recommending PECO's Free Energy Checkup (n=102)

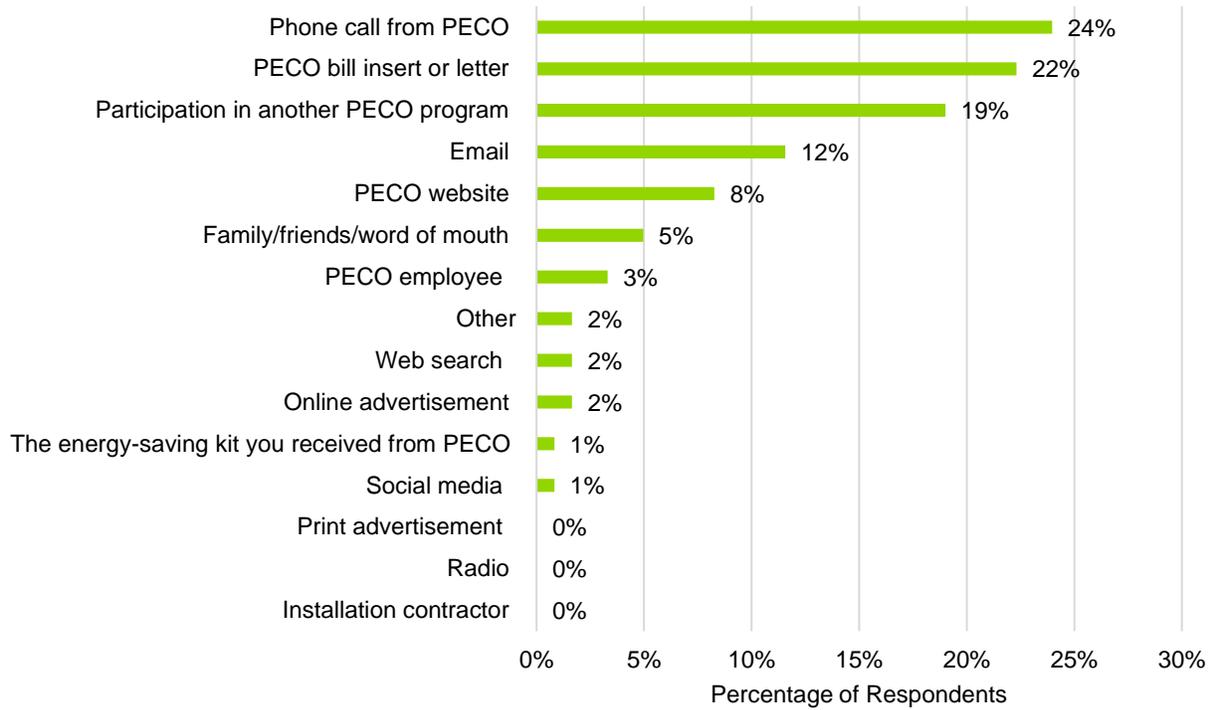


Respondents received the following question: “How likely are you to recommend PECO's Free Energy Checkup to others?”

Source: Guidehouse analysis

Respondents were asked how they learned about the Free Energy Checkup component. Most participants learned of the component through a phone call from PECO (24%) or a bill insert or letter from PECO (22%) as Figure E-12 shows. Guidehouse excluded “don't know” responses from analysis.

Figure E-12. Component Awareness of Free Energy Checkup Participants (n=104)



Respondents received the following question: “How did you learn about the Free Energy Checkup program? Select all that apply.”

Note: The component is referred to throughout the survey as “PECO’s Free Energy Checkup program” as “program” is a more familiar term to customers than “component.”

Source: Guidehouse analysis

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

This appendix details the evaluation methods and activities Guidehouse deployed in PY15 for select Residential and Income-Eligible HER Programs. According to the Phase IV Evaluation Plan,⁷⁴ these programs are planned to account for 8% of total portfolio energy savings and 9% of total portfolio demand savings. Refer to Sections 3.3 and 3.4 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 PY15 as per guidance from the SWE's Evaluation Framework.⁷⁵

F.3 Process Evaluation

Guidehouse did not conduct a process evaluation for the HER Programs in PY15.

⁷⁴ Guidehouse, *Phase IV Evaluation Plan*.

⁷⁵ Pennsylvania Statewide Evaluator, *Evaluation Framework for Pennsylvania*, 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 PY15 for select Non-Residential EE Program components. Refer to Section 3.5 for evaluation findings, results, and conclusions for these components.

