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September 30, 2022

VIA ELECTRONIC FILE

Rosemary Chiavetta, Secretary
Pennsylvania Public Utility Commission
Commonwealth Keystone Building
400 North Street
Harrisburg, PA 17120

Re: Semi-Annual Report to the Pennsylvania Public Utility Commission and Act 129 Statewide Evaluator; Phase IV Program Period June 1, 2021 to May 31, 2022 for Metropolitan Edison Company, Pennsylvania Electric Company, Pennsylvania Power Company and West Penn Power Company;
Docket Nos. M-2015-2514767, et. al

Dear Secretary Chiavetta:

Enclosed please find the Final Semi-Annual Report to the Pennsylvania Public Utility Commission in the above-captioned matter for Metropolitan Edison Company, Pennsylvania Electric Company, Pennsylvania Power Company, and West Penn Power Company.

Should you have any questions regarding this matter, please do not hesitate to contact me.

Sincerely,

Daniel A. Garcia

DAG:kbw

Enclosure

cc: Certificate of Service

Final Annual Report to the Pennsylvania Public Utility Commission

Phase IV of Act 129

Program Year 13

(June 1, 2021 – May 31, 2022)

For Pennsylvania Act 129 of 2008

Energy Efficiency and Conservation Plan

Prepared by ADM Associates, Tetra Tech, and Ecometric Consulting

For

Metropolitan Edison Company M-2015-2514767

Pennsylvania Electric Company M-2015-2514768

Pennsylvania Power Company M-2015-2514769

West Penn Power Company M-2015-2514772

September 30, 2022

Contents

Acronyms

BOC	Building Operator Certification
C&I	Commercial and Industrial
CFL	Compact Fluorescent Lamp
CSP	Conservation Service Provider or Curtailment Service Provider
CV	Coefficient of Variation
DLC	Direct Load Control
DDR	Dispatchable Demand Response
EAP	Energy Association of Pennsylvania
EDC	Electric Distribution Company
EDT	Eastern Daylight Time
EE&C	Energy Efficiency and Conservation
EM&V	Evaluation, Measurement, and Verification
EMNC	Energy Management and New Construction
ER	Early Replacement
EUL	Effective Useful Life
GNI	Government, Non-Profit, Institutional
HER	Home Energy Report
HERS	Home Energy Rating System
HIM	High-Impact Measure
HPWP	Heat Pump Water Heater
HVAC	Heating, Ventilating, and Air Conditioning
ICSP	Implementation Conservation Service Provider
IDI	In-Depth Interview
IMP	Interim Measure Protocol
kW	Kilowatt
kWh	Kilowatt-hour
LED	Light-Emitting Diode
LI	Low-Income
LIURP	Low-Income Usage Reduction Program
LLF	Line Loss Factor
M&V	Measurement and Verification
MW	Megawatt
MWh	Megawatt-hour
NPV	Net Present Value
NTG	Net-to-Gross
O&M	Operation and Maintenance
P4TD	Phase IV to Date
PA PUC	Pennsylvania Public Utility Commission
PSA	Phase IV to Date Preliminary Savings Achieved; equal to VTD + PYRTD
PSA+CO	PSA savings plus Carryover from Phase III
PY	Program Year: e.g. PY13, from June 1, 2021, to May 31, 2022
PYRTD	Program Year Reported to Date
PYVTD	Program Year Verified to Date
RCT	Randomized Control Trial
ROB	Replace on Burnout

RTD	Phase IV to Date Reported Gross Savings
RTO	Regional Transmission Organization
SO	Spillover
SWE	Statewide Evaluator
TRC	Total Resource Cost
TRM	Technical Reference Manual
VTD	Phase IV to Date Verified Gross Savings
WACC	Weighted Average Cost of Capital

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 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 estimate due to adjustments for the effects of free riders, changes in codes and standards, market effects, participant and nonparticipant spillover, and other causes of changes in energy consumption or demand not directly attributable to the EE&C program.

Reported Gross: Also referred to as *ex ante* (Latin for "beforehand") savings. The energy and peak demand savings values calculated by the EDC or its program Implementation Conservation Service Providers (ICSP) 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 multi-year cycle, the reported savings for a program year where evaluated results are not available are characterized as unverified reported gross until the impact evaluation is completed and verified savings can be calculated and reported.

Verified Gross: Also referred to as *ex post* (Latin for "from something done afterward") gross savings. The energy and peak demand savings estimates reported by the independent evaluation contractor after the gross impact evaluation and associated 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.

Annual Savings: Energy and demand savings expressed on an annual basis, or the amount of energy and/or peak demand an EE&C measure or program can be expected to save over the course of a typical year. Annualized savings are noted as MWh/year or MW/year. The Pennsylvania TRM 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. The 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. PYTD values for energy efficiency will always be reported gross savings in a semi-annual 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 below.

> **Phase IV to Date Reported (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 (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 Savings Achieved (PSA):** The sum of the verified gross savings (VTD) from previous program years in Phase IV where the impact evaluation is complete plus the reported gross savings from the current program year.
>
> **Phase IV to Date Preliminary 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 is the best estimate of an EDC's progress toward the Phase IV compliance targets.

Phase IV to Date Verified + 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.

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 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 in Program Year 13 (PY13) for Metropolitan Edison (Met-Ed), Pennsylvania Electric Company (Penelec), Pennsylvania Power Company (Penn Power), and West Penn Power Company (WPP), collectively referred to herein as the FirstEnergy PA Companies (Companies) or the four PA EDCs, 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 towards EDC savings compliance targets for Phase IV.

This report details the participation, spending, reported gross, verified gross, and verified net impacts of the energy efficiency programs in PY13. 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 test (TRC).[1] The Companies have retained ADM Associates, Tetra Tech, and Ecometric Consulting (the ADM team, or ADM) as an independent evaluation contractor for Phase IV of Act 129. The ADM team is responsible for the measurement, verification, and calculation of gross verified and net verified savings.

The ADM team also performed process evaluations to examine the design, administration, implementation, and market response to the EE&C program. This report presents the key findings and recommendations identified by the process evaluation and documents any changes to EE&C program delivery considered based on the recommendations.

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

2 Summary of Achievements

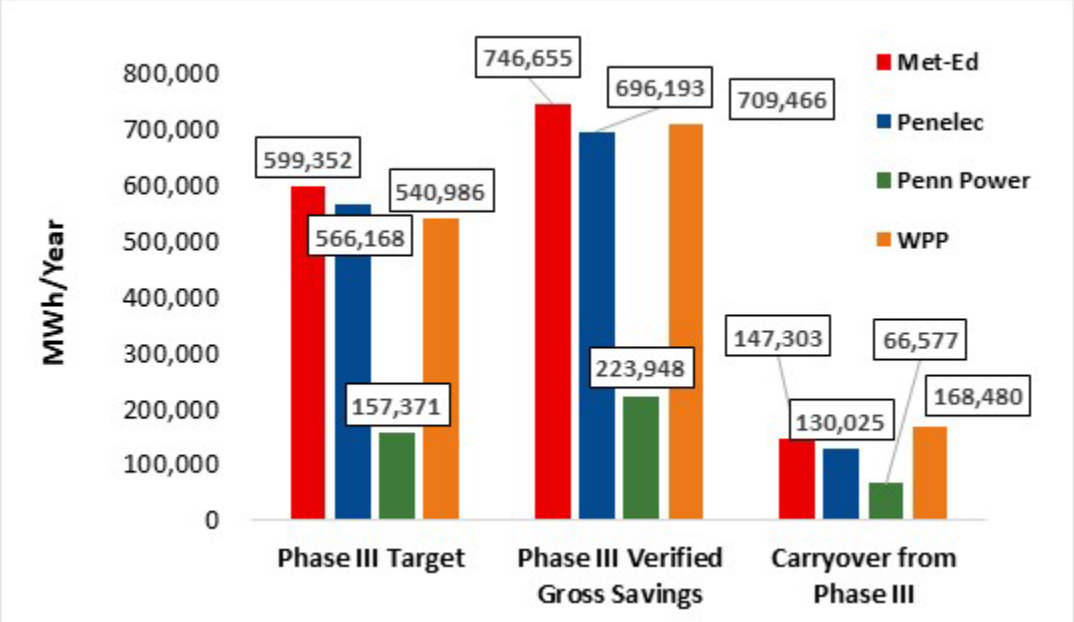
2.1 Carryover Savings from Phase III of Act 129

Table 1 shows total MWh/year carryover savings from Phase III for each of the FirstEnergy EDCs. Figure 1 compares Phase III verified gross savings total to the Phase III compliance target to illustrate the carryover calculation.

Table 1: Carryover Savings from Phase III

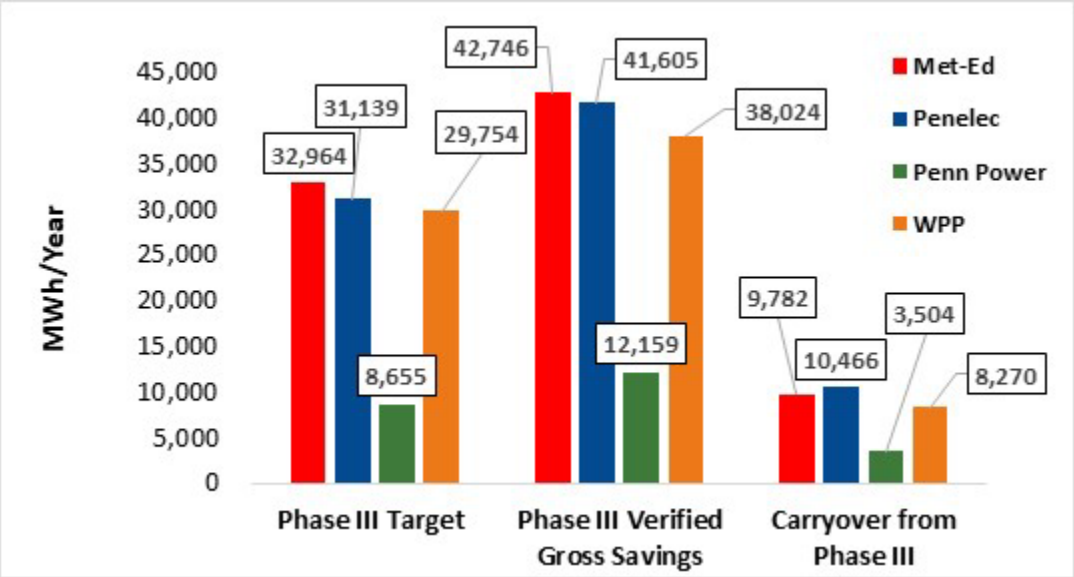
FirstEnergy EDC	Phase IV Carryover Savings (MWh/Year)	Phase IV Low-Income Carryover Savings (MWh/Year)
Met-Ed	147,303	9,782
Penelec	130,025	10,466
Penn Power	66,577	3,504
West Penn Power	168,480	8,270

Figure 1: Carryover Savings from Phase III of Act 129



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

Figure 2: Low-Income Carryover from Phase III



2.2 Phase IV Energy Efficiency Achievements to Date

Phase IV energy savings targets (MWh) were established at the meter level and peak demand reduction targets (MW) were set at the system level. Accordingly, the MWh totals in this report are presented at the meter level, while peak demand savings are adjusted for transmission and distribution losses to reflect system-level savings. Since the beginning of Program Year 13 on June 1, 2021, the four FirstEnergy PA EDCs reported and verified gross electric energy savings and gross peak demand savings are shown in Table 2 below.

[2] 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.
[3] Proportionate to those savings achieved by dedicated low-income programs in Phase III.

Table 2: Gross Reported and Verified Electric and Demand Savings for PY13

EDC	PYRTD MWh	PYRTD MW	PYVTD MWh	PYVTD MW
Met-Ed	49,187	7.9	46,455	7.0
Penelec	36,788	7.2	36,021	6.8
Penn Power	16,643	2.5	15,934	2.1
West Penn Power	46,338	7.2	43,638	5.7

Since the beginning of Phase IV of Act 129 on June 1, 2021, the four FirstEnergy PA EDCs reported and verified gross electric energy savings and gross peak demand savings are shown in Table 3 below[4].

Table 3: Gross Reported and Verified Electric and Demand Savings since the beginning of Phase IV of Act 129

EDC	RTD MWh	RTD MW	VTD MWh	VTD MW
Met-Ed	49,187	7.9	46,455	7.0
Penelec	36,788	7.2	36,021	6.8
Penn Power	16,643	2.5	15,934	2.1
West Penn Power	46,338	7.2	43,638	5.7

Achievements toward Phase IV Energy Savings compliance, including carryover savings from Phase III, are shown in Table 4 below for the four PA EDCs.

Table 4: Phase IV Electric Savings including Phase III Carryover

EDC	VTD +CO MWh	MWh Compliance Target	Percent of Energy Target to Date	VTD MW	MW Compliance Target	Percent of Demand Target to Date
Met-Ed	193,758	463,215	42%	7.0	76	9%
Penelec	166,046	437,676	38%	6.8	80	9%
Penn Power	82,511	128,909	64%	2.1	20	10%
West Penn Power	212,118	504,951	42%	5.7	86	7%

Figure 3 and Figure 4 summarize progress towards the Phase IV MWh and MW portfolio compliance targets, respectively, for each of the four EDCs.

[4]All program-year and cumulative results are the same for PY13 since PY13 is the first year of Phase IV.

Figure 3: EE&C Plan Performance toward Phase IV Portfolio Compliance Target

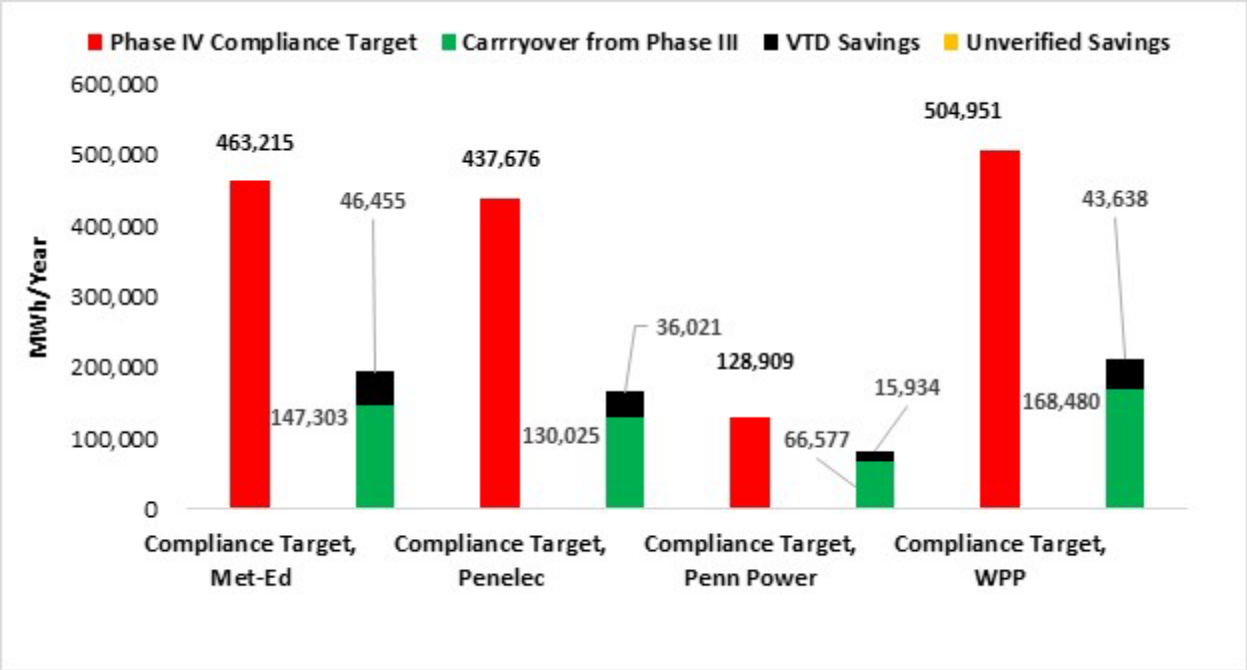
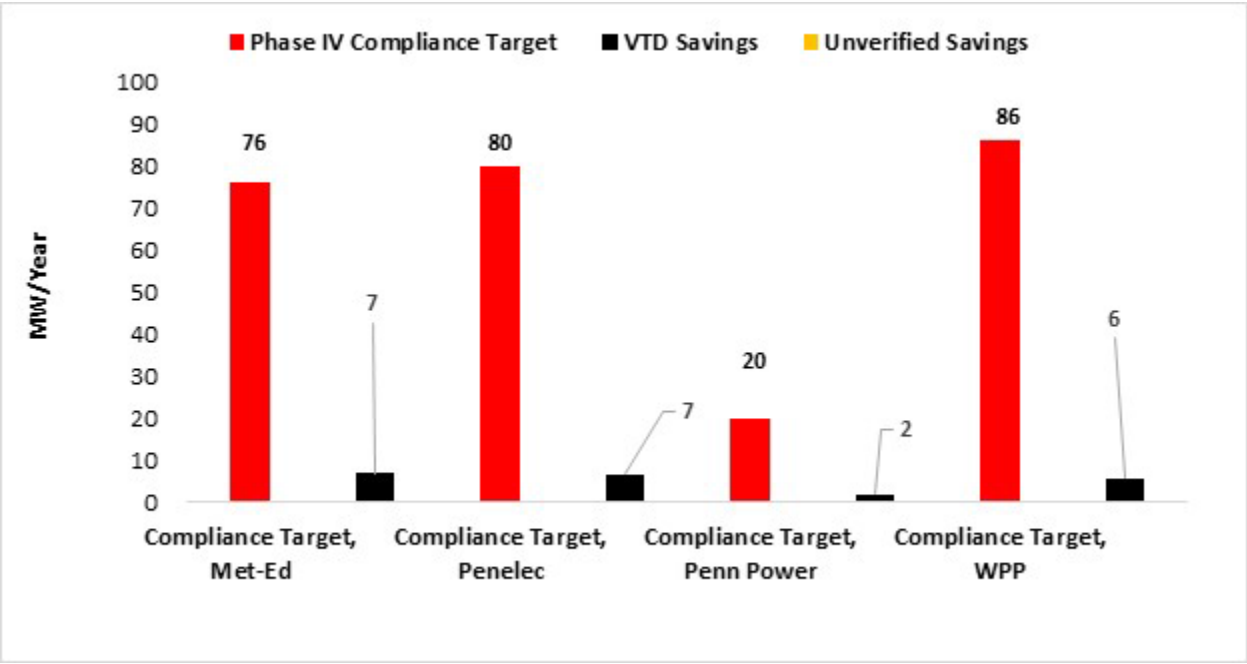


Figure 4: EE&C Plan Performance toward Phase IV Portfolio Compliance Target



2.2.1 Phase IV Prescription of Low-Income Measures and Carve-Out

The Phase IV Implementation Order directed EDCs to offer conservation measures to the low-income customer segment based on the proportion of electric sales attributable to low-income households. The proportionate number of measures targets for the EDCs are listed in the second column of Table 5. The total number of EE&C measures offered by each EDC to its residential and non-residential customer classes are shown in the third column. The fourth column shows the number of measures available to the low-income customer segment at no cost to the customer. The last column shows the percentages of total measures offered in the EE&C plan. These percentages exceed the proportionate number of measures targets for each EDC.