G.1 Downstream Rebates

The Downstream Rebates component includes incentives for existing building retrofit projects with either deemed, partially deemed, or custom measures. Typical measures include lighting, VFDs, HVAC systems, motors, refrigeration, and controls. New for PY15, the component also includes incentives for solar PV and BOC certification. According to the Phase IV Evaluation Plan,⁷⁶ this component is planned to account for 45% of Non-Residential EE Program energy savings, 48% of Non-Residential EE Program demand savings, 32% of total portfolio energy savings, and 36% of total portfolio demand savings. DNV implements the Downstream Rebates component.

G.1.1 Gross Impact Evaluation

G.1.1.1 Methodology

In the first step of the gross impact evaluation, Guidehouse conducted a tracking database analysis for all 914 projects from all 755 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 verify whether all assumptions used in measure savings calculations were supported by the project documentation and that 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 Memo⁷⁷ 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,

⁷⁶ Guidehouse, *Phase IV Evaluation Plan*.

⁷⁷ Guidehouse, *PECO PY15 Nonresidential Impact Sample Design Memo Draft*.

the operating status of the measures, equipment nameplate data, operating schedules, a careful description of site conditions, and overall verification of the information contained in the project files. 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.⁷⁸ 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.⁷⁹ Ten projects were converted to engineering desk review after the team exhausted all customer contact attempts.

Table G-1 shows the number of Downstream Rebates projects by evaluation method. Of the 914 completed projects, the team originally sampled 36 projects for additional data collection and analysis. Seven census projects and one CHP project were added to the sample throughout the evaluation period resulting in a total of 44 sampled projects.

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

Verification Level	Evaluation Target	Number of Projects Evaluated
Tracking Database Analysis	914	914
Engineering Desk Review Only	0	10
Phone Verification	36	23
Onsite Verification	0	11
Total Sampled Projects	36	44

Source: Guidehouse analysis

Eleven projects surpassed the energy (kWh) savings thresholds set in Table 1-2 of the TRM,⁸⁰ which requires site-specific data collection for enhanced evaluation rigor. For these 11 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 eight of the 11 projects that surpassed the savings threshold to gather site-specific information. The team remotely gathered site-specific information, such as trend data, for the other four projects.

⁷⁸ Guidehouse, *PECO PY15 Nonresidential Impact Sample Design Memo Draft*.

⁷⁹ Guidehouse, *Phase IV Evaluation Plan*.

⁸⁰ Pennsylvania Public Utility Commission, *Technical Reference Manual*, <https://www.puc.pa.gov/filing-resources/issues-laws-regulations/act-129/technical-reference-manual/>.

G.1.1.2 Sampling

Using tracking data from PY15, 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 PY15 to bin projects into six strata, as outlined in the PY15 Sample Design Memo.⁸¹

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 44 Downstream Rebates projects evaluated:

- Twenty-nine included lighting or lighting control retrofits
- Six included RCx or custom HVAC improvements
- Three were refrigeration controls
- Two were custom projects
- One was a solar PV project
- One was a variable speed drive retrofit
- One was a variable speed drive retrofit and custom HVAC improvement
- One was a CHP project

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

G.1.2 Net Impact Evaluation

As described in the Phase IV Evaluation Plan⁸² approved by the SWE, Guidehouse did not conduct NTG research for this component in PY15.

G.1.3 Process Evaluation

As described in the Phase IV Evaluation Plan⁸³ approved by the SWE, Guidehouse did not conduct in-depth process activities for this component in PY15. 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.

⁸¹ Guidehouse, *PECO PY15 Nonresidential Impact Sample Design Memo Draft*.

⁸² Guidehouse, *Phase IV Evaluation Plan*.

⁸³ Guidehouse, *Phase IV Evaluation Plan*.

G.2 Midstream Rebates

The Midstream Rebates component includes incentives at the distributor and manufacturer levels to encourage the purchase and installation of high efficiency lighting, HVAC, refrigeration and food service, compressed air, and other measures. PECO has several pathways to receive midstream rebates, including the Point of Sale (POS) for all measures, and LED Aggregation pathway (for lighting measures).

The LED aggregation pathway captures savings from manufacturer and national distributor direct-to-consumer transactions that did not go through the POS pathway. Manufacturer and national distributor (channel partner) sales and transaction data are collected and processed by Encenitiv Energy, which identifies program-qualifying LED sales. The program then disperses incentive funds to the channel partners and Encenitiv Energy to accelerate market transformation through product pricing buy-downs, sales promotions, and other mechanisms.

According to the Phase IV Evaluation Plan,⁸⁴ this component is expected to account for 33% of Non-Residential EE Program energy savings, 29% of Non-Residential EE Program demand savings, 24% of total portfolio energy savings, and 22% of total portfolio demand savings. DNV implements the Midstream Rebates component.

G.2.1 Gross Impact Evaluation

G.2.1.1 Methodology

In the first step of the gross impact evaluation, Guidehouse conducted a tracking database analysis for all 11,862 projects from all 6,906 participants in the Midstream Rebates 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 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 verify whether all assumptions used in measure savings calculations were supported by the project documentation and that 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 Memo⁸⁵ that was submitted to and

⁸⁴ Guidehouse, *Phase IV Evaluation Plan*.

⁸⁵ Guidehouse, *PECO PY15 Nonresidential Impact Sample Design Memo Draft*.

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.⁸⁵ Projects assigned an onsite visit first received an engineering desk review to create the SSMVP. The primary objective of site visits was to collect the data required by the TRM and the Phase IV Evaluation Framework. This data included verifying the quantities and type of each measure, equipment nameplate data, and operating schedules, and carefully describing the site conditions. Guidehouse verified this information through visual inspection of the measures and by interviewing the customers, and updated measure savings calculations as warranted based on verified information obtained onsite.

Guidehouse made every attempt to complete its verification efforts. 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.⁸⁶ Thirty-one projects were converted to a file review after the team exhausted all customer contact attempts.

Table G-2 shows the number of Midstream Rebates projects by evaluation method. Of the 11,862 completed projects through 6,906 participants, the team originally sampled 86 projects for increased evaluation rigor. Partway through the PY15 program year, the EDC and CSP identified an anomalous vendor in the tracking data and took actions to rectify violations of the program rules. Because the rigor of this review was limited to this one vendor, Guidehouse deemed this vendor to have been treated uniquely from other participating vendors. Therefore, projects from this vendor may not be representative of typical participating projects from the greater population, and projects from the general population may not be representative of projects from this specific vendor. Due to this uniqueness and lack of representativeness, Guidehouse created an additional stratum specific to this vendor. Three additional projects from this vendor were added to the sample to increase the sample count to nine. This resulted in a total of 89 sampled Midstream Rebates projects.

Table G-2. Non-Residential Midstream Rebates Project Count by Evaluation Method

Verification Level	Evaluation Target	Final Evaluation Total
Tracking Database Analysis	11,862	11,862
Engineering Desk Review Only	0	31
Phone Verification	86	58
Onsite Verification	0	0
Total Sampled Projects	86	89

Source: Guidehouse analysis

⁸⁶ Guidehouse, *Phase IV Evaluation Plan*.

No projects surpassed the energy (kWh) savings thresholds set in Table 1-2 of the TRM,⁸⁷ which requires site-specific data collection for enhanced evaluation rigor.

G.2.1.2 Sampling

Using tracking data from PY15, 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 PY15 to bin projects within five strata, as outlined in the PY15 Sample Design Memo.⁸⁸

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 Rebates 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 Midstream Rebates energy savings. Partway through the PY15 program year, Guidehouse added a sixth stratum to evaluate projects from an anomalous vendor.

For Midstream Rebates projects, all 89 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

As described in the Phase IV Evaluation Plan⁸⁹ approved by the SWE, Guidehouse did not conduct NTG research for this component in PY15.

G.2.3 Process Evaluation

As described in the Phase IV Evaluation Plan⁹⁰ approved by the SWE, Guidehouse did not conduct in-depth process activities for this component in PY15. 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.

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,⁹¹ this component is predicted to account for 18% of Non-Residential EE Program energy savings, 19% of Non-Residential Program demand savings, 13% of total

⁸⁷ Pennsylvania Public Utility Commission, *Technical Reference Manual*, <https://www.puc.pa.gov/filing-resources/issues-laws-regulations/act-129/technical-reference-manual/>.

⁸⁸ Guidehouse, *PECO PY15 Nonresidential Impact Sample Design Memo Draft*.

⁸⁹ Guidehouse, *Phase IV Evaluation Plan*.

⁹⁰ Guidehouse, *Phase IV Evaluation Plan*.

⁹¹ Guidehouse, *Phase IV Evaluation Plan*.

portfolio energy savings, and 14% of total portfolio demand savings. DNV implements the Small Business Direct Install component using an open contractor network.