Table 5: Proportion of Measures Offered to Low-Income Customers

EDC	% Proportionate Number of Measures Target	Total Measures Offered	Number of Measures Available at No Cost	% Measures Offered
Met-Ed	9%	128	33	26%
Penelec	10%	128	33	26%
Penn Power	11%	128	33	26%
West Penn Power	9%	128	33	26%

The PA PUC also established a low-income energy savings target of 5.8% of the portfolio savings goal. The second column of Table 6 shows the low-income savings targets, based on verified gross savings, for each EDC. The third column of the table shows the verified low-income impacts, inclusive of Phase III carryover. The percentages of the Phase IV low-income energy savings targets achieved to date are shown in the last column of the table.

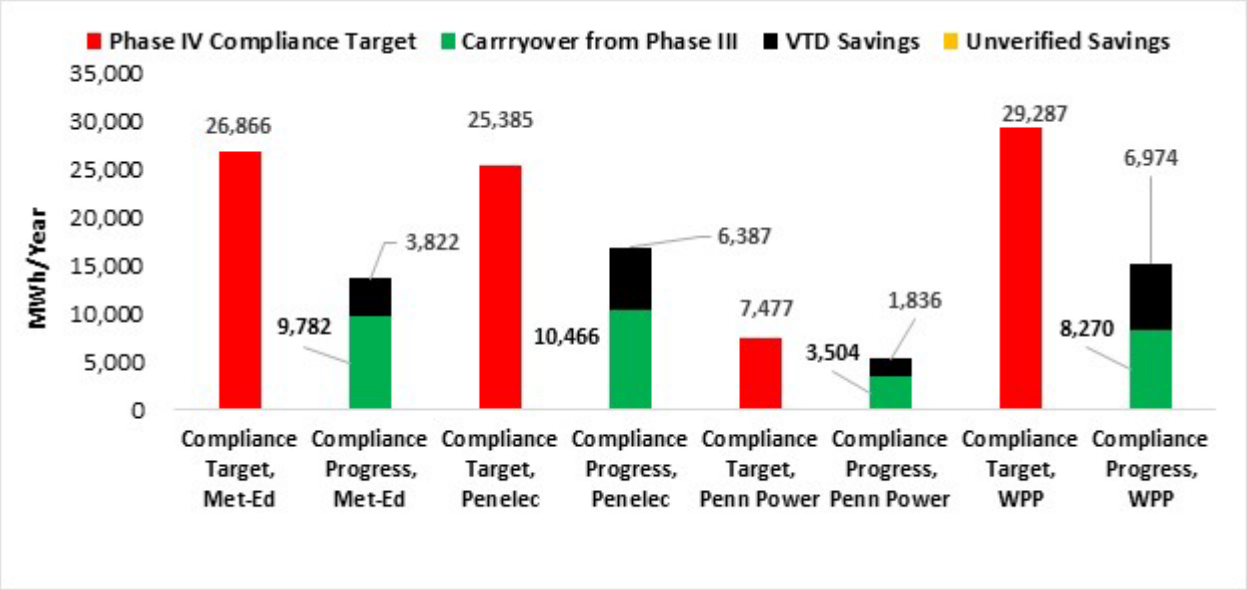
Table 6: Low-Income Program Energy Savings and Targets[5]

EDC	Compliance Target	LI VTD +CO MWh	Percent of Target to Date
Met-Ed	26,866	13,604	51%
Penelec	25,385	16,853	66%
Penn Power	7,477	5,340	71%
West Penn Power	29,287	15,243	52%

Figure 5 compares the VTD performance for the low-income customer segment to the Phase IV savings target.

[5] The sum of the LI VTD + CO in this table may differ by ±1 MWh from the sum of the VTD and CO reported in Figure 2 due to rounding. The values in Table 6 result from adding unrounded elements, and then rounding to the nearest MWh.

Figure 5: EE&C Plan Performance toward Phase IV Low-Income Compliance Target



2.2.2 Phase IV Performance, Multifamily Housing

The first and second column of Table 7 respectively show verified gross electric energy savings (PYVTD) in the multifamily sector and for low-income customers within that sector. based on verified gross savings, for each EDC. The third and fourth columns of the table show Phase IV verified gross electric energy savings (VTD) in the multifamily sector and for low-income customers within that sector.

Table 7: Energy Savings in the Multifamily Sector

EDC	PYVTD MF MWh	PYVTD MF LI MWh	VTD MF MWh	VTD MF LI MWh
Met-Ed	554	167	554	167
Penelec	691	667	691	667
Penn Power	124	124	124	124
West Penn Power	1,352	1,351	1,352	1,351

2.3 Phase IV Performance by Customer Segment

Table 8 presents the participation[6], savings, and spending by customer sector for PY13. The residential, small C&I, and large C&I sectors are defined by EDC tariff and the residential low-income and governmental/educational/non-profit sector were defined by statute (66 Pa. C.S. § 2806.1). The residential low-income segment is a subset of the residential customer class and the GNI segment will include customers who are part of the Small C&I or Large C&I rate

[6] The definition of participant is discussed in Section 2.4 below.

classes. The savings, spending, and participation values for the LI and GNI segments have been removed from the parent sectors in Table 8.

Table 8: Program Year 13 Summary Statistics by Customer Segment

EDC	Parameter	Residential (Non-LI)	Low Income	Small C&I (Non-GNI)	Large C&I (Non-GNI)	GNI	Total
Met-Ed	# participants	109,857	23,572	137	15	22	133,603
	PYVTD MWh/yr	19,969	3,762	4,601	17,098	1,025	46,455
	PYVTD MW/yr	3.24	0.48	0.78	2.34	0.17	7.02
	Incentives ($1000)	$3,471	$989	$359	$618	$227	$5,664
Penelec	# participants	79,438	29,443	158	13	9	109,061
	PYVTD MWh/yr	14,637	5,942	13,204	1,882	356	36,021
	PYVTD MW/yr	2.19	0.61	3.71	0.31	0.03	6.84
	Incentives ($1000)	$2,140	$1,504	$1,254	$172	$34	$5,104
Penn Power	# participants	38,930	10,822	55	7	7	49,821
	PYVTD MWh/yr	5,715	1,716	1,085	7,266	151	15,934
	PYVTD MW/yr	0.92	0.17	0.14	0.82	0.02	2.08
	Incentives ($1000)	$955	$411	$235	$456	$8	$2,066
West Penn Power	# participants	120,205	22,364	171	12	3	142,755
	PYVTD MWh/yr	19,646	5,817	6,862	11,243	71	43,638
	PYVTD MW/yr	2.88	0.56	1.06	1.23	0.01	5.74
	Incentives ($1000)	$3,121	$1,044	$1,701	$658	$12	$6,536

Table 9 summarizes plan performance by sector since the beginning of Phase IV.

Table 9: Phase IV Summary Statistics by Customer Segment

EDC	Parameter	Residential (Non-LI)	Low Income	Small C&I (Non-GNI)	Large C&I (Non-GNI)	GNI	Total
Met-Ed	# participants	109,857	23,572	137	15	22	133,603
	VTD MWh/yr	19,969	3,762	4,601	17,098	1,025	46,455
	VTD MW	3.2	0.5	1	2	0	7.0
	Incentives ($1000)	3,471	989	359	618	227	5,664
Penelec	# participants	79,438	29,443	158	13	9	109,061
	VTD MWh/yr	14,637	5,942	13,204	1,882	356	36,021
	VTD MW	2.2	0.6	4	0	0	6.8
	Incentives ($1000)	2,140	1,504	1,254	172	34	5,104
Penn Power	# participants	38,930	10,822	55	7	7	49,821
	VTD MWh/yr	5,715	1,716	1,085	7,266	151	15,934
	VTD MW	0.9	0.2	0	1	0	2.1
	Incentives ($1000)	955	411	235	456	8	2,066
West Penn Power	# participants	120,205	22,364	171	12	3	142,755
	VTD MWh/yr	19,646	5,817	6,862	11,243	71	43,638
	VTD MW	2.9	0.6	1	1	0	5.7
	Incentives ($1000)	3,121	1,044	1,701	658	12	6,536

2.4 SUMMARY OF PARTICIPATION BY PROGRAM

Participation is defined differently for certain programs depending on the program delivery channel and data tracking practices. The nuances of the participant definition vary by program and are summarized by program in the bullets below. Table 10 provides the current participation totals for PY13 and Phase IV.

- For the Appliance Recycling components of the Energy Efficient Products, Low-Income Energy Efficiency Program, and Energy Solutions for Business – Small Program, participation is the count of rebate applications, which corresponds to appliance pick-up events. If a homeowner recycles two refrigerators on one occasion, that counts as one participant.
- For the Home Energy Reports and Online Audit components of the Energy Efficient Homes and Low-Income Energy Efficiency Programs, the number of participants is taken as the maximum number of participants in the treatment group during the year. This definition of participant is selected because it aligns with the gross impact evaluation protocol for Home Energy Reports.
- For the Conservation Kits components of the Energy Efficient Homes Program and Low-Income Energy Efficiency Programs, the participant counts are equal to the overall count of kits distributed by each program. In nearly all cases, one kit is sent to a household.
- For the Residential New Construction components of the Energy Efficient Homes Program and Low-Income Energy Efficiency Programs, the participant count is equal to the number of houses (or in the case of multifamily housing, the number of dwelling units).
- For the Direct Install component of the Energy Efficient Homes Program, the participant count is equal to the number of rebate homes treated in the program.
- For Midstream Appliances component of the Energy Efficient Products Program, the participant count is equal to the appliances sold.
- For the Upstream Electronics component of the Energy Efficient Products Program, the participant count is equal to the number of electronics equipment sold.
- For the HVAC component of the Energy Efficient Products Program, the participant count is equal to the sum of HVAC units and HVAC tune-ups rebated by the program. If a customer purchases multiple HVAC units or tune-ups, then the customer counts as two participants. The majority of rebate applications, however, are for a single HVAC system or service.
- For the Appliances components of the Energy Efficient Products Program and the Low-Income Energy Efficiency Program, the participant count is equal to the sum of rebate applications. If a customer purchases multiple appliances and submits one application for them all, then the customer counts as one participant. If a customer submits multiple rebate applications, then they count as multiple participants.
- For the Direct Install component of the Low-Income Energy Efficiency Program, the participant count is equal to the number of homes treated in the program.

- For the downstream and midstream rebates in all nonresidential energy efficiency programs, the participant count is equal to the number of unique account numbers associated with rebate applications for the program year.

Table 10: EE&C Portfolio Participation by Program

Utility	Program	PY13 Participation	P4TD Participation
Met-Ed	Energy Efficient Homes	89,015	89,015
	Energy Efficient Products	20,842	20,842
	Low Income Energy Efficiency	23,572	23,572
	C&I Energy Solutions for Business - Small	157	157
	C&I Energy Solutions for Business - Large	17	17
	Portfolio Total	**133,603**	**133,603**
Penelec	Energy Efficient Homes	62,974	62,974
	Energy Efficient Products	16,464	16,464
	Low Income Energy Efficiency	29,443	29,443
	C&I Energy Solutions for Business - Small	166	166
	C&I Energy Solutions for Business - Large	14	14
	Portfolio Total	**109,061**	**109,061**
Penn Power	Energy Efficient Homes	31,722	31,722
	Energy Efficient Products	7,208	7,208
	Low Income Energy Efficiency	10,822	10,822
	C&I Energy Solutions for Business - Small	61	61
	C&I Energy Solutions for Business - Large	8	8
	Portfolio Total	**49,821**	**49,821**
West Penn Power	Energy Efficient Homes	102,229	102,229
	Energy Efficient Products	17,976	17,976
	Low Income Energy Efficiency	22,364	22,364
	C&I Energy Solutions for Business - Small	174	174
	C&I Energy Solutions for Business - Large	12	12
	Portfolio Total	**142,755**	**142,755**

2.5 Summary of Impact Evaluation Results

During PY13 the ADM team completed gross impact evaluations for all the energy efficiency programs in the portfolio, and net impact evaluation for the Appliance Recycling initiative. Table 11 and Table 12 summarize the realization rates and net-to-gross ratios by program. Initiative-level evaluation detail is available in the Appendices to this report. Note that net-to-gross studies for most initiatives are scheduled for subsequent program years. The net-to-gross ratios shown in the tables, other than for Appliance Recycling, derive from comparable programs and initiatives offered by the Companies in Phase III of Act 129.

Table 11: Impact Evaluation Results Summary for Met-Ed and Penelec

Program/ Initiative	Parent Program	Met-Ed			Penelec		
		Energy Realization Rate	Demand Realization Rate	Net to Gross Ratio	Energy Realization Rate	Demand Realization Rate	Net to Gross Ratio
EE Kits	Energy Efficient Homes	68.2%	61.3%	82.0%	91.6%	84.6%	83.5%
Home Energy Reports	Energy Efficient Homes	109.8%	0.0%	100.0%	-182.7%	0.0%	100.0%
Direct Install	Energy Efficient Homes	110.7%	74.5%	95.0%	124.0%	69.1%	103.0%
New Homes	Energy Efficient Homes	98.1%	69.0%	73.0%	102.8%	79.8%	73.0%
Multifamily	Energy Efficient Homes	0.0%	0.0%	81.0%	140.3%	72.9%	84.0%
Online Audits	Energy Efficient Homes	0.0%	100.0%	100.0%	0.0%	100.0%	100.0%
Appliance Recycling	Energy Efficient Products	102.8%	98.7%	39.0%	108.5%	103.5%	65.0%
Upstream Electronics	Energy Efficient Products	0.0%	0.0%	58.3%	0.0%	0.0%	58.3%
HVAC	Energy Efficient Products	114.5%	119.4%	50.7%	155.0%	157.0%	52.3%
Appliances	Energy Efficient Products	98.7%	98.7%	50.2%	95.1%	96.2%	60.0%
Midstream Appliances	Energy Efficient Products	104.8%	104.0%	47.2%	104.3%	104.4%	53.1%
Appliances	Low Income Program	98.7%	98.7%	100.0%	95.1%	96.2%	100.0%
Appliance Turn-In	Low Income Program	114.4%	117.5%	100.0%	100.8%	96.8%	100.0%
Direct Install	Low Income Program	100.2%	100.1%	100.0%	100.4%	99.5%	100.0%
Home Energy Reports	Low Income Program	61.4%	0.0%	100.0%	140.9%	0.0%	100.0%
Kits	Low Income Program	91.4%	90.8%	100.0%	97.5%	91.8%	100.0%
New Homes	Low Income Program	98.1%	69.0%	100.0%	102.8%	79.8%	100.0%
Online Audits	Low Income Program	0.0%	100.0%	100.0%	0.0%	100.0%	100.0%
CI Prescriptive	C&I Solutions for Business Programs - Small and Large	117.9%	105.3%	63.3%	95.3%	86.2%	78.4%
CI Custom	C&I Solutions for Business Programs - Small and Large	100.0%	100.0%	54.1%	100.3%	100.0%	89.3%
CI EMNC	C&I Solutions for Business Programs - Small and Large	84.1%	81.7%	62.5%	85.9%	74.9%	75.4%
CI Multifamily	C&I Solutions for Business Program - Small	49.0%	43.2%	100.0%	71.9%	70.0%	100.0%
Appliance Recycling	C&I Solutions for Business Program - Small	102.8%	98.7%	39.0%	108.5%	103.5%	65.0%

Table 12: Impact Evaluation Results Summary for Penn Power and WPP

Program/ Initiative	Parent Program	Penn Power			West Penn Power		
		Energy Realization Rate	Demand Realization Rate	Net to Gross Ratio	Energy Realization Rate	Demand Realization Rate	Net to Gross Ratio
EE Kits	Energy Efficient Homes	68.2%	61.3%	82.0%	91.6%	84.6%	83.5%
Home Energy Reports	Energy Efficient Homes	109.8%	0.0%	100.0%	-182.7%	0.0%	100.0%
Direct Install	Energy Efficient Homes	110.7%	74.5%	95.0%	124.0%	69.1%	103.0%
New Homes	Energy Efficient Homes	98.1%	69.0%	73.0%	102.8%	79.8%	73.0%
Multifamily	Energy Efficient Homes	0.0%	0.0%	81.0%	140.3%	72.9%	84.0%
Online Audits	Energy Efficient Homes	0.0%	100.0%	100.0%	0.0%	100.0%	100.0%
Appliance Recycling	Energy Efficient Products	102.8%	98.7%	39.0%	108.5%	103.5%	65.0%
Upstream Electronics	Energy Efficient Products	0.0%	0.0%	58.3%	0.0%	0.0%	58.3%
HVAC	Energy Efficient Products	114.5%	119.4%	50.7%	155.0%	157.0%	52.3%
Appliances	Energy Efficient Products	98.7%	98.7%	50.2%	95.1%	96.2%	60.0%
Midstream Appliances	Energy Efficient Products	104.8%	104.0%	47.2%	104.3%	104.4%	53.1%
Appliances	Low Income Program	98.7%	98.7%	100.0%	95.1%	96.2%	100.0%
Appliance Turn-In	Low Income Program	114.4%	117.5%	100.0%	100.8%	96.8%	100.0%
Direct Install	Low Income Program	100.2%	100.1%	100.0%	100.4%	99.5%	100.0%
Home Energy Reports	Low Income Program	61.4%	0.0%	100.0%	140.9%	0.0%	100.0%
Kits	Low Income Program	68.2%	61.3%	100.0%	91.6%	84.6%	100.0%
New Homes	Low Income Program	98.1%	69.0%	100.0%	102.8%	79.8%	100.0%
Online Audits	Low Income Program	0.0%	100.0%	100.0%	0.0%	100.0%	100.0%
CI Prescriptive	C&I Solutions for Business Programs - Small and Large	117.9%	105.3%	63.3%	95.3%	86.2%	78.4%
CI Custom	C&I Solutions for Business Programs - Small and Large	100.0%	100.0%	54.1%	100.3%	100.0%	89.3%
CI EMNC	C&I Solutions for Business Programs - Small and Large	84.1%	81.7%	62.5%	85.9%	74.9%	75.4%
CI Multifamily	C&I Solutions for Business Program - Small	49.0%	43.2%	100.0%	71.9%	70.0%	100.0%
Appliance Recycling	C&I Solutions for Business Program - Small	102.8%	98.7%	39.0%	108.5%	103.5%	65.0%

2.6 Summary of Energy Impacts by Program

Act 129 compliance targets are based on annualized savings estimates (MWh/year). Each program year, the annual savings achieved by EE&C program activity are recorded as incremental annual, or “first-year”, savings and added to an EDC’s progress toward compliance. Incremental annual savings estimates are presented in Section 2.6.1. Lifetime energy savings incorporate the Effective Useful Life (EUL) of installed measures and estimate the total energy savings associated with EE&C program activity. Lifetime savings are used in the TRC test, by program participants when assessing the economics of upgrades, and by the SWE when calculating the emissions benefits of Act 129 programs. Section 2.6.2 presents the lifetime energy savings by program.