G.3.1 Gross Impact Evaluation

G.3.1.1 Methodology

Guidehouse conducted a tracking database analysis for all 1,388 projects across all 1,347 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. Guidehouse applied the verification ratios from the PY14 evaluation of the Small Business Direct Install program to the PY15 adjusted database savings for energy and demand to arrive at PY15 gross impact results.

G.3.2 Net Impact Evaluation

As described in the Phase IV Evaluation Plan⁹² approved by the SWE, Guidehouse did not conduct NTG research for this component in PY15.

G.3.3 Process Evaluation

As described in the Phase IV Evaluation Plan⁹³ approved by the SWE, Guidehouse did not conduct in-depth process activities for this component in PY15. 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.

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,⁹⁴ this component is expected to account for 4% of Non-Residential EE Program energy savings, 3% of Non-Residential EE Program demand

⁹² Guidehouse, *Phase IV Evaluation Plan*.

⁹³ Guidehouse, *Phase IV Evaluation Plan*.

⁹⁴ Guidehouse, *Phase IV Evaluation Plan*.

savings, 3% of total portfolio energy savings, and 2% of total portfolio demand savings. DNV implements the New Construction component.

G.4.1 Gross Impact Evaluation

G.4.1.1 Methodology

Guidehouse conducted a tracking database analysis for all 93 projects across all 79 participants⁹⁵ 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.

The evaluation team supplemented engineering desk reviews with phone verifications, which the team assigned to projects per the Sample Design Memo⁹⁶ 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 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.⁹⁷ Projects assigned an onsite visit first received an engineering desk review to create the SSMVP. The primary objective of site visits was to collect the data required by the TRM and the Phase IV Evaluation Framework. This data included verifying the quantities and type of each measure, equipment nameplate data, and operating schedules, and carefully describing the site conditions. Guidehouse verified this information through visual inspection of the measures and by interviewing the customers, and updated measure savings calculations as warranted based on verified information obtained onsite.

Guidehouse made every attempt to complete its verification efforts. 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.⁹⁸ Two projects were converted to engineering desk review after the team exhausted all customer contact attempts.

Table G-3 shows the number of New Construction projects by evaluation method. Of the 93 completed projects, the team sampled 13 projects for additional data collection and analysis.

⁹⁵ Participants are defined as the count of unique bill accounts.

⁹⁶ Guidehouse, *PECO PY15 Nonresidential Impact Sample Design Memo Draft*.

⁹⁷ Guidehouse, *PECO PY15 Nonresidential Impact Sample Design Memo Draft*.

⁹⁸ Guidehouse, *Phase IV Evaluation Plan*.

Table G-3. Non-Residential New Construction Project Count by Evaluation Method

Verification Level	Evaluation Target	Number of Projects Evaluated
Tracking Database Analysis	93	93
Engineering Desk Review Only	0	2
Phone Verification	13	9
Onsite Verification	0	2
Total Sampled Projects	13	13

Source: Guidehouse analysis

Three projects surpassed the energy (kWh) savings thresholds set in Table 1-2 of the TRM,⁹⁹ which requires site-specific data collection for enhanced evaluation rigor. For these three 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 two of the three projects that surpassed the savings threshold to gather site-specific information. Site-specific information, like trend data, for the other project was gathered remotely without a site visit.

G.4.1.2 Sampling

Using tracking data from PY15, 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 PY15 to bin projects into six strata, as outlined in the PY15 Sample Design Memo.¹⁰⁰

Guidehouse first 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 1% of total energy savings. Finally, the team divided the remaining population into two additional strata: those projects make up the upper and lower half of the total remaining energy savings.

Of the 13 New Construction projects evaluated:

- Five included lighting or lighting control retrofits and HVAC improvements
- Five included lighting or lighting control retrofits
- Two included custom HVAC improvements
- One included custom refrigeration and HVAC improvements

The SWE sampled two total projects for its review. It conducted a site visit for one of the projects and conducted an engineering desk review for the other project.

G.4.2 Net Impact Evaluation

Guidehouse estimated NTG in PY15 by conducting online surveys with customers participating in the Non-Residential New Construction component. Due to the lack of survey responses from

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

¹⁰⁰ Guidehouse, *PECO PY15 Nonresidential Impact Sample Design Memo Draft*.

this component in PY14, Guidehouse and the SWE decided to continue the survey effort through PY15 to improve survey complete counts. 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 Rebates component. See Section 3.5.3 for the NTG results of the Non-Residential New Construction component.

G.1.2.1 Estimating Free Ridership

Guidehouse followed the SWE’s Evaluation Framework¹⁰¹ on 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 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 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 Non-Residential New Construction component included:

- A. Would not have designed and built the project above code
- B. Would have postponed the new construction project
- 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 installed any energy efficient equipment or would have postponed installation) indicate zero free ridership and thus results in a score of 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-4 shows the questions and scoring for the New Construction component.

Table G-4. 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	0.00
	Postponed project	0.00
	Reduced size, scope, efficiency	Based on response to FR3
	Designed and built exactly the same	Based on response to FR4

¹⁰¹ Pennsylvania Statewide Evaluator, *Evaluation Framework for Pennsylvania*, https://www.puc.pa.gov/media/1584/swe-phaseiv_evaluation_framework071621.pdf.

Question	Response	Intention Score
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%)	0.38
	Moderate amount (34% - 66%)	0.25
	Large amount (67% - 99%)	0.13
	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	0.38 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 intentional question but left in for follow-up questions.

2 Infrequent responses.

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 New Construction 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-5 shows.

Table G-5. Influence Scoring for the Non-Residential New Construction Component

Component Influence Rating	Influence Score
0 – Not at All Influential	0.50
1-2 ¹	0.44
3-4	0.38
5-6	0.25
7-8	0.13
9-10 – Extremely Influential	0.00
Don't Know	0.25