2.6.1 Incremental Annual Energy Savings by Program

Table 13, Table 14, Table 15, and Table 16 present a summary of the Program Year 13 and Phase IV to date energy savings by program for Met-Ed, Penelec, Penn Power, and WPP respectively. The energy impacts in this report are presented at the meter level and do not

reflect adjustments for transmission and distribution losses, while the demand impacts do reflect those losses. The verified gross savings are adjusted by the energy recent realization rate and the verified net savings are adjusted by both the realization rate and the net-to-gross ratio

Table 13: Incremental Annual Energy Savings by Program - Met-Ed

Program	PYRTD (MWh/yr)	PYVTD Gross (MWh/yr)	PYVTD Net (MWh/yr)	RTD (MWh/yr)	VTD Gross (MWh/yr)	VTD Net (MWh/yr)
Energy Efficient Homes	14,005	10,266	8,485	14,005	10,266	8,485
Energy Efficient Products	9,299	9,703	4,252	9,299	9,703	4,252
Low Income Program	4,060	3,762	3,762	4,060	3,762	3,762
C&I Solutions for Business Program - Small	5,243	5,562	3,491	5,243	5,562	3,491
C&I Solutions for Business Program - Large	16,579	17,162	9,630	16,579	17,162	9,630
Portfolio Total	**49,187**	**46,455**	**29,620**	**49,187**	**46,455**	**29,620**

Table 14: Incremental Annual Energy Savings by Program - Penelec

Program	PYRTD (MWh/yr)	PYVTD Gross (MWh/yr)	PYVTD Net (MWh/yr)	RTD (MWh/yr)	VTD Gross (MWh/yr)	VTD Net (MWh/yr)
Energy Efficient Homes	8,407	7,573	6,335	8,407	7,573	6,335
Energy Efficient Products	6,483	7,064	4,169	6,483	7,064	4,169
Low Income Program	5,920	5,942	5,942	5,920	5,942	5,942
C&I Solutions for Business Program - Small	13,829	13,407	11,610	13,829	13,407	11,610
C&I Solutions for Business Program - Large	2,149	2,035	1,593	2,149	2,035	1,593
Portfolio Total	**36,788**	**36,021**	**29,649**	**36,788**	**36,021**	**29,649**

Table 15: Incremental Annual Energy Savings by Program – Penn Power

Program	PYRTD (MWh/yr)	PYVTD Gross (MWh/yr)	PYVTD Net (MWh/yr)	RTD (MWh/yr)	VTD Gross (MWh/yr)	VTD Net (MWh/yr)
Energy Efficient Homes	3,913	3,135	2,657	3,913	3,135	2,657
Energy Efficient Products	2,548	2,580	1,111	2,548	2,580	1,111
Low Income Program	1,738	1,716	1,716	1,738	1,716	1,716
C&I Solutions for Business Program - Small	1,150	1,162	951	1,150	1,162	951
C&I Solutions for Business Program - Large	7,293	7,340	4,709	7,293	7,340	4,709
Portfolio Total	**16,643**	**15,934**	**11,144**	**16,643**	**15,934**	**11,144**

Table 16: Incremental Annual Energy Savings by Program - WPP

Program	PYRTD (MWh/yr)	PYVTD Gross (MWh/yr)	PYVTD Net (MWh/yr)	RTD (MWh/yr)	VTD Gross (MWh/yr)	VTD Net (MWh/yr)
Energy Efficient Homes	14,685	11,375	11,791	14,685	11,375	11,791
Energy Efficient Products	7,794	8,270	5,075	7,794	8,270	5,075
Low Income Program	5,398	5,817	5,817	5,398	5,817	5,817
C&I Solutions for Business Program - Small	7,268	6,933	4,957	7,268	6,933	4,957
C&I Solutions for Business Program - Large	11,194	11,243	6,826	11,194	11,243	6,826
Portfolio Total	**46,338**	**43,638**	**34,466**	**46,338**	**43,638**	**34,466**

The previously reported VTD savings from prior years have not changed since no prior final annual report was submitted for Phase IV.

2.6.2 Lifetime Energy Savings by Program

Table 17, Table 18, Table 19, and Table 20 present the PYTD and P4TD lifetime energy savings by program for Met-Ed, Penelec, Penn Power, and WPP respectively. Lifetime savings are calculated by using expected useful lives (EULs) listed in the PA TRM for each measure, subject to a 15-year cap. For commercial and industrial projects, the measure lives are first determined for each sampled project during gross impact evaluation. The measure lives are then weighted by sampling initiative and EDC as the ratio between verified lifetime energy savings and program-year verified savings. This step is conducted in part because measure lives, as determined post-verification, may differ from ex-ante measure lives in the tracking database[7], and in part to maintain consistency between verified impacts, measure lives, and incremental costs for all sampled projects. For cases that involve early replacement, the measure life is adjusted to replicate the effect of a dual-baseline benefits stream. This involves calculating a discounted lifetime savings for the measure with the first period corresponding to the remaining useful life (RUL) of the supplanted equipment (taken to be 1/3 of the measure life) and using the supplanted equipment as the baseline, and with the second period using the prevailing code or standard at the end of the RUL as the baseline. The adjustment factor for measure life is the ratio of the discounted lifetime savings with the dual-baseline approach compared to the discounted lifetime savings as calculated by using the first-year savings for the duration of the nominal measure life.

Table 17: Lifetime Energy Savings by Program for Met-Ed

Program	PYVTD Gross Lifetime (MWh)	PYVTD Net Lifetime (MWh)	VTD Gross Lifetime (MWh)	VTD Net Lifetime (MWh)
Energy Efficient Homes	124,026	99,092	124,026	99,092
Energy Efficient Products	80,465	36,762	80,465	36,762
Low Income Energy Efficiency	35,703	35,703	35,703	35,703
C&I Energy Solutions for Business - Small	79,949	50,234	79,949	50,234
C&I Energy Solutions for Business - Large	248,945	139,874	248,945	139,874
Portfolio Total	**569,089**	**361,665**	**569,089**	**361,665**

[7] For example, a project may consist of various measures with different lifetimes can have different realization rates by measure.

Table 18: Lifetime Energy Savings by Program for Penelec

Program	PYVTD Gross Lifetime (MWh)	PYVTD Net Lifetime (MWh)	VTD Gross Lifetime (MWh)	VTD Net Lifetime (MWh)
Energy Efficient Homes	95,975	79,870	95,975	79,870
Energy Efficient Products	58,108	32,888	58,108	32,888
Low Income Energy Efficiency	55,740	55,740	55,740	55,740
C&I Energy Solutions for Business - Small	192,739	166,908	192,739	166,908
C&I Energy Solutions for Business - Large	30,265	23,687	30,265	23,687
Portfolio Total	**432,826**	**359,093**	**432,826**	**359,093**

Table 19: Lifetime Energy Savings by Program for Penn Power

Program	PYVTD Gross Lifetime (MWh)	PYVTD Net Lifetime (MWh)	VTD Gross Lifetime (MWh)	VTD Net Lifetime (MWh)
Energy Efficient Homes	35,159	28,565	35,159	28,565
Energy Efficient Products	23,025	10,275	23,025	10,275
Low Income Energy Efficiency	16,893	16,893	16,893	16,893
C&I Energy Solutions for Business - Small	16,747	13,726	16,747	13,726
C&I Energy Solutions for Business - Large	109,627	70,340	109,627	70,340
Portfolio Total	**201,450**	**139,798**	**201,450**	**139,798**

Table 20: Lifetime Energy Savings by Program for WPP

Program	PYVTD Gross Lifetime (MWh)	PYVTD Net Lifetime (MWh)	VTD Gross Lifetime (MWh)	VTD Net Lifetime (MWh)
Energy Efficient Homes	127,729	132,501	127,729	132,501
Energy Efficient Products	67,977	39,165	67,977	39,165
Low Income Energy Efficiency	47,606	47,606	47,606	47,606
C&I Energy Solutions for Business - Small	98,854	70,095	98,854	70,095
C&I Energy Solutions for Business - Large	166,131	100,823	166,131	100,823
Portfolio Total	**508,298**	**390,190**	**508,298**	**390,190**

The previously reported VTD lifetime savings from prior years have not changed since no prior final annual report was submitted for Phase IV.

2.7 Summary of Demand 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. The peak demand impacts from energy efficiency in this report are presented at the system level, meaning they have been adjusted to account for transmission and distribution losses. Table 21 lists the line loss multipliers by EDC and by sector.

Table 21: Line Loss Multipliers by EDC and Customer Sector

Sector	Met-Ed	Penelec	Penn Power	WPP
Residential	1.0945	1.0945	1.0949	1.0943
Small C&I	1.0720	1.0720	1.0545	1.0790
Large C&I	1.0720	1.0720	1.0545	1.0790

Summaries of the peak demand impacts by energy efficiency program through the current reporting period are presented in Table 22, Table 23, Table 24, and Table 25 for Met-Ed, Penelec, Penn Power, and WPP respectively.

Table 22: Peak Demand Savings by Energy Efficiency Program for Met-Ed

Program	PYRTD (MW/yr)	PYVTD Gross (MW/yr)	PYVTD Net (MW/yr)	RTD (MW/yr)	VTD Gross (MW/yr)	VTD Net (MW/yr)
Energy Efficient Homes	2.19	1.26	0.98	2.19	1.26	0.98
Energy Efficient Products	1.94	1.98	0.86	1.94	1.98	0.86
Low Income Energy Efficiency	0.54	0.48	0.48	0.54	0.48	0.48
C&I Energy Solutions for Business - Small	0.96	0.94	0.59	0.96	0.94	0.59
C&I Energy Solutions for Business - Large	2.32	2.36	1.34	2.32	2.36	1.34
Portfolio Total	**7.94**	**7.02**	**4.24**	**7.94**	**7.02**	**4.24**

Table 23: Peak Demand Savings by Energy Efficiency Program for Penelec

Program	PYRTD (MW/yr)	PYVTD Gross (MW/yr)	PYVTD Net (MW/yr)	RTD (MW/yr)	VTD Gross (MW/yr)	VTD Net (MW/yr)
Energy Efficient Homes	0.86	0.74	0.61	0.86	0.74	0.61
Energy Efficient Products	1.38	1.45	0.86	1.38	1.45	0.86
Low Income Energy Efficiency	0.74	0.61	0.61	0.74	0.61	0.61
C&I Energy Solutions for Business - Small	3.86	3.73	3.27	3.86	3.73	3.27
C&I Energy Solutions for Business - Large	0.36	0.31	0.24	0.36	0.31	0.24
Portfolio Total	**7.20**	**6.84**	**5.59**	**7.20**	**6.84**	**5.59**

Table 24: Peak Demand Savings by Energy Efficiency Program for Penn Power

Program	PYRTD (MW/yr)	PYVTD Gross (MW/yr)	PYVTD Net (MW/yr)	RTD (MW/yr)	VTD Gross (MW/yr)	VTD Net (MW/yr)
Energy Efficient Homes	0.75	0.40	0.31	0.75	0.40	0.31
Energy Efficient Products	0.52	0.53	0.23	0.52	0.53	0.23
Low Income Energy Efficiency	0.23	0.17	0.17	0.23	0.17	0.17
C&I Energy Solutions for Business - Small	0.17	0.15	0.12	0.17	0.15	0.12
C&I Energy Solutions for Business - Large	0.84	0.84	0.54	0.84	0.84	0.54
Portfolio Total	**2.52**	**2.08**	**1.37**	**2.52**	**2.08**	**1.37**

Table 25: Peak Demand Savings by Energy Efficiency Program for WPP

Program	PYRTD (MW/yr)	PYVTD Gross (MW/yr)	PYVTD Net (MW/yr)	RTD (MW/yr)	VTD Gross (MW/yr)	VTD Net (MW/yr)
Energy Efficient Homes	2.26	1.28	1.27	2.26	1.28	1.27
Energy Efficient Products	1.60	1.60	0.99	1.60	1.60	0.99
Low Income Energy Efficiency	0.80	0.56	0.56	0.80	0.56	0.56
C&I Energy Solutions for Business - Small	1.22	1.07	0.76	1.22	1.07	0.76
C&I Energy Solutions for Business - Large	1.31	1.23	0.75	1.31	1.23	0.75
Portfolio Total	**7.20**	**5.74**	**4.33**	**7.20**	**5.74**	**4.33**

The previously reported VTD demand reductions from prior years have not changed since no prior final annual report was submitted for Phase IV.

2.7.1 Peak Demand Savings Nominated to PJM Forward Capacity Market (FCM)

Table 26, Table 27, Table 28, and Table 29 summarize the potential PJM Phase IV peak demand savings by Act 129 program year and PJM delivery year for Met-Ed, Penelec, Penn Power, and West Penn Power.

Table 26: Met-Ed Potential FCM Nominations by PY & PJM Delivery Year

Act 129 Program Year	Estimated MW Acquisition for FCM	DY 23/24 MW Range	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	2.4 to 4.2	2.4 to 4.2	2.4 to 4.2	2.4 to 4.2				
PY14	2.4 to 4.2	2.4 to 4.2	2.4 to 4.2	2.4 to 4.2	2.4 to 4.2			
PY15	2.4 to 4.2		2.4 to 4.2	2.4 to 4.2	2.4 to 4.2	2.4 to 4.2		
PY16	2.4 to 4.2			2.4 to 4.2	2.4 to 4.2	2.4 to 4.2	2.4 to 4.2	
PY17	2.4 to 4.2				2.4 to 4.2	2.4 to 4.2	2.4 to 4.2	2.4 to 4.2
Phase IV Total	**12.0 to 21.0**	**4.8 to 8.4**	**7.2 to 12.6**	**9.6 to 16.8**	**9.6 to 16.8**	**7.2 to 12.6**	**4.8 to 8.4**	**2.4 to 4.2**

Table 27: Penelec Potential FCM Nominations by PY & PJM Delivery Year

Act 129 Program Year	Estimated MW Acquisition for FCM	DY 23/24 MW Range	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	2.8 to 4.2	2.8 to 4.2	2.8 to 4.2	2.8 to 4.2				
PY14	2.8 to 4.2	2.8 to 4.2	2.8 to 4.2	2.8 to 4.2	2.8 to 4.2			
PY15	2.8 to 4.2		2.8 to 4.2	2.8 to 4.2	2.8 to 4.2	2.8 to 4.2		
PY16	2.8 to 4.2			2.8 to 4.2	2.8 to 4.2	2.8 to 4.2	2.8 to 4.2	
PY17	2.8 to 4.2				2.8 to 4.2	2.8 to 4.2	2.8 to 4.2	2.8 to 4.2
Phase IV Total	**14.0 to 21.0**	**5.6 to 8.4**	**8.4 to 12.6**	**12.0 to 18.0**	**12.0 to 18.0**	**8.4 to 12.6**	**5.6 to 8.4**	**2.8 to 4.2**

Table 28: Penn Power Potential FCM Nominations by PY & PJM Delivery Year

Act 129 Program Year	Estimated MW Acquisition for FCM	DY 23/24 MW Range	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	0.8 to 1.2	0.8 to 1.2	0.8 to 1.2	0.8 to 1.2				
PY14	0.8 to 1.2	0.8 to 1.2	0.8 to 1.2	0.8 to 1.2	0.8 to 1.2			
PY15	0.8 to 1.2		0.8 to 1.2	0.8 to 1.2	0.8 to 1.2	0.8 to 1.2		
PY16	0.8 to 1.2			0.8 to 1.2	0.8 to 1.2	0.8 to 1.2	0.8 to 1.2	
PY17	0.8 to 1.2				0.8 to 1.2	0.8 to 1.2	0.8 to 1.2	0.8 to 1.2
Phase IV Total	**4.0 to 6.0**	**1.6 to 2.0**	**2.4 to 3.6**	**3.2 to 4.8**	**3.2 to 4.8**	**2.4 to 3.6**	**1.6 to 2.0**	**0.8 to 1.2**

Table 29: WPP Potential FCM Nominations by PY & PJM Delivery Year

Act 129 Program Year	Estimated MW Acquisition for FCM	DY 23/24 MW Range	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	2.3 to 4.1	2.3 to 4.1	2.3 to 4.1	2.3 to 4.1				
PY14	2.3 to 4.1	2.3 to 4.1	2.3 to 4.1	2.3 to 4.1	2.3 to 4.1			
PY15	2.3 to 4.1		2.3 to 4.1	2.3 to 4.1	2.3 to 4.1	2.3 to 4.1		
PY16	2.3 to 4.1			2.3 to 4.1	2.3 to 4.1	2.3 to 4.1	2.3 to 4.1	
PY17	2.3 to 4.1				2.3 to 4.1	2.3 to 4.1	2.3 to 4.1	2.3 to 4.1
Phase IV Total	**11.5 to 20.5**	**4.6 to 8.2**	**6.9 to 12.3**	**9.2 to 16.4**	**9.2 to 16.4**	**6.9 to 12.3**	**4.6 to 8.2**	**2.3 to 4.1**

The values in the tables above remain consistent with the original estimated ranges of the PJM Summer and Winter MW EE potential for each PJM delivery year as shown in Appendix C, Table C-3 based on the MWh savings as projected in the EE&C Plan, based on the following assumptions and modifications:

- Identified and removed energy savings of all measures not eligible for PJM including:
  - appliance recycling;
  - building lighting controls and occupancy sensors;
  - smart thermostats, energy management systems or smart homes;
  - behavioral and educational programs;

- Excluded some low-volume measures for which PJM-required M&V activities would likely cost more than the associated PJM revenues.
- The EDCs retain all Phase IV Plan program Capacity Rights to support their offered EE resources and to ensure no double counting of EE resources by third parties;
- Assigned an initial savings load shape to each PJM eligible EE measure; Estimated the potential kW savings values for each measure for the PJM defined Summer and Winter periods using the appropriate load shape curve; and
- Included T & D line losses to adjust retail kW values to wholesale kW values.

Actual EE offer values may vary from the values provided above to reflect any anticipated performance variability from impacts such as COVID-19, supply chain issues, baseline changes from code changes as well as PJM capacity market rule changes.