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

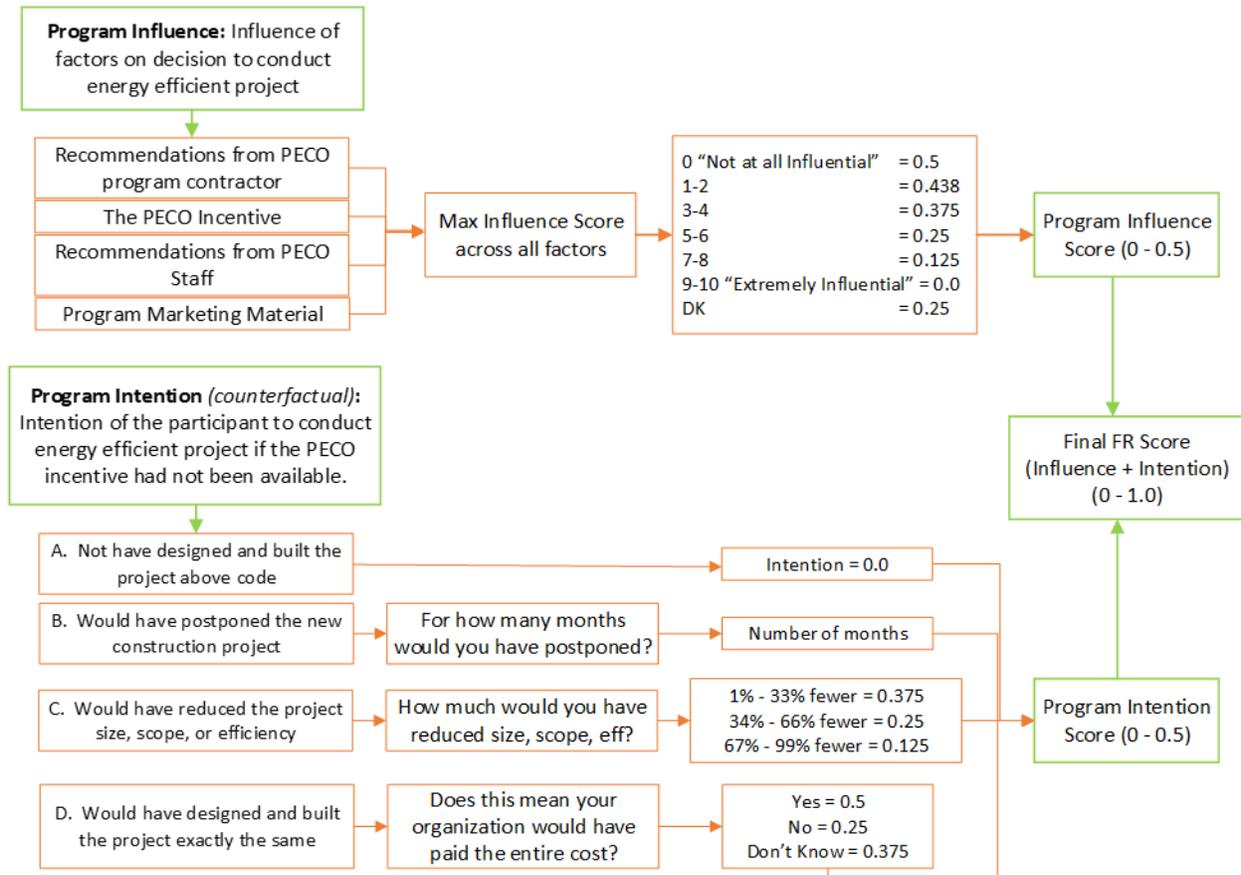
G.1.2.2 Total Free Ridership Score

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 New Construction component.

G.1.2.3 Algorithm Diagram

Figure G-1 provides a visual representation of the scoring of the free ridership questions.

Figure G-1. Free Ridership Algorithm – New Construction



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-incentivized 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 PY15.

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.¹⁰² The New Construction 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 = 0.0 (no savings attributed to the component)

Only one New Construction respondent reported the installation of additional equipment without a rebate, an air handler unit. Guidehouse calculated an energy savings estimate per the TRM and developed conservative working assumptions for any required inputs (e.g., square footage of facility) or identified average verified savings for like-spillover equipment.

Guidehouse then estimated the attributable Equipment spillover 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 spillover from each participant to the New Construction population, Guidehouse:

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

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

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

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

¹⁰² Guidehouse only asked the influence question to participants once, even if they reported installing multiple additional equipment types without receiving incentives.

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

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

G.1.2.5 Estimating the NTGR

Guidehouse estimated the final NTGR score using Equation G-1:

Equation G-1. NTG Equation

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

Where:

Free Ridership is the estimated savings that would have occurred even if the program did not exist

Spillover is the estimated savings occurring outside of the program, but directly influenced by the program

Market Effects is the estimated savings occurring in the Non-Residential market due to general knowledge and education around energy efficiency, not to be double counted with spillover (not applicable in PY15)

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.

Due to a low response rate in PY14, Guidehouse continued the Non-Residential New Construction process evaluation through PY15. Combined results from both program years are presented here.

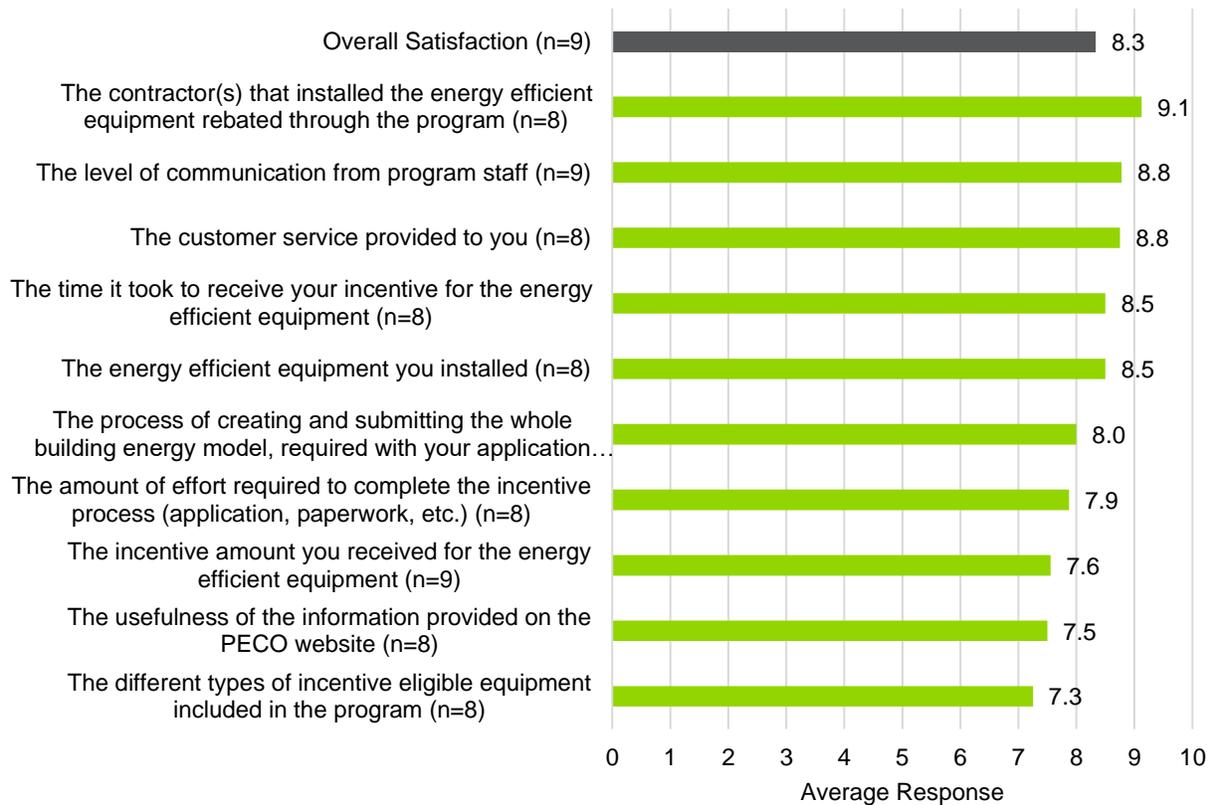
Guidehouse contacted 47 customers who participated in the New Construction component during PY14 and 53 customers who participated during PY15 to conduct the process evaluation for this component. Nine participants replied to the survey resulting in a 9% response rate.

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

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-2 shows. Respondents also rated their satisfaction with 10 aspects of the component, as Figure G-2 shows. The

contractors that installed the energy efficient equipment received the highest mean satisfaction score of 9.1 out of 10. The different types of eligible equipment included in the component received the lowest mean satisfaction score of 7.3 out of 10.

Figure G-2. New Construction Component Satisfaction

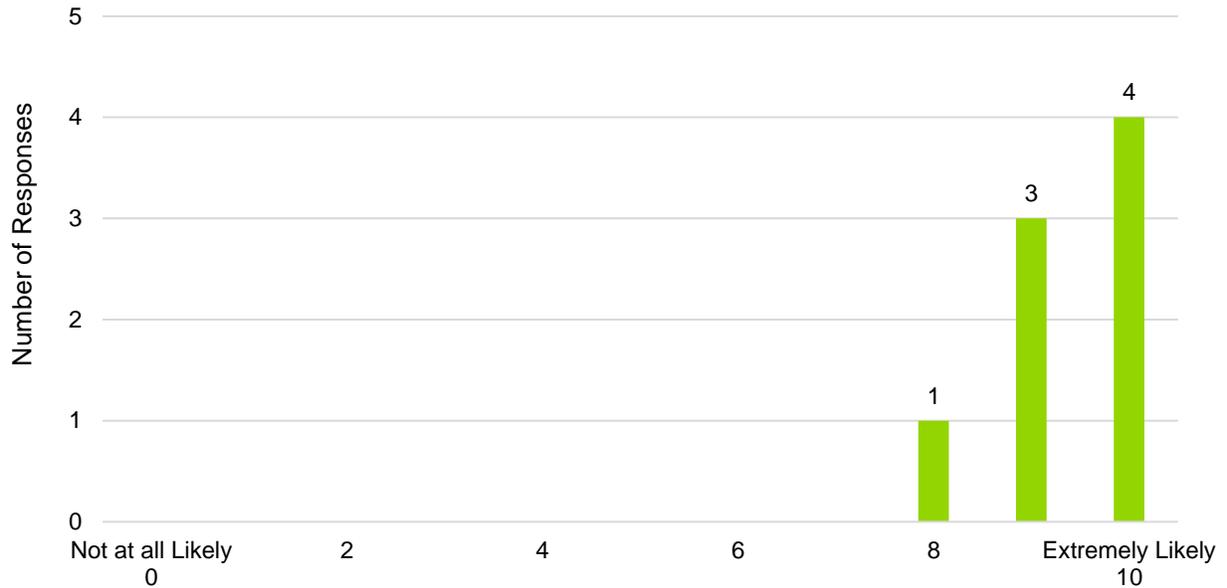


Respondents received the following questions: “How would you rate your satisfaction with PECO Ways to Save overall?” and “How would you rate your satisfaction with the following aspects of PECO Ways to Save?”

Source: Guidehouse analysis

On average, respondents rated their likelihood to recommend the New Construction component to others as 9.4 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.