Revenues from PJM's FCM will be used to offset cost recovery on a per customer class basis. PJM revenues will be treated as program cost reductions, and market participation costs or deficiency charges (if any), will be treated as program cost increases.

2.8 Summary of Fuel Switching Impacts

Act 129 allows EDCs to achieve electric savings by converting electric equipment to non-electric equipment. Table 30 summarizes for each EDC, key fuel switching metrics to date in Phase IV. Combined Heat and Power (CHP) and solar water heating are the only fuel switching measures offered by the Companies in Phase IV. There was one rebate approved by Penelec for a CHP project in PY13.

Table 30: Phase IV to Date Fuel Switching Summary

	Met-Ed	Penelec	Penn Power	WPP
Fuel Switching Measures Offered	CHP, Solar Water Heaters			
Fuel Switching Measures Implemented in PY13	None	CHP	None	None
Fuel Switching Measures Implemented in Phase IV	None	CHP	None	None
PY13 Energy Savings Achieved via Fuel Switching (MWh/yr)	0	9,001	0	0
PY13 Increased Fossil Fuel Consumption Due to Fuel Switching Measures (MMBTU/yr)	0	92,381	0	0
PY13 Incentive Payments for Fuel Switching Measures ($1000)	0	399	0	0
VTD Energy Savings Achieved via Fuel Switching (MWh/yr)	0	9,001	0	0
P4TD Increased Fossil Fuel Consumption Due to Fuel Switching Measures (MMBTU/yr)	0	92,381	0	0
P4TD Incentive Payments for Fuel Switching Measures ($1000)	0	399	0	0

2.9 SUMMARY OF COST-EFFECTIVENESS RESULTS

A detailed breakdown of portfolio finances and cost-effectiveness is presented for Met-Ed, Penelec, Penn Power, and West Penn Power in Table 31, Table 32, Table 33, and Table 34. TRC benefits in these tables were calculated using gross verified impacts. Net present value (NPV) PY13 costs and benefits are expressed in 2021 dollars. Net present value costs and benefits for P4TD financials are expressed in 2021 dollars.

Table 31: Summary of Program Finances – Met-Ed

Row #	Cost Category	Gross PYTD ($1,000)		Gross P4TD ($1,000)	
1	**IMCs**	15,517		15,517	
2	Rebates to Participants and Trade Allies	2,599		2,599	
3	Upstream / Midstream Incentives	608		608	
4	Material Cost for Self-Install Programs (EE&C Kits)	1,922		1,922	
5	Direct Installation Program Materials and Labor	536		536	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	9,853		9,853	
		EDC	CSP	EDC	CSP
7	Program Design	4	22	4	22
8	Administration and Management	1,029	2,704	1,029	2,704
9	Marketing	35	550	35	550
10	Program Delivery	66	171	66	171
11	EDC Evaluation Costs	562		562	
12	SWE Audit Costs	253		253	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	5,397		5,397	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	**20,914**		**20,914**	
15	Total NPV Lifetime Electric Energy Benefits	16,225		16,225	
16	Total NPV Lifetime Electric Capacity Benefits	10,651		10,651	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	444		444	
18	Total NPV Lifetime Fossil Fuel Impacts	-273		-273	
19	Total NPV Lifetime Water Impacts	3,040		3,040	
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	**30,087**		**30,087**	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	**1.44**		**1.44**	

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

Table 32: Summary of Program Finances – Penelec

Row #	Cost Category	Gross PYTD ($1,000)		Gross P4TD ($1,000)	
1	**IMCs**	9,808		9,808	
2	Rebates to Participants and Trade Allies	1,581		1,581	
3	Upstream / Midstream Incentives	395		395	
4	Material Cost for Self-Install Programs (EE&C Kits)	1,898		1,898	
5	Direct Installation Program Materials and Labor	1,230		1,230	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	4,704		4,704	
		EDC	CSP	EDC	CSP
7	Program Design	4	20	4	20
8	Administration and Management	986	2,561	986	2,561
9	Marketing	34	533	34	533
10	Program Delivery	61	149	61	149
11	EDC Evaluation Costs	507		507	
12	SWE Audit Costs	230		230	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	5,084		5,084	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	**14,893**		**14,893**	
15	Total NPV Lifetime Electric Energy Benefits	12,323		12,323	
16	Total NPV Lifetime Electric Capacity Benefits	9,248		9,248	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	418		418	
18	Total NPV Lifetime Fossil Fuel Impacts	-3,534		-3,534	
19	Total NPV Lifetime Water Impacts	3,351		3,351	
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	**21,806**		**21,806**	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	**1.46**		**1.46**	

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

Table 33: Summary of Program Finances – Penn Power

Row #	Cost Category	Gross PYTD ($1,000)		Gross P4TD ($1,000)	
1	**IMCs**	10,181		10,181	
2	Rebates to Participants and Trade Allies	1,022		1,022	
3	Upstream / Midstream Incentives	185		185	
4	Material Cost for Self-Install Programs (EE&C Kits)	527		527	
5	Direct Installation Program Materials and Labor	332		332	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	8,115		8,115	
		EDC	CSP	EDC	CSP
7	Program Design	1	6	1	6
8	Administration and Management	340	951	340	951
9	Marketing	10	172	10	172
10	Program Delivery	22	80	22	80
11	EDC Evaluation Costs	147		147	
12	SWE Audit Costs	71		71	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	1,800		1,800	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	**11,981**		**11,981**	
15	Total NPV Lifetime Electric Energy Benefits	6,001		6,001	
16	Total NPV Lifetime Electric Capacity Benefits	1,864		1,864	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	4,329		4,329	
18	Total NPV Lifetime Fossil Fuel Impacts	64		64	
19	Total NPV Lifetime Water Impacts	821		821	
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	**13,080**		**13,080**	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	**1.09**		**1.09**	

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

Table 34: Summary of Program Finances – WPP

Row #	Cost Category	Gross PYTD ($1,000)		Gross P4TD ($1,000)	
1	IMCs	13,296		13,296	
2	Rebates to Participants and Trade Allies	2,357		2,357	
3	Upstream / Midstream Incentives	381		381	
4	Material Cost for Self-Install Programs (EE&C Kits)	2,135		2,135	
5	Direct Installation Program Materials and Labor	1,663		1,663	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	6,760		6,760	
		EDC	CSP	EDC	CSP
7	Program Design	4	21	4	21
8	Administration and Management	1,023	2,830	1,023	2,830
9	Marketing	41	515	41	515
10	Program Delivery	61	183	61	183
11	EDC Evaluation Costs	529		529	
12	SWE Audit Costs	238		238	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	5,443		5,443	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	**18,739**		**18,739**	
15	Total NPV Lifetime Electric Energy Benefits	15,335		15,335	
16	Total NPV Lifetime Electric Capacity Benefits	4,403		4,403	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	340		340	
18	Total NPV Lifetime Fossil Fuel Impacts	-107		-107	
19	Total NPV Lifetime Water Impacts	3,516		3,516	
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	**23,486**		**23,486**	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	**1.25**		**1.25**	

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

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

2.10 Comparison of Performance to Approved EE&C Plan

Table 35 presents PY13 expenditures compared to the budget estimates set forth in the EE&C plan for PY13 and P4TD. PY13 values are presented in 2021 dollars and P4TD values are presented in 2021 dollars. Program-level comparisons of expenditures to plans are presented in Appendix D.

Table 35: Comparison of Expenditures to Phase IV EE&C Plan ($1,000)

EDC	Expenditures	Budget from EE&C Plan	Actual Expenditures	Ratio (Actual/Plan)
Met-Ed	PY13 Portfolio	$ 23,850.00	$ 11,061.47	0.46
Met-Ed	P4TD	$ 23,850.00	$ 11,061.47	0.46
Penelec	PY13 Portfolio	$ 22,018.00	$ 10,188.34	0.46
Penelec	P4TD	$ 22,018.00	$ 10,188.34	0.46
Penn Power	PY13 Portfolio	$ 6,459.00	$ 3,865.83	0.60
Penn Power	P4TD	$ 6,459.00	$ 3,865.83	0.60
West Penn Power	PY13 Portfolio	$ 23,166.00	$ 11,979.13	0.52
West Penn Power	P4TD	$ 23,166.00	$ 11,979.13	0.52

Table 36 and Table 37 compare PY13 and P4TD verified gross program savings and demand reductions compared to the energy savings projections set forth in the EE&C plan. Program-level comparisons of expenditures to plans are presented in Appendix D.

Table 36: Comparison of Actual Portfolio Savings to Plan Projections

EDC	Savings	EE&C Plan Projections	Gross MWh Savings	Ratio (Actual/Plan)
Met-Ed	PY13 Portfolio MWh	86,235	46,455	0.54
Met-Ed	P4TD MWh	86,235	46,455	0.54
Penelec	PY13 Portfolio MWh	83,893	36,021	0.43
Penelec	P4TD MWh	83,893	36,021	0.43
Penn Power	PY13 Portfolio MWh	24,291	15,934	0.66
Penn Power	P4TD MWh	24,291	15,934	0.66
West Penn Power	PY13 Portfolio MWh	88,670	43,638	0.49
West Penn Power	P4TD MWh	88,670	43,638	0.49

Table 37: Comparison of Actual Portfolio Demand Reductions to Plan Projections

EDC	Savings	EE&C Plan Projections	Gross MW Savings	Ratio (Actual/Plan)
Met-Ed	PY13 Portfolio MW	15.8	7.0	0.45
Met-Ed	P4TD MW	15.8	7.0	0.45
Penelec	PY13 Portfolio MW	15.4	6.8	0.44
Penelec	P4TD MW	15.4	6.8	0.44
Penn Power	PY13 Portfolio MW	4.7	2.1	0.44
Penn Power	P4TD MW	4.7	2.1	0.44
West Penn Power	PY13 Portfolio MW	17.0	5.7	0.34
West Penn Power	P4TD MW	17.0	5.7	0.34

PY13 included significant challenges related to program startup and launch. The Companies rolled out many new offerings and program elements and onboarded new ICSPs. The transition to new programs and ICSPs, though started as soon as plans and contracts were approved,

necessarily required more time than continuing with the same programs and ICSPs as Phase III. As a result, both savings and expenditures are lower than the EE&C plan projections. As averaged across the four EDCs, the Energy Efficient Products and Low-Income Energy Efficiency programs are near the plan savings targets, while the Commercial and Industrial Programs are only at one third of projected impacts and expenditures. The Companies are particularly concerned about the combined effects of inflation, supply chain shortages, and labor shortages. Anecdotal evidence suggests that these factors are adversely impacting nonresidential project timelines and scopes.

2.11 Findings and Recommendations

The impact and process evaluation activities completed by the ADM team led to recommendations for program improvement. Table 38 lists the overarching recommendations that affect more than one program, the evaluation activity(ies) that uncovered the finding, and the ADM team's recommendation(s) to the Companies to address the finding. All the overarching recommendations are intended to reduce noncompliance risks for Phase IV.

Table 38: Summary of Evaluation Recommendations

Evaluation Activity	Finding	Recommendation
General Evaluation	While this is likely due to the transition between phases and the launching of new programs, the companies are trending behind projections for demand reduction compliance.	Consider targeted program marketing and incentive structures that prioritize demand reduction. This could include per-kW incentive amounts and targeting customers that have favorable peak demand profiles.
General Evaluation	ISCP interviews, along with day-to-day communication related to evaluation, provide anecdotal evidence of project delays due to supply chain shortages.	Continue to monitor the supply and labor situation as it evolves and form strategies to mitigate the potential impact of supply-chain related delays or cancellations.
Behavioral Programs	The PY13 evaluation could not prove savings for the Online Audits Program.	Consider cancelling that program and using its funds to increase the scope or frequency of the Home Energy Reports program interactions during the summer peak period.
EE Kits Program	The in-service rates for measures within the Standard and Electric kits were found to be lower than in past years. However, the Low-Income and School Education had normal in-service rates.	Consider a targeted impact/process evaluation effort in PY14 to determine the root cause of the ISR decline for the non-Low-Income kits and take corrective actions.
General Evaluation	While this is likely due to the startup costs incurred in PY13, the expenditure rate per verified kW is higher than planned. The inflation that has transpired since the EE&C plans were approved also erodes the EDC's ability to execute programs on budget.	Consider a targeted study to rank all offerings on a $/kW basis and shift resources to low-cost, scalable offerings.

3 Evaluation Results by Program

This section documents the gross impact, net impact, and process evaluation activities conducted in PY13 along with the outcomes of those activities. Not every program receives an evaluation every year. Planned evaluation activities for Phase IV are shown in Figure 6. Each row shows how savings from the initiative will be presented in that year's final annual report, where:

- V = verified using the results of the impact evaluation completed that year.
- H = verified using the results of a historic impact evaluation.
- U = unverified until the results of the impact evaluation are available.
- NA = the initiative is not offered in that program year.

The evaluation team plans on single-year sampling and data collection for any given evaluation effort denoted by the letter "V" in the table below.

Figure 6: Evaluation Activity Matrix

Sector	Initiative	Sub-Initiative	PY13	PY14	PY15	PY16	PY17
Residential	EE Kits	EE Kits	V	V	V	V	V
Residential	Home Energy Reports	Home Energy Reports	V	V	V	V	V
Residential	Home Energy Reports	LI - Home Energy Reports	V	V	V	V	V
Residential	LI Direct Install	LI Direct Install	V	V	V	V	H
Residential	Multifamily - Res	Multifamily - Res	V	V	H	V	H
Residential	New Homes	New Homes	V	V	V	V	H
Residential	Online Audits	LI - Online Audit	V	V	V	V	H
Residential	Online Audits	On-Line Audit	V	V	V	V	H
Residential	Residential Audit and DI	Residential Audit and DI	V	V	H	V	H
Residential	Residential Downstream Appliances	Downstream Appliances	V	V	V	V	H
Residential	Residential Downstream HVAC	Downstream HVAC	V	V	V	V	H
Residential	Residential Midstream Appliances	Midstream Appliances	V	V	V	V	H
Residential	Residential Midstream Electronics	Midstream Electronics	NA	V	H	V	H
Nonresidential	CI Custom	CI Custom	V	V	V	H	V
Nonresidential	CI EMNC	Building Improvements	V	V	V	V	H
Nonresidential	CI EMNC	Building Operations Training	V	V	H	V	H
Nonresidential	CI EMNC	Building Tune-Ups	V	V	V	V	V
Nonresidential	CI EMNC	Commissioning	NA	V	V	H	V
Nonresidential	CI EMNC	New Construction	V	V	H	V	H
Nonresidential	CI Multifamily	CI Multifamily	V	V	H	V	H
Nonresidential	CI Prescriptve	Downstream Lighting	V	V	V	H	V
Nonresidential	CI Prescriptve	Midstream Lighting	V	V	V	V	V
Nonresidential	CI Prescriptve	Downstream Nonlighting	V	V	V	V	H
Nonresidential	CI Prescriptve	Midstream Nonlighting	V	V	H	V	H
Cross-Cutting	Appliance Recycling	Appliance Recycling	V	V	V	V	V
Cross-Cutting	Appliance Recycling	Midstream Appliance Recycling	NA	V	V	V	V

3.1 ENERGY EFFICIENT HOMES PROGRAM

Energy Efficiency Homes Program has seven distinct components: Energy Efficiency Kits, School Education (with kits), Online Audits, Home Energy Reports, Residential Energy Audits and Direct Install, Multifamily Direct Install, and New Homes. ADM evaluates the program through six initiatives by combining the similar (from an impact evaluation perspective) Energy Efficiency Kit and School Education program components into one initiative.

AM Conservation Group (AMCG) administers the School Education and Energy Efficiency Kits program components. In the Energy Efficiency Kits program component, participants receive energy conservation kits which include energy efficiency measures As with Phase III, there are two kits aimed at homes with electric water heating and non-electric water heating. This program allows customers to receive one EE Kit per new account number at the time of move-in or eligible customers can request a kit for their home, with the water heat fuel source reported by the customer. In the School Education Program Component, students participate in a classroom-based presentation around energy conservation. Teachers also use a corresponding curriculum to continue to teach about energy conservation topics. New in Phase IV, all students receive a kit filled with energy-savings measures to install in their homes and are encouraged to to continue discussions regarding energy conservation in the home.

The Home Energy Reports program component is administered by Oracle (formerly Opower). Home energy reports provide customers with comparative electric energy usage data and offer tips and advice on behavioral and low-cost energy saving measures. The number of participants for this program component is taken as the maximum number of participants in the treatment group during the year.

The Online Audit program component is also administered by Oracle and provides a web portal where customers can enter information about their home's envelope, HVAC systems, and plug loads to receive customized advice regarding their energy usage and ways to increase energy efficiency.

The Companies have retained CLEAResult to administer the Direct Install (branded as the Residential Energy Audit Program) component in Phase IV. Through this program component, customers receive free diagnostic assessments, followed by the direct installation of low-cost measures or incentivized installation of building shell measures. The participant count for this program component is equal to the number of rebate homes treated in the program.

CLEAResult also administers the Multifamily Audit program, which provides measures like those offered in the Residential Energy Audit Program to participants in individually metered multifamily dwellings.

The New Homes component is again administered by Performance System Development (PSD). The New Homes program component provides incentives to builders that choose to build new homes to higher efficiency standards through the installation of efficient building shell measures, HVAC systems, appliances, lighting, smart thermostats, and other features. The participant count for the New Homes program component is equal to the number of houses (or in the case of multifamily housing, the number of dwelling units).

3.1.1 Participation and Reported Savings by Customer Segment

Table 39 presents the participation counts, reported energy and demand savings, and incentive payments for the Energy Efficient Homes Program in PY13 by EDC. This program serves only the residential customer segment. The EE&C portfolios include separate and corresponding program components, administered by the same ICSPs, to serve the low-income residential customer segment.

Table 39: EEH Program Participation and Reported Impacts

Parameter	Met-Ed Residential (Non-LI)	Penelec Residential (Non-LI)	Penn Power Residential (Non-LI)	WPP Residential (Non-LI)
PYTD # Participants	89,015	62,974	31,722	102,229
PYRTD MWh/yr	14,005	8,407	3,913	14,685
PYRTD MW/yr	2.19	0.86	0.75	2.26
PYTD Incentives ($1000)	2,223	1,368	612	2,149

3.1.2 Gross Impact Evaluation

Each program component is treated as a separate evaluation initiative. The impact evaluation of the HER Initiative is described in Appendix B. The impact evaluation of the EE Kits Initiative is described in Appendix E. The impact evaluation of the Res DI Initiative is described in Appendix F. The impact evaluation of the Res NC Initiative is described in Appendix G. The impact evaluation of the Res MF initiative is described in Appendix H. The impact evaluation of the Online Audit initiative is described in Appendix I. Table 40 summarizes program verified impacts and realization rates for each EDC.