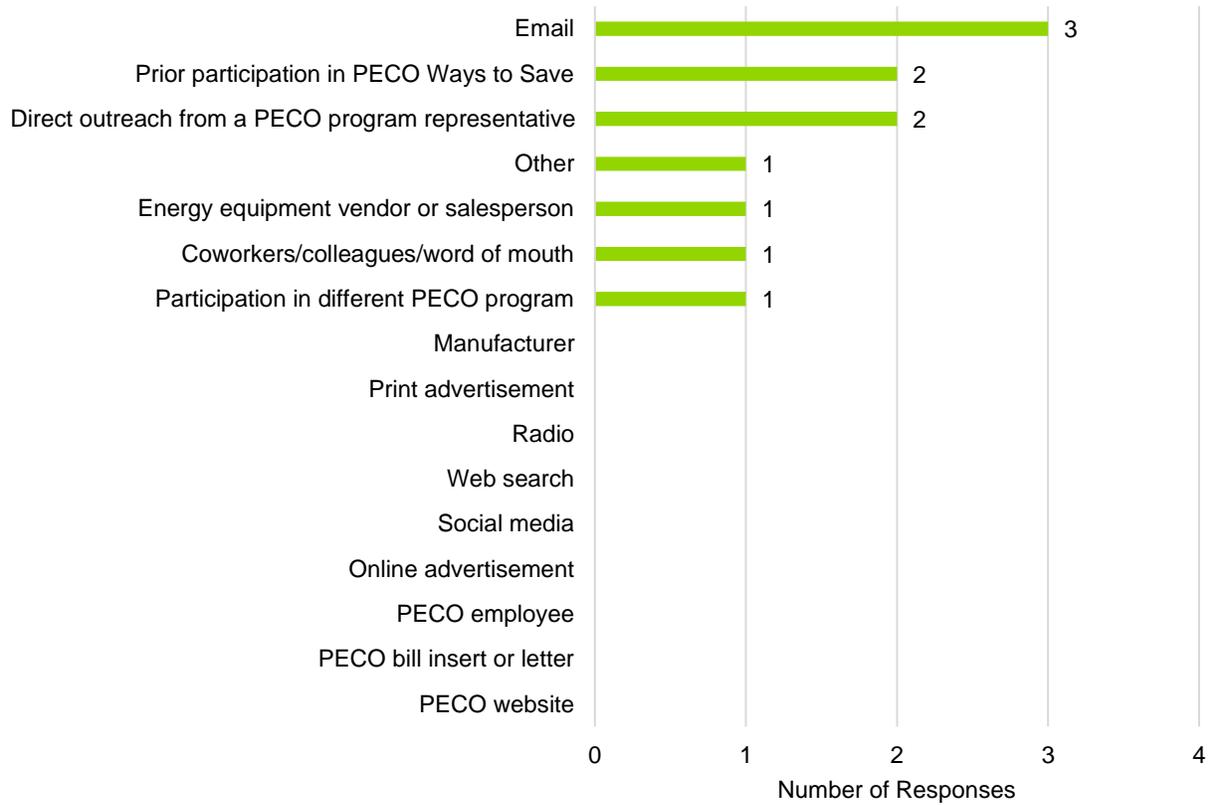
Figure G-3. Likelihood of Recommending the New Construction Component (n=8)



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-4 shows. Each of the nine respondents were made aware of the component via seven different channels.

Figure G-4. Component Awareness of New Construction Participants (n=9)



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 implemented three tactic pilots in Phase IV, approved by the PUC, as determined by the settlement agreement.¹⁰³ 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 presented earlier. The final evaluations of the pilots were reported separately upon completion of the implementation period of the pilots, which ended in late 2023.

Table H-1. Implementation Tactic Pilot Programs

Pilot	PY15 Participation ¹	Reported Energy Savings (MWh)	Reported Demand Savings (MW)	Incentive Spending (\$1,000)	Bonus Incentive Spending (\$1,000)
Residential Comprehensive Projects	696	2,467	0.321	\$394	370
Non-Residential Comprehensive Projects	13	1,079	0.187	\$134	\$32
IE Healthy and Safety	73	267	0.009	Bridge Measures: \$270	H&S: \$270

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.

Income-Eligible H&S Pilot incentive totals are sourced from CMC-maintained Pilot Performance Tracker Power BI Dashboard. Total non-incentive spending provided in PY14 Annual Report.

¹ Participation for Residential and Non-Residential Comprehensive Projects is the customer count. Participation for the Income-Eligible H&S Pilot is the count of customers whose participating H&S projects and bridge measures appeared in eTRACK.

Source: Guidehouse analysis

¹⁰³ PECO, *PECO Settlement EEC Term Sheet*, dated February 11, 2021.