Table 40: EEH Program Gross Impact Evaluation Summary for PY13

EDC	Sampling Initiative	Gross Verified MWh	Gross Verified MW	MWh Realization Rate	MW Realization Rate
Met-Ed	EE Kits	6,629	0.64	68.2%	61.3%
Met-Ed	Home Energy Reports	1,436	0.00	109.8%	0.0%
Met-Ed	Direct Install	31	0.00	110.7%	74.5%
Met-Ed	New Homes	2,171	0.62	98.1%	69.0%
Met-Ed	Multifamily	0	0.00	0.0%	0.0%
Met-Ed	Online Audits	0	0.00	0.0%	100.0%
Met-Ed Total		**10,266**	**1.26**	**73%**	**58%**
Penelec	EE Kits	7,156	0.66	91.6%	84.6%
Penelec	Home Energy Reports	189	0.00	-182.7%	0.0%
Penelec	Direct Install	6	0.00	124.0%	69.1%
Penelec	New Homes	221	0.08	102.8%	79.8%
Penelec	Multifamily	2	0.00	140.3%	72.9%
Penelec	Online Audits	0	0.00	0.0%	100.0%
Penelec Total		**7,573**	**0.74**	**90%**	**86%**
Penn Power	EE Kits	1,818	0.17	76.9%	67.3%
Penn Power	Home Energy Reports	602	0.00	93.7%	0.0%
Penn Power	Direct Install	22	0.00	118.6%	80.1%
Penn Power	New Homes	692	0.22	94.5%	59.4%
Penn Power	Multifamily	0	0.00	0.0%	0.0%
Penn Power	Online Audits	0	0.00	0.0%	100.0%
Penn Power Total		**3,135**	**0.40**	**80%**	**52%**
WPP	EE Kits	7,901	0.89	72.5%	71.7%
WPP	Home Energy Reports	1,975	0.00	112.9%	0.0%
WPP	Direct Install	28	0.00	117.7%	84.9%
WPP	New Homes	1,469	0.39	102.7%	57.6%
WPP	Multifamily	2	0.00	131.5%	88.5%
WPP	Online Audits	0	0.00	0.0%	100.0%
WPP Total		**11,375**	**1.28**	**77%**	**57%**

The gross realization rates for energy savings were driven primarily by the two largest components: Home Energy Reports and EE Kits. Realization rates for kits were lower than 100% due to lower in-service rates than planning estimates. Home Energy Reports energy savings varied from reported values due to differences in data validation, modeling, and the cross-participation corrections. The negative realization rate for Penelec is due to Oracle measuring a small negative savings, and ADM measuring a small positive savings, the underlying cause is likely low savings associated with initial ramp-up for the new cohort.

3.1.2.1 Evaluation Adjustments in Response to the COVID-19 Pandemic

Evaluation, measurement, and verification of the Energy Efficient Homes Program was not impacted by the COVID-19 pandemic. The majority of energy savings were verified through participant surveys and billing analyses. On-site visits occurred in support of the New Homes program component, but the homes were not yet sold or occupied at the time of the site visits.

3.1.3 Net Impact Evaluation

The impact evaluation of the HER Initiative is described in Appendix B. The impact evaluation of the EE Kits Initiative is described in Appendix E. The impact evaluation of the Res DI Initiative is described in Appendix F. The impact evaluation of the Res NC Initiative is described in Appendix G. The impact evaluation of the Res MF initiative is described in Appendix H. The impact evaluation of the Online Audit initiative is described in Appendix I. The NTG for the HER program is estimated to be 1.0, which is a feature of the randomized control trial gross impact evaluation approach. Note that none of the initiatives were evaluated for NTG in PY13. Historical NTG values from research in Phase III were applied to each initiative as shown in Table 41, which summarizes program verified gross and net energy impacts and net-to-gross ratios for each EDC.

Table 41: EEH Program Net Impact Evaluation Summary for PY13

EDC	Sampling Initiative	Gross Verified MWh	NTG	Net Verified MWh	Net Verified MW
Met-Ed	EE Kits	6,629	82.0%	5,436	0.53
Met-Ed	Home Energy Reports	1,436	100.0%	1,436	0.00
Met-Ed	Direct Install	31	95.0%	29	0.00
Met-Ed	New Homes	2,171	73.0%	1,585	0.45
Met-Ed	Multifamily	0	81.0%	0	0.00
Met-Ed	Online Audits	0	100.0%	0	0.00
Met-Ed Total		**10,266**	**82.7%**	**8,485**	**0.98**
Penelec	EE Kits	7,156	83.5%	5,978	0.55
Penelec	Home Energy Reports	189	100.0%	189	0.00
Penelec	Direct Install	6	103.0%	6	0.00
Penelec	New Homes	221	73.0%	161	0.06
Penelec	Multifamily	2	84.0%	2	0.00
Penelec	Online Audits	0	100.0%	0	0.00
Penelec Total		**7,573**	**83.7%**	**6,335**	**0.61**
Penn Power	EE Kits	1,818	84.0%	1,528	0.14
Penn Power	Home Energy Reports	602	100.0%	602	0.00
Penn Power	Direct Install	22	100.0%	22	0.00
Penn Power	New Homes	692	73.0%	505	0.16
Penn Power	Multifamily	0	100.0%	0	0.00
Penn Power	Online Audits	0	100.0%	0	0.00
Penn Power Total		**3,135**	**84.8%**	**2,657**	**0.31**
WPP	EE Kits	7,901	110.3%	8,713	0.98
WPP	Home Energy Reports	1,975	100.0%	1,975	0.00
WPP	Direct Install	28	104.0%	29	0.00
WPP	New Homes	1,469	73.0%	1,073	0.28
WPP	Multifamily	2	80.0%	1	0.00
WPP	Online Audits	0	100.0%	0	0.00
WPP Total		**11,375**	**103.7%**	**11,791**	**1.27**

3.1.3.1 High-Impact Measure Research

No Initiatives from this program have been designated as high impact measures for PY13.

3.1.4 Verified Savings Estimates

In Table 42 the realization rates and net-to-gross ratios determined by ADM and Tetra Tech team are applied to the reported energy and demand savings estimates to calculate the verified savings estimates for the Energy Efficient Homes Program in PY13. These totals are added to the verified savings achieved in previous program years to calculate the P4TD program impacts.

Table 42: PYTD and P4TD Savings Summary

	Met-Ed		Penelec		Penn Power		WPP	
Savings Type	Energy (MWh/yr)	Demand (MW/yr)	Energy (MWh/yr)	Demand (MW/yr)	Energy (MWh/yr)	Demand (MW/yr)	Energy (MWh/yr)	Demand (MW/yr)
PYRTD	14,005	2.19	8,407	0.86	3,913	0.75	14,685	2.26
PYVTD Gross	10,266	1.26	7,573	0.74	3,135	0.40	11,375	1.28
PYVTD Net	8,485	0.98	6,335	0.61	2,657	0.31	11,791	1.27
RTD	14,005	2.19	8,407	0.86	3,913	0.75	14,685	2.26
VTD Gross	10,266	1.26	7,573	0.74	3,135	0.40	11,375	1.28
VTD Net	8,485	0.98	6,335	0.61	2,657	0.31	11,791	1.27

3.1.5 Process Evaluation

No initiatives within the Energy Efficient Homes program were scheduled for process evaluation reporting in PY13. However, several program elements are scheduled for reporting in PY14, and Tetra Tech has conducted the following initial process evaluation activities as of this writing.

3.1.5.1 Home Energy Reports

In PY13 Tetra Tech conducted both semi-structured interviews with FirstEnergy program managers and the program implementer. FirstEnergy and ICSP staff noted a low drop-out rate, suggesting that there are not issues that cause participants to be dissatisfied. Both FirstEnergy and the ICSP felt the program design was working well, but expressed concern related to a delayed program launch in PY13 as the process of getting the contract approved took longer than expected.

3.1.5.2 School Education Program

Process evaluation activities in PY13 focused on understanding the program design, any changes in design or implementation in Phase IV, how the program engages with schools, and identifying evaluation priorities. Tetra Tech interviewed the FirstEnergy program manager, representatives of the ICSP AMCG, and representatives of the National Energy Foundation (NEF), which AMCG contracts to market the program and present in the classrooms. Overall the program is reported to operate smoothly, and was able to achieve over 90% of the PY13 kit-distribution target despite launching in April 2022. Program design changes for Phase IV include shipping kits to schools directly for distribution to all students in participating classrooms. The in-school educational component has changed from an assembly to in-class performances to support a more educationally-focused presentation.

3.1.5.3 In-Home Audits

Tetra Tech interviewed the Companies' program manager; representatives of CLEAResult, the ICSP; and representatives of Honeywell, which is contracted to perform quality assurance/quality control (QA/QC) activities. Tetra Tech staff also reviewed program tracking data and program documentation. The interviews revealed program design changes to help increase program participation and impacts in Phase IV. The Companies dropped the customer payment for the audit and increased funding for direct-install measures. The Phase IV program also prioritizes direct install measures over capital cost measures to further maximize participation and impacts.

3.1.5.4 New Homes

Tetra Tech interviewed the Companies' program manager; representatives of Performance Systems Development, the ICSP. Process evaluation activities in PY13 focused on understanding the program design, any changes in design or implementation in Phase IV, how the program engages with builders and raters, and identifying evaluation priorities. The New Homes program enjoyed a smooth transition from Phase III to Phase IV with relatively little changes in design or staffing. Interviews revealed that home construction, like many other markets, is facing material and labor shortages. PSD reports that, so far, it is taking longer to complete projects, but the volume of projects has not declined noticeably.

3.1.5.5 Multifamily Program

In PY13 Tetra Tech conducted both conducted semi-structured interviews with FirstEnergy program managers, with CLEAResult, the ICSP, and with Honeywell, the QA/QC site inspection contractor. Process evaluation activities in PY13 focused on understanding the program design, any changes in design or implementation in Phase IV, and to identify researchable issues for the upcoming process evaluation effort.

3.1.5.6 Behavioral Online Audits

The Process evaluation activities in PY13 focused on understanding the Online Audit program design and identifying evaluation priorities. Tetra Tech interviewed the FirstEnergy program manager and representatives of Oracle, the conservation service provider (CSP), and reviewed program data provided by Oracle. Tetra Tech will complete a comprehensive process evaluation for PY14.

3.1.6 Cost-Effectiveness Reporting

A detailed breakdown of program finances and cost-effectiveness is presented Table 43, Table 44, Table 45, and Table 46 for Met-Ed, Penelec, Penn Power, and WPP respectively. The last two columns of the tables show benefits as calculated with net verified impacts, along with net participant costs (if applicable). The third and fourth columns show results as calculated on a gross basis. PYTD costs and benefits are net present values (NPV) expressed in 2021 dollars. NPV costs and benefits for P4TD financials are expressed in the 2021 dollars.

Table 43: Summary of Program Finances – Met-Ed

Row #	Cost Category	Gross PYTD ($1,000)		Gross P4TD ($1,000)		Net PYTD ($1,000)		Net P4TD ($1,000)	
1	**IMCs**	3,430		3,430		2,647		2,647	
2	Rebates to Participants and Trade Allies	660		660		660		660	
3	Upstream / Midstream Incentives	0		0		0		0	
4	Material Cost for Self-Install Programs (EE&C Kits)	1,546		1,546		1,546		1,546	
5	Direct Installation Program Materials and Labor	17		17		17		17	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	1,207		1,207		424		424	
		EDC	CSP	EDC	CSP	EDC	CSP	EDC	CSP
7	Program Design	1	4	1	4	1	4	1	4
8	Administration and Management	179	532	179	532	179	532	179	532
9	Marketing	8	119	8	119	8	119	8	119
10	Program Delivery	13	65	13	65	13	65	13	65
11	EDC Evaluation Costs	77		77		77		77	
12	SWE Audit Costs	42		42		42		42	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	1,037		1,037		1,037		1,037	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	**4,467**		**4,467**		**3,683**		**3,683**	
15	Total NPV Lifetime Electric Energy Benefits	3,669		3,669		2,926		2,926	
16	Total NPV Lifetime Electric Capacity Benefits	2,198		2,198		1,702		1,702	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	0		0		0		0	
18	Total NPV Lifetime Fossil Fuel Impacts	-7		-7		-6		-6	
19	Total NPV Lifetime Water Impacts	2,133		2,133		1,749		1,749	
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	**7,993**		**7,993**		**6,371**		**6,371**	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	**1.79**		**1.79**		**1.73**		**1.73**	

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

Table 44: Summary of Program Finances – Penelec

Row #	Cost Category	Gross PYTD ($1,000)		Gross P3TD ($1,000)		Net PYTD ($1,000)		Net P3TD ($1,000)	
1	**IMCs**	1,544		1,544		1,368		1,368	
2	Rebates to Participants and Trade Allies	64		64		64		64	
3	Upstream / Midstream Incentives	0		0		0		0	
4	Material Cost for Self-Install Programs (EE&C Kits)	1,302		1,302		1,302		1,302	
5	Direct Installation Program Materials and Labor	2		2		2		2	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	176		176		0		0	
		EDC	CSP	EDC	CSP	EDC	CSP	EDC	CSP
7	Program Design	1	3	1	3	1	3	1	3
8	Administration and Management	154	268	154	268	154	268	154	268
9	Marketing	8	76	8	76	8	76	8	76
10	Program Delivery	11	43	11	43	11	43	11	43
11	EDC Evaluation Costs	58		58		58		58	
12	SWE Audit Costs	33		33		33		33	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	653		653		653		653	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	**2,198**		**2,198**		**2,021**		**2,021**	
15	Total NPV Lifetime Electric Energy Benefits	2,816		2,816		2,343		2,343	
16	Total NPV Lifetime Electric Capacity Benefits	1,060		1,060		872		872	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	0		0		0		0	
18	Total NPV Lifetime Fossil Fuel Impacts	-92		-92		-77		-77	
19	Total NPV Lifetime Water Impacts	2,481		2,481		2,072		2,072	
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	**6,266**		**6,266**		**5,211**		**5,211**	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	**2.85**		**2.85**		**2.58**		**2.58**	

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

Table 45: Summary of Program Finances – Penn Power

Row #	Cost Category	Gross PYTD ($1,000)		Gross P3TD ($1,000)		Net PYTD ($1,000)		Net P3TD ($1,000)	
1	**IMCs**	1,209		1,209		927		927	
2	Rebates to Participants and Trade Allies	215		215		215		215	
3	Upstream / Midstream Incentives	0		0		0		0	
4	Material Cost for Self-Install Programs (EE&C Kits)	384		384		384		384	
5	Direct Installation Program Materials and Labor	12		12		12		12	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	597		597		315		315	
		EDC	CSP	EDC	CSP	EDC	CSP	EDC	CSP
7	Program Design	0	1	0	1	0	1	0	1
8	Administration and Management	73	210	73	210	73	210	73	210
9	Marketing	2	30	2	30	2	30	2	30
10	Program Delivery	5	37	5	37	5	37	5	37
11	EDC Evaluation Costs	27		27		27		27	
12	SWE Audit Costs	15		15		15		15	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	401		401		401		401	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	**1,609**		**1,609**		**1,327**		**1,327**	
15	Total NPV Lifetime Electric Energy Benefits	1,115		1,115		904		904	
16	Total NPV Lifetime Electric Capacity Benefits	385		385		299		299	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	0		0		0		0	
18	Total NPV Lifetime Fossil Fuel Impacts	19		19		16		16	
19	Total NPV Lifetime Water Impacts	612		612		514		514	
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	**2,131**		**2,131**		**1,733**		**1,733**	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	**1.32**		**1.32**		**1.31**		**1.31**	

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

Table 46: Summary of Program Finances – WPP

Row #	Cost Category	Gross PYTD ($1,000)		Gross P3TD ($1,000)		Net PYTD ($1,000)		Net P3TD ($1,000)	
1	**IMCs**	3,316		3,316		3,063		3,063	
2	Rebates to Participants and Trade Allies	421		421		421		421	
3	Upstream / Midstream Incentives	0		0		0		0	
4	Material Cost for Self-Install Programs (EE&C Kits)	1,710		1,710		1,710		1,710	
5	Direct Installation Program Materials and Labor	18		18		18		18	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	1,166		1,166		914		914	
		EDC	CSP	EDC	CSP	EDC	CSP	EDC	CSP
7	Program Design	1	4	1	4	1	4	1	4
8	Administration and Management	210	588	210	588	210	588	210	588
9	Marketing	8	93	8	93	8	93	8	93
10	Program Delivery	16	70	16	70	16	70	16	70
11	EDC Evaluation Costs	87		87		87		87	
12	SWE Audit Costs	47		47		47		47	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	1,125		1,125		1,125		1,125	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	**4,440**		**4,440**		**4,188**		**4,188**	
15	Total NPV Lifetime Electric Energy Benefits	3,948		3,948		4,074		4,074	
16	Total NPV Lifetime Electric Capacity Benefits	1,103		1,103		1,082		1,082	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	0		0		0		0	
18	Total NPV Lifetime Fossil Fuel Impacts	-38		-38		-41		-41	
19	Total NPV Lifetime Water Impacts	2,463		2,463		2,716		2,716	
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	**7,477**		**7,477**		**7,830**		**7,830**	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	**1.68**		**1.68**		**1.87**		**1.87**	

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

3.1.7 Status of Recommendations

No program components were evaluated in PY13.

3.2 Energy Efficient Products Program

Through the Residential Energy Efficient Products Program, customers receive incentives for installing ENERGY STAR® qualified appliances, energy efficient HVAC equipment, and energy efficient water heaters. Qualifying appliances include items such as clothes washers, dehumidifiers, and refrigerators. HVAC equipment qualifying as part of the program include central air conditioners, air source heat pumps, ground source heat pumps, and mini-split heat pumps. The program also provides incentives to customers for the maintenance (tune-ups) of existing HVAC equipment. Water heaters rebated under the program include heat pump water heaters, efficient electric water heaters, and solar water heaters. The program also provides incentives to customers who recycle old, inefficient appliances. The Companies have retained Franklin Energy Services to administer the rebate components of the program and ARCA for the recycling component.

For the appliances component of the program, the participant count is equal to the sum of appliances rebated by the program. For the HVAC component, the participant count is equal to the sum of the distinct HVAC measures rebated by the program. For the upstream electronics component of the program, the participant count is equal to the number of electronics equipment sold.

3.2.1 Participation and Reported Savings by Customer Segment

This program serves primarily the residential customer segment. Table 47, Table 48, Table 49, and Table 50 present the participation counts, reported energy and demand savings, and incentive payments for the EEP Program in PY13 by customer segment and EDC.

Table 47: EEP Program Participation and Reported Impacts for Met-Ed

Parameter	Residential (Non-LI)	Small C&I (Non-GNI)	GNI	Total
PYTD # Participants	20,842	0	0	20,842
PYRTD MWh/yr	9,299	0	0	9,299
PYRTD MW/yr	1.94	0.00	0.00	2
PYTD Incentives ($1000)	1,248	0.00	0.00	1,248

Table 48: EEP Program Participation and Reported Impacts for Penelec

Parameter	Residential (Non-LI)	Small C&I (Non-GNI)	GNI	Total
PYTD # Participants	16,464	0	0	16,464
PYRTD MWh/yr	6,483	0	0	6,483
PYRTD MW/yr	1.38	0.00	0.00	1
PYTD Incentives ($1000)	772	0.00	0.00	772

Table 49: EEP Program Participation and Reported Impacts for Penn Power

Parameter	Residential (Non-LI)	Small C&I (Non-GNI)	GNI	Total
PYTD # Participants	7,208	0	0	7,208
PYRTD MWh/yr	2,548	0	0	2,548
PYRTD MW/yr	0.52	0.00	0.00	1
PYTD Incentives ($1000)	343	0.00	0.00	343

Table 50: EEP Program Participation and Reported Impacts for WPP

Parameter	Residential (Non-LI)	Small C&I (Non-GNI)	GNI	Total
PYTD # Participants	17,976	0	0	17,976
PYRTD MWh/yr	7,794	0	0	7,794
PYRTD MW/yr	1.60	0.00	0.00	2
PYTD Incentives ($1000)	971	0.00	0.00	971

3.2.2 Gross Impact Evaluation

This program is disaggregated into five initiatives for evaluation. The impact evaluation of the Appliance Recycling initiative is described in Appendix J. The impact evaluation of the Upstream Electronics initiative is described in detail in Appendix K. The impact evaluation of the Res HVAC initiative is described in detail in Appendix L. The impact evaluation of the Res Appliances initiative is described in detail in Appendix M. The impact evaluation of the Res Midstream Appliances initiative is described in detail in Appendix N. Table 51 summarizes program verified impacts and realization rates for each EDC.

Table 51: EEP Program Gross Impact Evaluation Summary for PY13

EDC	Sampling Initiative	Gross Verified MWh	Gross Verified MW	MWh Realization Rate	MW Realization Rate
Met-Ed	Appliance Recycling	4,502	1.00	102.8%	98.7%
Met-Ed	Upstream Electronics	0	0.00	0.0%	0.0%
Met-Ed	HVAC	826	0.16	114.5%	119.4%
Met-Ed	Appliances	405	0.06	98.7%	98.7%
Met-Ed	Midstream Appliances	3,970	0.75	104.8%	104.0%
Met-Ed Total		**9,703**	**1.98**	**104%**	**102%**
Penelec	Appliance Recycling	3,450	0.74	108.5%	103.5%
Penelec	Upstream Electronics	0	0.00	0.0%	0.0%
Penelec	HVAC	565	0.05	155.0%	157.0%
Penelec	Appliances	181	0.03	95.1%	96.2%
Penelec	Midstream Appliances	2,869	0.62	104.3%	104.4%
PenelecTotal		**7,064**	**1.45**	**109%**	**105%**
Penn Power	Appliance Recycling	958	0.20	94.8%	92.4%
Penn Power	Upstream Electronics	0	0.00	0.0%	0.0%
Penn Power	HVAC	170	0.03	106.3%	124.2%
Penn Power	Appliances	118	0.02	105.6%	95.4%
Penn Power	Midstream Appliances	1,335	0.28	105.4%	106.5%
Penn PowerTotal		**2,580**	**0.53**	**101%**	**101%**
WPP	Appliance Recycling	4,192	0.86	99.8%	95.4%
WPP	Upstream Electronics	0	0.00	0.0%	0.0%
WPP	HVAC	1,020	0.12	151.7%	114.4%
WPP	Appliances	407	0.06	104.7%	107.2%
WPP	Midstream Appliances	2,651	0.56	104.6%	104.9%
WPP Total		**8,270**	**1.60**	**106%**	**100%**

The gross realization rates for energy savings were driven primarily by the realization rates of the appliance recycling and midstream appliances components.

3.2.2.1 Evaluation Adjustments in Response to the COVID-19 Pandemic

Data to support evaluation, measurement, and verification of this program are collected with remote online and telephone surveys. As a result, the PY13 evaluation was not altered due to COVID-19 induced social distancing measures.

3.2.3 Net Impact Evaluation

The impact evaluation of the Appliance Recycling initiative is described in Appendix J. The impact evaluation of the Upstream Electronics initiative is described in detail in Appendix K. The impact evaluation of the Res HVAC initiative is described in detail in Appendix L. The impact evaluation of the Res Appliances initiative is described in detail in Appendix M. . The impact evaluation of the Res Midstream Appliances initiative is described in detail in Appendix N. Note that only the Appliance Recycling initiative was evaluated for NTG in PY13. Historical NTG values from research in Phase III were applied to other initiatives as shown in Table 52, which

summarizes program verified gross and net energy impacts and net-to-gross ratios for each EDC.

Table 52: EEP Program Net Impact Evaluation Summary for PY13

EDC	Sampling Initiative	Gross Verified MWh	NTG	Net Verified MWh	Net Verified MW
Met-Ed	Appliance Recycling	4,502	39.0%	1,756	0.39
Met-Ed	Upstream Electronics	0	58.3%	0	0.00
Met-Ed	HVAC	826	50.7%	419	0.08
Met-Ed	Appliances	405	50.2%	203	0.03
Met-Ed	Midstream Appliances	3,970	47.2%	1,874	0.36
Met-Ed Total		**9,703**	**43.8%**	**4,252**	**0.86**
Penelec	Appliance Recycling	3,450	65.0%	2,242	0.48
Penelec	Upstream Electronics	0	58.3%	0	0.00
Penelec	HVAC	565	52.3%	295	0.03
Penelec	Appliances	181	60.0%	108	0.02
Penelec	Midstream Appliances	2,869	53.1%	1,523	0.33
Penelec Total		**7,064**	**59.0%**	**4,169**	**0.86**
Penn Power	Appliance Recycling	958	38.0%	364	0.07
Penn Power	Upstream Electronics	0	58.3%	0	0.00
Penn Power	HVAC	170	54.8%	93	0.02
Penn Power	Appliances	118	56.2%	66	0.01
Penn Power	Midstream Appliances	1,335	44.0%	587	0.12
Penn Power Total		**2,580**	**43.0%**	**1,111**	**0.23**
WPP	Appliance Recycling	4,192	70.0%	2,934	0.61
WPP	Upstream Electronics	0	58.3%	0	0.00
WPP	HVAC	1,020	52.0%	530	0.06
WPP	Appliances	407	64.7%	264	0.04
WPP	Midstream Appliances	2,651	50.8%	1,347	0.28
WPP Total		**8,270**	**61.4%**	**5,075**	**0.99**

3.2.3.1 High-Impact Measure Research

The Appliance Recycling Initiative was identified as a High-Impact Measure and researched for net-to-gross in PY13. The net impact evaluation of the Appliance Recycling Initiative is described in Appendix J.

3.2.4 Verified Savings Estimates

In Table 53 the realization rates and net-to-gross ratios determined by the ADM and Tetra Tech team are applied to the reported energy and demand savings estimates to calculate the verified savings estimates for the Energy Efficient Products Program in PY13. These totals are added to the verified savings achieved in previous program years to calculate the P4TD program impacts.

Table 53: PYTD and P4TD Savings Summary

	Met-Ed		Penelec		Penn Power		WPP	
Savings Type	Energy (MWh/yr)	Demand (MW/yr)	Energy (MWh/yr)	Demand (MW/yr)	Energy (MWh/yr)	Demand (MW/yr)	Energy (MWh/yr)	Demand (MW/yr)
PYRTD	9,299	1.94	6,483	1.38	2,548	0.52	7,794	1.60
PYVTD Gross	9,703	1.98	7,064	1.45	2,580	0.53	8,270	1.60
PYVTD Net	4,252	0.86	4,169	0.86	1,111	0.23	5,075	0.99
RTD	9,299	1.94	6,483	1.38	2,548	0.52	7,794	1.60
VTD Gross	9,703	1.98	7,064	1.45	2,580	0.53	8,270	1.60
VTD Net	4,252	0.86	4,169	0.86	1,111	0.23	5,075	0.99

3.2.5 Process Evaluation

In PY13, Tetra Tech completed a process evaluation for the Appliance Recycling program component, and also conducted initial research and staff interviews to support the planning effort for upcoming process evaluations of other program components. The sample design for Phase IV process evaluation research conducted to date shown in Table 54 below.

Table 54: EEP Program Process Evaluation Sample Design

EDC	Measure	Activity	Population Size	Target Sample Size	Achieved Sample Size
Met-Ed	Appliance Recycling	In-Depth Interviews (PY13) Customer Surveys (PY13)	7,026	139	151
Penelec	Appliance Recycling		5,175	123	177
Penn Power	Appliance Recycling		1,533	68	95
WPP	Appliance Recycling		6,321	130	163
Program Total			**20,055**	**459**	**586**

Process evaluation efforts for each program component are summarized below.

3.2.5.1 Appliance Recycling

The Appliance Recycling program process evaluation relied on program staff and ICSP interviews as well as participant customer surveys. The researchable issues for process evaluation related to customer satisfaction and program awareness. The results of both of these metrics remain similar to Phase III. The results are also similar across the FirstEnergy EDCs. The sample for the survey was randomly selected for each EDC. Key findings and recommendations for the Appliance Recycling component are listed in Section 3.2.7

3.2.5.2 Appliances & HVAC

Interviews with EDC and ICSP program managers provided an understanding of program design and implementation changes for Phase IV and researchable issues for the upcoming process evaluation effort. During these interviews, Tetra Tech learned that a primary contractor

complaint has been addressed in a new online submission portal developed by Franklin Energy. Each evaluation year, contractors say their biggest obstacle is providing the Air Conditioning, Heating, and Refrigeration Institute (AHRI) information on the rebate application because it is difficult to track down. This new portal is integrated with the AHRI system, so contractors do not have to enter the AHRI number or certificate. Through submission of model and manufacturer information, along with a few other specifications, the portal does a "smart search," pulling in the AHRI information. Other program design updates include an expansion of offerings in the midstream component. Program staff also expressed concern that supply chain constraints associated with the COVID-19 pandemic have impacted both the HVAC Downstream and the Appliance Rebate Midstream program components. For HVAC, it has resulted in a supply delay on larger units. For Midstream Appliances component, retailers are reporting a five-month delay in the shipment of some appliances, and they believe this will continue through 2022.

3.2.5.3 Midstream Electronics

The midstream electronics sub-program was not offered in PY13.

3.2.6 Cost-Effectiveness Reporting

A detailed breakdown of program finances and cost-effectiveness is presented in Table 55, Table 56, Table 57, and Table 58 for Met-Ed, Penelec, Penn Power, and WPP respectively. The last two columns of the tables show benefits as calculated with net verified impacts, along with net participant costs (if applicable). The third and fourth columns show results as calculated on a gross basis. PYTD costs and benefits are net present values (NPV) expressed in 2021 dollars. NPV costs and benefits for P4TD financials are expressed in the 2021 dollars.

Table 55: Summary of Program Finances – Met-Ed

Row #	Cost Category	Gross PYTD ($1,000)		Gross P4TD ($1,000)		Net PYTD ($1,000)		Net P4TD ($1,000)	
1	**IMCs**	3,664		3,664		1,777		1,777	
2	Rebates to Participants and Trade Allies	646		646		646		646	
3	Upstream / Midstream Incentives	602		602		602		602	
4	Material Cost for Self-Install Programs (EE&C Kits)	0		0		0		0	
5	Direct Installation Program Materials and Labor	0		0		0		0	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	2,416		2,416		529		529	
		EDC	CSP	EDC	CSP	EDC	CSP	EDC	CSP
7	Program Design	1	3	1	3	1	3	1	3
8	Administration and Management	160	765	160	765	160	765	160	765
9	Marketing	27	223	27	223	27	223	27	223
10	Program Delivery	8	56	8	56	8	56	8	56
11	EDC Evaluation Costs	84		84		84		84	
12	SWE Audit Costs	40		40		40		40	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	1,368		1,368		1,368		1,368	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	**5,032**		**5,032**		**3,145**		**3,145**	
15	Total NPV Lifetime Electric Energy Benefits	2,366		2,366		1,082		1,082	
16	Total NPV Lifetime Electric Capacity Benefits	2,044		2,044		927		927	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	0		0		0		0	
18	Total NPV Lifetime Fossil Fuel Impacts	244		244		117		117	
19	Total NPV Lifetime Water Impacts	110		110		55		55	
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	**4,764**		**4,764**		**2,181**		**2,181**	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	**0.95**		**0.95**		**0.69**		**0.69**	

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

Table 56: Summary of Program Finances – Penelec

Row #	Cost Category	Gross PYTD ($1,000)		Gross P3TD ($1,000)		Net PYTD ($1,000)		Net P3TD ($1,000)	
1	**IMCs**	2,882		2,882		1,571		1,571	
2	Rebates to Participants and Trade Allies	383		383		383		383	
3	Upstream / Midstream Incentives	389		389		389		389	
4	Material Cost for Self-Install Programs (EE&C Kits)	0		0		0		0	
5	Direct Installation Program Materials and Labor	0		0		0		0	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	2,110		2,110		799		799	
		EDC	CSP	EDC	CSP	EDC	CSP	EDC	CSP
7	Program Design	1	3	1	3	1	3	1	3
8	Administration and Management	156	521	156	521	156	521	156	521
9	Marketing	26	178	26	178	26	178	26	178
10	Program Delivery	8	42	8	42	8	42	8	42
11	EDC Evaluation Costs	79		79		79		79	
12	SWE Audit Costs	38		38		38		38	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	1,054		1,054		1,054		1,054	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	**3,935**		**3,935**		**2,625**		**2,625**	
15	Total NPV Lifetime Electric Energy Benefits	1,696		1,696		961		961	
16	Total NPV Lifetime Electric Capacity Benefits	1,301		1,301		740		740	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	0		0		0		0	
18	Total NPV Lifetime Fossil Fuel Impacts	201		201		110		110	
19	Total NPV Lifetime Water Impacts	78		78		47		47	
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	**3,276**		**3,276**		**1,857**		**1,857**	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	**0.83**		**0.83**		**0.71**		**0.71**	

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

Table 57: Summary of Program Finances – Penn Power

Row #	Cost Category	Gross PYTD ($1,000)		Gross P3TD ($1,000)		Net PYTD ($1,000)		Net P3TD ($1,000)	
1	**IMCs**	919		919		455		455	
2	Rebates to Participants and Trade Allies	158		158		158		158	
3	Upstream / Midstream Incentives	185		185		185		185	
4	Material Cost for Self-Install Programs (EE&C Kits)	0		0		0		0	
5	Direct Installation Program Materials and Labor	0		0		0		0	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	576		576		111		111	
		EDC	CSP	EDC	CSP	EDC	CSP	EDC	CSP
7	Program Design	0	1	0	1	0	1	0	1
8	Administration and Management	55	197	55	197	55	197	55	197
9	Marketing	8	58	8	58	8	58	8	58
10	Program Delivery	3	14	3	14	3	14	3	14
11	EDC Evaluation Costs	24		24		24		24	
12	SWE Audit Costs	12		12		12		12	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	371		371		371		371	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	**1,290**		**1,290**		**826**		**826**	
15	Total NPV Lifetime Electric Energy Benefits	714		714		319		319	
16	Total NPV Lifetime Electric Capacity Benefits	346		346		153		153	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	0		0		0		0	
18	Total NPV Lifetime Fossil Fuel Impacts	142		142		67		67	
19	Total NPV Lifetime Water Impacts	37		37		21		21	
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	**1,239**		**1,239**		**560**		**560**	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	**0.96**		**0.96**		**0.68**		**0.68**	

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

Table 58: Summary of Program Finances – WPP

Row #	Cost Category	Gross PYTD ($1,000)		Gross P3TD ($1,000)		Net PYTD ($1,000)		Net P3TD ($1,000)	
1	**IMCs**	3,225		3,225		1,801		1,801	
2	Rebates to Participants and Trade Allies	598		598		598		598	
3	Upstream / Midstream Incentives	374		374		374		374	
4	Material Cost for Self-Install Programs (EE&C Kits)	0		0		0		0	
5	Direct Installation Program Materials and Labor	0		0		0		0	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	2,254		2,254		830		830	
		EDC	CSP	EDC	CSP	EDC	CSP	EDC	CSP
7	Program Design	1	4	1	4	1	4	1	4
8	Administration and Management	186	693	186	693	186	693	186	693
9	Marketing	32	202	32	202	32	202	32	202
10	Program Delivery	10	55	10	55	10	55	10	55
11	EDC Evaluation Costs	97		97		97		97	
12	SWE Audit Costs	46		46		46		46	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	1,325		1,325		1,325		1,325	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	**4,550**		**4,550**		**3,126**		**3,126**	
15	Total NPV Lifetime Electric Energy Benefits	2,119		2,119		1,221		1,221	
16	Total NPV Lifetime Electric Capacity Benefits	835		835		485		485	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	0		0		0		0	
18	Total NPV Lifetime Fossil Fuel Impacts	233		233		132		132	
19	Total NPV Lifetime Water Impacts	136		136		88		88	
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	**3,324**		**3,324**		**1,926**		**1,926**	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	**0.73**		**0.73**		**0.62**		**0.62**	

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

3.2.7 Status of Recommendations

The process evaluation activities in PY13 led to the following findings and recommendations from Tetra Tech to the Companies, along with a summary of how the Companies plan to address the recommendation in program delivery.

Finding #1: *FirstEnergy program staff report that the program is running well.* This program has been running for multiple years and has been operating smoothly. The relationship with the Appliance Recycling Centers of America, Inc. (ARCA), the conservation service provider (CSP), is effective, with good communication, timely and accurate reporting, and high customer satisfaction. The program had to shut down for three months due to the COVID-19 pandemic but successfully transitioned processes to accommodate contactless pickups.

Finding #2: *ARCA reports the program has successfully transitioned into Phase IV.* ARCA believes the working relationship with FirstEnergy is excellent, driven by how mature the program is and the good relationship between ARCA and FirstEnergy. ARCA offers customers both in-person and contactless pickup services and provides weekly and monthly updates to FirstEnergy. There were some concerns about macroeconomic factors like the price and availability of new appliances; however, ARCA does not feel any specific action was necessary. To improve implementation, ARCA is continuing efforts to partner with retailers to talk and provide information about the Appliance Recycling program when customers are buying new appliances.

Finding #3: *The program is searching for additional ways to recycle more units in bulk.* The program is in the process of developing a midstream offering; this effort would involve working with retailers to recycle several used units at once. The program also works with hotels, apartment complexes, and universities to recycle units, including room air conditioners.

Finding #4: *Bill inserts continue to be the most common source of program information.* In PY13, 49 percent of respondents indicated bill inserts as a source of program information, consistent with prior evaluations. Email from the electric distribution company (EDC) was the second most common source of program awareness mentioned by 17 percent of respondents.

Finding #5: *Program satisfaction remains high.* Mean satisfaction scores for the overall program and individual program components ranged from 4.4 to 4.8 (on a scale where 1 was *very dissatisfied* and 5 was *very satisfied*). Seventy-seven percent of respondents reported they were *very satisfied* with the program overall, down slightly from 79 percent in PY10. Of the customers who expressed *dissatisfaction* (82 out of 570), pickup cancelation and scheduling were the most common reasons.

Finding #6: *Most customers were able to purchase their preferred replacement equipment.* The evaluation team wanted to understand if the delays in the supply chain due to the COVID-19 pandemic had any impact on customers replacing their recycled units and if they could purchase the equipment they preferred. The majority of customers (over 85 percent) said they were able to buy their preferred equipment; for those customers who did not, the cost was the driving factor. Additionally, customers tended to purchase equipment with fewer features than their preferred model if their preferred model was unavailable.

Recommendation #1: *Continue to offer both in-home and contactless pickups as a means of program participation. C*ontactless pickups were introduced during the COVID-19 pandemic to keep the program running. While restrictions loosen, some customers have become more comfortable welcoming contractors back into their homes while others remain cautious. Contactless pickups remain viable for customers who are not yet comfortable with contractors in their homes.

EDC Status Report #1: Recommendation accepted.

Recommendation #2: *Continue to offer appliance recycling options to customers.* Customer satisfaction with the Appliance Recycling program remains high. The program offers a valued service and removes old, inefficient appliances from the system with little burden on customers.

EDC Status Report #2: Recommendation accepted.

Recommendation #3: *Continue to use bill inserts and email to promote the program.* Almost one-half of survey participants cite bill inserts as a source of program awareness; nearly one in five mention email. These communication channels are effective and can be deployed cost-efficiently.

EDC Status Report #3: Recommendation accepted.

3.3 LOW-INCOME ENERGY EFFICIENCY PROGRAM

The Low-Income Energy Efficiency Program (LIEEP) has seven distinct initiatives, each described below.

The *Low-Income Direct Install* (LI DI) component is administered by the Companies, and has three distinct components:

- *WARM Plus* low-income weatherization
- *WARM Extra Measures* low-income weatherization
- *WARM Multifamily*

These programs provide for direct installation of energy efficiency measures within customers' homes and tenants' apartments. The WARM Plus and WARM Multifamily components provide for audits and direct installation of energy efficient equipment and envelope upgrades. WARM *Extra Measures* is similar to WARM Plus, except that it provides for additional measures that are Act 129 funded to be installed in homes that participate in the Companies' non-Act 129 Low-Income Usage Reduction Programs. The Companies' tracking and reporting system can cross reference account numbers with previous years to generate a list of unique, new participants for each program year. For sampling and reporting purposes, however, ADM selects to treat each unique account in the tracking data for the program year as one participant.

Each of these program components are similar to their corresponding non-Low-Income components in the Energy Efficient Homes Program, but they are targeted to low-income customers.

The *Low-Income Appliance Recycling* (LI ATI) component is administered by ARCA. The program is implemented in parallel with the main residential Appliance Recycling program, but provides targeted marketing and enhanced incentives to income qualified customers. Each rebate application (which corresponds to an appliance pick-up event, and may involve multiple appliances) is treated as one participant.

The *Low-Income Kits* (LI Kit) component includes two subcomponents, both administered by AMCG:

- Low-Income EE Kits
- Low-Income School Education Program

Low-Income kits contained Advanced Power Strips instead of Electrical Outlet Gaskets. Each kit is treated as a participant.

The *Low-Income Appliance Rebates* (LI Appliances) component is administered by Franklin Energy Services and provides for targeted marketing and enhanced downstream rebates on appliances.

The *Low-Income Home Energy Reports* (LI HER) component is similar to the HER component in the Energy Efficient Homes Program but is targeted to low-income qualified customers.

The *Low-Income Online Audits* (LI Online Audit) component is similar to the Online Audit component in the Energy Efficient Homes Program but is targeted to low-income qualified customers.

The *Low Income New Homes* component is similar to the New Homes component in the Energy Efficient Homes Program but is targeted to low-income customers.

3.3.1 Participation and Reported Savings by Customer Segment

Table 59 presents the participation counts, reported energy and demand savings, and incentive payments for the Low-Income Energy Efficiency Program in PY13 by customer segment and EDC. This program serves only the low-income residential customer segment.

Table 59: LIEEP Participation and Reported Impacts

Parameter	Met-Ed LI Residential	Penelec LI Residential	Penn Power LI Residential	WPP LI Residential
PYTD # Participants	23,572	29,443	10,822	22,364
PYRTD MWh/yr	4,060	5,920	1,738	5,398
PYRTD MW/yr	0.54	0.74	0.23	0.80
PYTD Incentives ($1000)	989	1,504	411	1,044

3.3.2 Gross Impact Evaluation

The impact evaluation of the Res Appliances initiative is described in detail in Appendix M. The impact evaluation of the LI Appliance Recycling sub-initiative is described in detail in Appendix O. The impact evaluation of the LI DI initiative is described in Appendix P. The impact evaluation of the HER initiative is described in Appendix B. The impact evaluation of the LI EE Kits sub-initiative is described in Appendix Q. The impact evaluation of the Res NC initiative is described in Appendix G. The impact evaluation of the Online Audit initiative is described in Appendix I. Table 60 summarizes program verified impacts and realization rates for each EDC.

Table 60: LIEEP Gross Impact Evaluation Summary for PY13

EDC	Sampling Initiative	Gross Verified MWh	Gross Verified MW	MWh Realization Rate	MW Realization Rate
Met-Ed	Appliances	12	0.00	98.7%	98.7%
Met-Ed	Appliance Turn-In	625	0.14	114.4%	117.5%
Met-Ed	Direct Install	783	0.10	100.2%	100.1%
Met-Ed	Home Energy Reports	197	0.00	61.4%	0.0%
Met-Ed	Kits	2,043	0.22	91.4%	90.8%
Met-Ed	New Homes	102	0.01	98.1%	69.0%
Met-Ed	Online Audits	0	0.00	0.0%	100.0%
Met-Ed Total		**3,762**	**0.48**	**93%**	**89%**
Penelec	Appliances	14	0.00	95.1%	96.2%
Penelec	Appliance Turn-In	596	0.13	100.8%	96.8%
Penelec	Direct Install	1,267	0.15	100.4%	99.5%
Penelec	Home Energy Reports	645	0.00	140.9%	0.0%
Penelec	Kits	3,412	0.33	97.5%	91.8%
Penelec	New Homes	8	0.00	102.8%	79.8%
Penelec	Online Audits	0	0.00	0.0%	100.0%
PenelecTotal		**5,942**	**0.61**	**100%**	**83%**
Penn Power	Appliances	4	0.00	105.6%	95.4%
Penn Power	Appliance Turn-In	134	0.03	101.0%	96.6%
Penn Power	Direct Install	487	0.06	99.6%	99.0%
Penn Power	Home Energy Reports	275	0.00	109.6%	0.0%
Penn Power	Kits	816	0.08	96.6%	87.7%
Penn Power	New Homes	0	0.00	94.5%	59.4%
Penn Power	Online Audits	0	0.00	0.0%	100.0%
Penn PowerTotal		**1,716**	**0.17**	**99%**	**73%**
WPP	Appliances	21	0.00	104.7%	107.2%
WPP	Appliance Turn-In	513	0.12	101.8%	99.0%
WPP	Direct Install	1,233	0.16	100.0%	99.6%
WPP	Home Energy Reports	1,498	0.00	144.6%	0.0%
WPP	Kits	2,551	0.28	99.8%	94.7%
WPP	New Homes	0	0.00	102.7%	57.6%
WPP	Online Audits	0	0.00	0.0%	100.0%
WPP Total		**5,817**	**0.56**	**108%**	**70%**

The gross realization rates for energy savings were driven primarily by the three largest components: Kits, Home Energy Reports and Direct Install.

3.3.2.1 Evaluation Adjustments in Response to the COVID-19 Pandemic

The evaluation effort for the Low-Income Energy Efficiency Program was not impacted by the COVID-19 pandemic in PY13.

3.3.3 Net Impact Evaluation

Net impact evaluation was not formally conducted for this program in PY13, in accordance with our evaluation plan. The NTG for the Low-Income Energy Efficiency Program is estimated as 1.0 for the purpose of net cost effectiveness calculations.

3.3.4 Verified Savings Estimates

In Table 61 the realization rates determined by ADM are applied to the reported energy and demand savings estimates to calculate the verified savings estimates for The Low-Income Energy Efficiency Program in PY13. These totals are added to the verified savings achieved in previous program years to calculate the P4TD program impacts.

Table 61: PYTD and P4TD Savings Summary

	Met-Ed		Penelec		Penn Power		WPP	
Savings Type	Energy (MWh/yr)	Demand (MW/yr)	Energy (MWh/yr)	Demand (MW/yr)	Energy (MWh/yr)	Demand (MW/yr)	Energy (MWh/yr)	Demand (MW/yr)
PYRTD	4,060	0.54	5,920	0.74	1,738	0.23	5,398	0.80
PYVTD Gross	3,762	0.48	5,942	0.61	1,716	0.17	5,817	0.56
PYVTD Net	3,762	0.48	5,942	0.61	1,716	0.17	5,817	0.56
RTD	4,060	0.54	5,920	0.74	1,738	0.23	5,398	0.80
VTD Gross	3,762	0.48	5,942	0.61	1,716	0.17	5,817	0.56
VTD Net	3,762	0.48	5,942	0.61	1,716	0.17	5,817	0.56

3.3.5 Process Evaluation

Apart from Appliance Recycling, no initiatives within the Low-Income Energy Efficiency Program were scheduled for process evaluation reporting in PY13. However, several program elements are scheduled for reporting in PY14, and Tetra Tech has conducted the following initial process evaluation activities as of this writing.

3.3.5.1 Downstream Appliances

Interviews with EDC and ICSP program managers provided an understanding of program design and implementation changes for Phase IV and researchable issues for the upcoming process evaluation effort.

3.3.5.2 Appliance Recycling

The Appliance Recycling program process evaluation relied on program staff and ICSP interviews as well as participant customer surveys. The researchable issues for process evaluation related to customer satisfaction and program awareness. The results of both of these metrics remain similar to Phase III. The results are also similar across the FirstEnergy EDCs. The sample for the survey was randomly selected for each EDC. Key findings and recommendations for the Appliance Recycling component are listed in Section 3.2.7

3.3.5.3 Direct Install

Interviews with EDC and ICSP program managers provided an understanding of program design and implementation changes for Phase IV and researchable issues for the upcoming process evaluation effort

3.3.5.4 Home Energy Reports

In PY13 Tetra Tech conducted semi-structured interviews with FirstEnergy program managers and the program implementer. FirstEnergy and ICSP staff noted a low drop-out rate, suggesting

that there are not issues that cause participants to be dissatisfied. Both FirstEnergy and the ICSP felt the program design was working well, but expressed concern related to a delayed program launch in PY13 as the process of getting the contract approved took longer than expected.

3.3.5.5 School Education Program

Process evaluation activities in PY13 focused on understanding the program design, any changes in design or implementation in Phase IV, how the program engages with schools, and identifying evaluation priorities. Tetra Tech interviewed the FirstEnergy program manager, representatives of the ICSP AMCG, and representatives of the National Energy Foundation (NEF), which AMCG contracts to market the program and present in the classrooms. Overall the program is reported to operate smoothly, and was able to achieve over 90% of the PY13 kit-distribution target despite launching in April 2022. Program design changes for Phase IV include shipping kits to schools directly for distribution to all students in participating classrooms. The in-school educational component has changed from an assembly to in-class performances to support a more educationally-focused presentation.

3.3.5.6 New Homes

Tetra Tech interviewed the Companies' program manager; representatives of Performance Systems Development, the ICSP. Process evaluation activities in PY13 focused on understanding the program design, any changes in design or implementation in Phase IV, how the program engages with builders and raters, and identifying evaluation priorities. The New Homes program enjoyed a smooth transition from Phase III to Phase IV with relatively little changes in design or staffing. Interviews revealed that home construction, like many other markets, is facing material and labor shortages. PSD reports that, so far, it is taking longer to complete projects, but the volume of projects has not declined noticeably.

3.3.5.7 Behavioral Online Audits

The Process evaluation activities in PY13 focused on understanding the Online Audit program design and identifying evaluation priorities. Tetra Tech interviewed the FirstEnergy program manager and representatives of Oracle, the conservation service provider (CSP), and reviewed program data provided by Oracle. Tetra Tech will complete a comprehensive process evaluation for PY14.

3.3.6 Cost-Effectiveness Reporting

A detailed breakdown of program finances and cost-effectiveness is presented in Table 62, Table 63, Table 64, and Table 65 for Met-Ed, Penelec, Penn Power, and WPP respectively. The last two columns of the tables show benefits as calculated with net verified impacts, along with net participant costs (if applicable). The third and fourth columns show results as calculated on a gross basis. PYTD costs and benefits are net present values (NPV) expressed in 2021 dollars. NPV costs and benefits for P4TD financials are expressed in the 2021 dollars.

Table 62: Summary of Program Finances – Met-Ed

Row #	Cost Category	Gross PYTD ($1,000)		Gross P4TD ($1,000)		Net PYTD ($1,000)		Net P4TD ($1,000)	
1	**IMCs**	1,045		1,045		1,045		1,045	
2	Rebates to Participants and Trade Allies	103		103		103		103	
3	Upstream / Midstream Incentives	0		0		0		0	
4	Material Cost for Self-Install Programs (EE&C Kits)	376		376		376		376	
5	Direct Installation Program Materials and Labor	510		510		510		510	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	56		56		56		56	
		EDC	CSP	EDC	CSP	EDC	CSP	EDC	CSP
7	Program Design	0	2	0	2	0	2	0	2
8	Administration and Management	136	345	136	345	136	345	136	345
9	Marketing	0	78	0	78	0	78	0	78
10	Program Delivery	5	27	5	27	5	27	5	27
11	EDC Evaluation Costs	46		46		46		46	
12	SWE Audit Costs	24		24		24		24	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	665		665		665		665	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	**1,710**		**1,710**		**1,710**		**1,710**	
15	Total NPV Lifetime Electric Energy Benefits	1,049		1,049		1,049		1,049	
16	Total NPV Lifetime Electric Capacity Benefits	563		563		563		563	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	0		0		0		0	
18	Total NPV Lifetime Fossil Fuel Impacts	-24		-24		-24		-24	
19	Total NPV Lifetime Water Impacts	777		777		777		777	
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	**2,365**		**2,365**		**2,365**		**2,365**	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	**1.38**		**1.38**		**1.38**		**1.38**	

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

Table 63: Summary of Program Finances – Penelec

Row #	Cost Category	Gross PYTD ($1,000)		Gross P3TD ($1,000)		Net PYTD ($1,000)		Net P3TD ($1,000)	
1	**IMCs**	1,531		1,531		1,531		1,531	
2	Rebates to Participants and Trade Allies	77		77		77		77	
3	Upstream / Midstream Incentives	0		0		0		0	
4	Material Cost for Self-Install Programs (EE&C Kits)	596		596		596		596	
5	Direct Installation Program Materials and Labor	831		831		831		831	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	27		27		27		27	
		EDC	CSP	EDC	CSP	EDC	CSP	EDC	CSP
7	Program Design	0	2	0	2	0	2	0	2
8	Administration and Management	166	368	166	368	166	368	166	368
9	Marketing	0	125	0	125	0	125	0	125
10	Program Delivery	6	27	6	27	6	27	6	27
11	EDC Evaluation Costs	55		55		55		55	
12	SWE Audit Costs	26		26		26		26	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	777		777		777		777	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	**2,308**		**2,308**		**2,308**		**2,308**	
15	Total NPV Lifetime Electric Energy Benefits	1,645		1,645		1,645		1,645	
16	Total NPV Lifetime Electric Capacity Benefits	661		661		661		661	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	0		0		0		0	
18	Total NPV Lifetime Fossil Fuel Impacts	-83		-83		-83		-83	
19	Total NPV Lifetime Water Impacts	790		790		790		790	
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	**3,014**		**3,014**		**3,014**		**3,014**	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	**1.31**		**1.31**		**1.31**		**1.31**	

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

Table 64: Summary of Program Finances – Penn Power

Row #	Cost Category	Gross PYTD ($1,000)		Gross P3TD ($1,000)		Net PYTD ($1,000)		Net P3TD ($1,000)	
1	**IMCs**	415		415		415		415	
2	Rebates to Participants and Trade Allies	16		16		16		16	
3	Upstream / Midstream Incentives	0		0		0		0	
4	Material Cost for Self-Install Programs (EE&C Kits)	142		142		142		142	
5	Direct Installation Program Materials and Labor	253		253		253		253	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	4		4		4		4	
		EDC	CSP	EDC	CSP	EDC	CSP	EDC	CSP
7	Program Design	0	1	0	1	0	1	0	1
8	Administration and Management	51	147	51	147	51	147	51	147
9	Marketing	0	44	0	44	0	44	0	44
10	Program Delivery	2	19	2	19	2	19	2	19
11	EDC Evaluation Costs	17		17		17		17	
12	SWE Audit Costs	9		9		9		9	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	289		289		289		289	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	**704**		**704**		**704**		**704**	
15	Total NPV Lifetime Electric Energy Benefits	523		523		523		523	
16	Total NPV Lifetime Electric Capacity Benefits	132		132		132		132	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	0		0		0		0	
18	Total NPV Lifetime Fossil Fuel Impacts	-36		-36		-36		-36	
19	Total NPV Lifetime Water Impacts	172		172		172		172	
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	**790**		**790**		**790**		**790**	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	**1.12**		**1.12**		**1.12**		**1.12**	

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

Table 65: Summary of Program Finances – WPP

Row #	Cost Category	Gross PYTD ($1,000)		Gross P3TD ($1,000)		Net PYTD ($1,000)		Net P3TD ($1,000)	
1	**IMCs**	1,064		1,064		1,064		1,064	
2	Rebates to Participants and Trade Allies	66		66		66		66	
3	Upstream / Midstream Incentives	0		0		0		0	
4	Material Cost for Self-Install Programs (EE&C Kits)	425		425		425		425	
5	Direct Installation Program Materials and Labor	553		553		553		553	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	20		20		20		20	
		EDC	CSP	EDC	CSP	EDC	CSP	EDC	CSP
7	Program Design	0	2	0	2	0	2	0	2
8	Administration and Management	147	309	147	309	147	309	147	309
9	Marketing	0	106	0	106	0	106	0	106
10	Program Delivery	5	20	5	20	5	20	5	20
11	EDC Evaluation Costs	51		51		51		51	
12	SWE Audit Costs	26		26		26		26	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	666		666		666		666	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	**1,730**		**1,730**		**1,730**		**1,730**	
15	Total NPV Lifetime Electric Energy Benefits	1,472		1,472		1,472		1,472	
16	Total NPV Lifetime Electric Capacity Benefits	371		371		371		371	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	0		0		0		0	
18	Total NPV Lifetime Fossil Fuel Impacts	-51		-51		-51		-51	
19	Total NPV Lifetime Water Impacts	862		862		862		862	
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	**2,654**		**2,654**		**2,654**		**2,654**	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	**1.53**		**1.53**		**1.53**		**1.53**	

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

3.3.7 Status of Recommendations

The Key findings and recommendations for the Appliance Recycling component are listed in Section 3.2.7.

3.4 C&I Energy Solutions for Business Program - Small

The C&I Solutions for Business Program – Small (referred to as ESB-Small Program) is offered to small commercial and industrial customers and was implemented jointly by Franklin Energy Services, Willdan, CLEAResult, and ARCA for PY13. The Franklin Energy Services portion of the program includes downstream and midstream incentives for customers that install energy efficient equipment. The Willdan portion of the program includes incentives for efficient new construction and the Building Tune-Up direct install program in PY13. CLEAResult staff conduct most of the audits and direct installations for the CI Multifamily initiative. ARCA administers the Appliance Recycling program component.

3.4.1 Participation and Reported Savings by Customer Segment

Table 66 and Table 67 present the participation counts, reported energy and demand savings, and incentive payments for the ESB-Small Program in PY13 by customer segment and EDC. This program serves the Small C&I and GNI customer segments. Each separate rebate application is counted as one participant.

Table 66: ESB-Small Program Participation and Reported Impacts for Met-Ed and Penelec

Parameter	Met-Ed Small C&I (Non-GNI)	Met-Ed GNI	Met-Ed Total	Penelec Small C&I (Non-GNI)	Penelec GNI	Penelec Total
PYTD # Participants	137	20	157	158	8	166
PYRTD MWh/yr	4,142	1,101	5,243	13,610	219	13,829
PYRTD MW/yr	0.70	0.19	0.89	3.57	0.03	3.60
PYTD Incentives ($1000)	359	224	584	1,254	26	1,280

Table 67: ESB-Small Program Participation and Reported Impacts for Penn Power and WPP

Parameter	Penn Power Small C&I (Non-GNI)	Penn Power GNI	Penn Power Total	WPP Small C&I (Non-GNI)	WPP GNI	WPP Total
PYTD # Participants	55	6	61	171	3	174
PYRTD MWh/yr	1,077	73	1,150	7,198	71	7,268
PYRTD MW/yr	0.15	0.01	0.16	1.13	0.01	1.13
PYTD Incentives ($1000)	235	5	240	1,701	12	1,713

3.4.2 Gross Impact Evaluation

The ESB-Small Program was disaggregated into five sampling initiatives for gross impact evaluation. Downstream and midstream lighting improvements and downstream prescriptive rebates for efficient equipment such as HVAC systems, food service, refrigeration, appliances, and agricultural measures were grouped into the CI Prescriptive initiative, and evaluated according to PA TRM protocols as described in detail in Appendix R. Within the Prescriptive initiative, lighting and non-lighting, and downstream and midstream components each had

distinct sampling strata. Custom projects include combinations of measures that serve multiple end-uses, as well as custom projects that involve combined heat and power, motors and drives, industrial process improvements, refrigeration, retro-commissioning, compressed air upgrades, data centers, and custom HVAC and chillers. The impact evaluation for the custom initiative is described in Appendix S. The Energy Management and New Construction (CI EMNC) initiative includes the Building Tune-Up direct install component, incentives for efficient new construction, and may eventually include additional components such as building operator certification, retro and virtual commissioning, and incentives for building improvements. The impact evaluation for the CI EMNC initiative is describe in Appendix T. The Master Metered Multifamily Direct Install (CI Multifamily) initiative targets low-income customers in master-metered communities. Evaluation activities for the CI Multifamily initiative are described in Appendix U. Appendix V describes the evaluation of the Appliance Recycling initiative. Table 68 summarizes program verified impacts and realization rates for each EDC.

Table 68: ESB-Small Program Gross Impact Evaluation Summary for PY13

EDC	Sampling Initiative	Gross Verified MWh	Gross Verified MW	MWh Realization Rate	MW Realization Rate
Met-Ed	CI Prescriptive	3,961	0.68	118%	105%
Met-Ed	CI Custom	312	0.04	100%	100%
Met-Ed	CI EMNC	1,176	0.20	84%	82%
Met-Ed	CI Multifamily	60	0.01	49%	43%
Met-Ed	Appliance Recycling	54	0.01	103%	99%
Met-Ed Total		**5,562**	**0.94**	**106%**	**98%**
Penelec	CI Prescriptive	2,274	0.48	95%	86%
Penelec	CI Custom	9,580	3.10	100%	100%
Penelec	CI EMNC	1,057	0.09	86%	75%
Penelec	CI Multifamily	445	0.06	72%	70%
Penelec	Appliance Recycling	50	0.01	108%	104%
PenelecTotal		**13,407**	**3.73**	**97%**	**97%**
Penn Power	CI Prescriptive	675	0.10	105%	97%
Penn Power	CI Custom	4	0.00	100%	100%
Penn Power	CI EMNC	356	0.03	99%	63%
Penn Power	CI Multifamily	120	0.01	90%	95%
Penn Power	Appliance Recycling	8	0.00	95%	92%
Penn PowerTotal		1,162	0.15	101%	86%
WPP	CI Prescriptive	4,530	0.68	101%	87%
WPP	CI Custom	59	0.01	100%	100%
WPP	CI EMNC	1,150	0.21	95%	95%
WPP	CI Multifamily	1,157	0.16	78%	79%
WPP	Appliance Recycling	37	0.01	100%	95%
WPP Total		**6,933**	**1.07**	**95%**	**87%**

The gross realization rates for energy savings were driven primarily by variances between assumed lighting hours of use in advance of rebate approval and hours of use that were determined through impact evaluation activities.

3.4.2.1 Evaluation Adjustments in Response to the COVID-19 Pandemic

This program's gross impact evaluation typically involves on-site visits, with occasional metering of equipment and monitoring lighting hours of use. ADM resumed on-site visits at the end of Phase III after businesses reopened and after ADM field staff became fully vaccinated. The COVID-19 pandemic did not hinder the evaluation effort for PY13, and no adjustments were made to typical evaluation processes.

3.4.3 Net Impact Evaluation

The net impact evaluation of the Prescriptive initiative is described in Appendix R. The net impact evaluation of the Custom initiative is described in Appendix S. The net impact evaluation of the CI EMNC initiative is described in Appendix T. Net impact evaluation was not conducted for the CI Multifamily initiative since that is a dedicated low-income program. The NTG for the Appliance Recycling Initiative is estimated to be the same as the NTG of the residential Appliance Recycling Initiative, as described in Appendix V.

Note that only the Appliance Recycling initiative was evaluated for NTG in PY13. Historical NTG values from research in Phase III were applied to other initiatives as shown in Table 69, which summarizes program verified gross and net energy impacts and net-to-gross ratios for each EDC.

Table 69: ESB-Small Program Net Impact Evaluation Summary for PY13

EDC	Sampling Initiative	Gross Verified MWh	NTG	Net Verified MWh	Net Verified MW
Met-Ed	CI Prescriptive	3,961	63.3%	2,506	0.43
Met-Ed	CI Custom	312	54.1%	168	0.02
Met-Ed	CI EMNC	1,176	62.5%	735	0.13
Met-Ed	CI Multifamily	60	100.0%	60	0.01
Met-Ed	Appliance Recycling	54	39.0%	21	0.00
Met-Ed Total		**5,562**	**62.8%**	**3,491**	**0.59**
Penelec	CI Prescriptive	2,274	78.4%	1,783	0.37
Penelec	CI Custom	9,580	89.3%	8,552	2.76
Penelec	CI EMNC	1,057	75.4%	797	0.07
Penelec	CI Multifamily	445	100.0%	445	0.06
Penelec	Appliance Recycling	50	65.0%	33	0.01
Penelec Total		**13,407**	**86.6%**	**11,610**	**3.27**
Penn Power	CI Prescriptive	675	80.4%	543	0.08
Penn Power	CI Custom	4	61.5%	2	0.00
Penn Power	CI EMNC	356	79.7%	283	0.03
Penn Power	CI Multifamily	120	100.0%	120	0.01
Penn Power	Appliance Recycling	8	38.0%	3	0.00
Penn Power Total		**1,162**	**81.8%**	**951**	**0.12**
WPP	CI Prescriptive	4,530	65.9%	2,986	0.45
WPP	CI Custom	59	57.7%	34	0.00
WPP	CI EMNC	1,150	65.7%	755	0.14
WPP	CI Multifamily	1,157	100.0%	1,157	0.16
WPP	Appliance Recycling	37	70.0%	26	0.01
WPP Total		**6,933**	**71.5%**	**4,957**	**0.76**

3.4.3.1 High-Impact Measure Research

The Appliance Recycling Initiative was identified as a High-Impact Measure and researched for net-to-gross in PY13. The net impact evaluation of the Appliance Recycling Initiative is described in Appendix J for the residential sector. Evaluation results from the residential sector (which accounts for 99% of initiative impacts) are deemed onto the nonresidential sector as described in Appendix V.

3.4.4 Verified Savings Estimates

In Table 70 the realization rates and net-to-gross ratios determined by ADM and Tetra Tech are applied to the reported energy and demand savings estimates to calculate the verified savings estimates for the ESB-Small Program in PY13. These totals are added to the verified savings achieved in previous program years to calculate the P4TD program impacts.

Table 70: PYTD and P4TD Savings Summary

	Met-Ed		Penelec		Penn Power		WPP	
Savings Type	Energy (MWh/yr)	Demand (MW/yr)	Energy (MWh/yr)	Demand (MW/yr)	Energy (MWh/yr)	Demand (MW/yr)	Energy (MWh/yr)	Demand (MW/yr)
PYRTD	5,243	0.96	13,829	3.86	1,150	0.17	7,268	1.22
PYVTD Gross	5,562	0.94	13,407	3.73	1,162	0.15	6,933	1.07
PYVTD Net	3,491	0.59	11,610	3.27	951	0.12	4,957	0.76
RTD	5,243	0.96	13,829	3.86	1,150	0.17	7,268	1.22
VTD Gross	5,562	0.94	13,407	3.73	1,162	0.15	6,933	1.07
VTD Net	3,491	0.59	11,610	3.27	951	0.12	4,957	0.76

3.4.5 Process Evaluation

In PY13 Tetra Tech conducted both conducted semi-structured interviews with FirstEnergy program managers and with ICSPs. Process evaluation activities in PY13 focused on understanding the program design, any changes in design or implementation in Phase IV, and to identify researchable issues for the upcoming process evaluation effort. Tetra Tech also completed a process evaluation for the Appliance Recycling initiative, which is described in 3.2.5.1, since the majority of impacts for this initiative occur in the Energy Efficient Products program.

3.4.6 Cost-Effectiveness Reporting

A detailed breakdown of program finances and cost-effectiveness is presented in Table 71, Table 72, Table 73, and Table 74 for Met-Ed, Penelec, Penn Power, and WPP respectively. The last two columns of the tables show benefits as calculated with net verified impacts, along with net participant costs (if applicable). The third and fourth columns show results as calculated on a gross basis. PYTD costs and benefits are net present values (NPV) expressed in 2021 dollars. NPV costs and benefits for P4TD financials are expressed in the 2021 dollars.

Table 71: Summary of Program Finances – Met-Ed

Row #	Cost Category	Gross PYTD ($1,000)		Gross P4TD ($1,000)		Net PYTD ($1,000)		Net P4TD ($1,000)	
1	**IMCs**	2,170		2,170		1,380		1,380	
2	Rebates to Participants and Trade Allies	571		571		571		571	
3	Upstream / Midstream Incentives	4		4		4		4	
4	Material Cost for Self-Install Programs (EE&C Kits)	0		0		0		0	
5	Direct Installation Program Materials and Labor	8		8		8		8	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	1,586		1,586		796		796	
		EDC	CSP	EDC	CSP	EDC	CSP	EDC	CSP
7	Program Design	1	6	1	6	1	6	1	6
8	Administration and Management	250	585	250	585	250	585	250	585
9	Marketing	0	82	0	82	0	82	0	82
10	Program Delivery	21	19	21	19	21	19	21	19
11	EDC Evaluation Costs	141		141		141		141	
12	SWE Audit Costs	64		64		64		64	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	1,169		1,169		1,169		1,169	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	**3,339**		**3,339**		**2,549**		**2,549**	
15	Total NPV Lifetime Electric Energy Benefits	2,262		2,262		1,421		1,421	
16	Total NPV Lifetime Electric Capacity Benefits	1,646		1,646		1,035		1,035	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	316		316		199		199	
18	Total NPV Lifetime Fossil Fuel Impacts	-206		-206		-130		-130	
19	Total NPV Lifetime Water Impacts	20		20		20		20	
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	**4,039**		**4,039**		**2,544**		**2,544**	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	**1.21**		**1.21**		**1.00**		**1.00**	

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

Table 72: Summary of Program Finances – Penelec

Row #	Cost Category	Gross PYTD ($1,000)		Gross P3TD ($1,000)		Net PYTD ($1,000)		Net P3TD ($1,000)	
1	**IMCs**	3,380		3,380		2,812		2,812	
2	Rebates to Participants and Trade Allies	880		880		880		880	
3	Upstream / Midstream Incentives	4		4		4		4	
4	Material Cost for Self-Install Programs (EE&C Kits)	0		0		0		0	
5	Direct Installation Program Materials and Labor	396		396		396		396	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	2,101		2,101		1,532		1,532	
		EDC	CSP	EDC	CSP	EDC	CSP	EDC	CSP
7	Program Design	1	6	1	6	1	6	1	6
8	Administration and Management	282	1,131	282	1,131	282	1,131	282	1,131
9	Marketing	0	117	0	117	0	117	0	117
10	Program Delivery	22	33	22	33	22	33	22	33
11	EDC Evaluation Costs	156		156		156		156	
12	SWE Audit Costs	71		71		71		71	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	1,820		1,820		1,820		1,820	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	**5,201**		**5,201**		**4,632**		**4,632**	
15	Total NPV Lifetime Electric Energy Benefits	5,331		5,331		4,613		4,613	
16	Total NPV Lifetime Electric Capacity Benefits	5,731		5,731		5,022		5,022	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	376		376		294		294	
18	Total NPV Lifetime Fossil Fuel Impacts	-3,515		-3,515		-3,124		-3,124	
19	Total NPV Lifetime Water Impacts	3		3		3		3	
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	**7,926**		**7,926**		**6,807**		**6,807**	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	**1.52**		**1.52**		**1.47**		**1.47**	

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

Table 73: Summary of Program Finances – Penn Power

Row #	Cost Category	Gross PYTD ($1,000)		Gross P3TD ($1,000)		Net PYTD ($1,000)		Net P3TD ($1,000)	
1	**IMCs**	380		380		319		319	
2	Rebates to Participants and Trade Allies	173		173		173		173	
3	Upstream / Midstream Incentives	0		0		0		0	
4	Material Cost for Self-Install Programs (EE&C Kits)	0		0		0		0	
5	Direct Installation Program Materials and Labor	67		67		67		67	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	140		140		79		79	
		EDC	CSP	EDC	CSP	EDC	CSP	EDC	CSP
7	Program Design	0	2	0	2	0	2	0	2
8	Administration and Management	89	213	89	213	89	213	89	213
9	Marketing	0	24	0	24	0	24	0	24
10	Program Delivery	7	8	7	8	7	8	7	8
11	EDC Evaluation Costs	40		40		40		40	
12	SWE Audit Costs	19		19		19		19	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	404		404		404		404	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	**783**		**783**		**723**		**723**	
15	Total NPV Lifetime Electric Energy Benefits	492		492		403		403	
16	Total NPV Lifetime Electric Capacity Benefits	146		146		119		119	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	50		50		42		42	
18	Total NPV Lifetime Fossil Fuel Impacts	-34		-34		-28		-28	
19	Total NPV Lifetime Water Impacts	0		0		0		0	
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	**654**		**654**		**537**		**537**	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	**0.84**		**0.84**		**0.74**		**0.74**	

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

Table 74: Summary of Program Finances – WPP

Row #	Cost Category	Gross PYTD ($1,000)		Gross P3TD ($1,000)		Net PYTD ($1,000)		Net P3TD ($1,000)	
1	**IMCs**	2,773		2,773		2,028		2,028	
2	Rebates to Participants and Trade Allies	617		617		617		617	
3	Upstream / Midstream Incentives	6		6		6		6	
4	Material Cost for Self-Install Programs (EE&C Kits)	0		0		0		0	
5	Direct Installation Program Materials and Labor	1,091		1,091		1,091		1,091	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	1,059		1,059		315		315	
		EDC	CSP	EDC	CSP	EDC	CSP	EDC	CSP
7	Program Design	1	5	1	5	1	5	1	5
8	Administration and Management	256	871	256	871	256	871	256	871
9	Marketing	0	83	0	83	0	83	0	83
10	Program Delivery	18	35	18	35	18	35	18	35
11	EDC Evaluation Costs	140		140		140		140	
12	SWE Audit Costs	62		62		62		62	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	1,472		1,472		1,472		1,472	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	**4,245**		**4,245**		**3,500**		**3,500**	
15	Total NPV Lifetime Electric Energy Benefits	2,917		2,917		2,075		2,075	
16	Total NPV Lifetime Electric Capacity Benefits	955		955		674		674	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	214		214		161		161	
18	Total NPV Lifetime Fossil Fuel Impacts	-66		-66		-52		-52	
19	Total NPV Lifetime Water Impacts	54		54		54		54	
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	**4,075**		**4,075**		**2,913**		**2,913**	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	**0.96**		**0.96**		**0.83**		**0.83**	

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

3.4.7 Status of Recommendations

The most recent process evaluation for this program occurred in PY10. Findings and recommendations from that process evaluation effort are available in the PY10 annual report. The Key findings and recommendations for the Appliance Recycling component are listed in Section 3.2.7.

3.5 C&I Energy Solutions for Business Program - Large

The C&I Solutions for Business Program – Large (referred to as ESB-Large Program) is offered to large commercial and industrial customers and was implemented jointly by Franklin Energy Services and Willdan for PY13. The Franklin Energy Services portion of the program includes downstream and midstream incentives for customers that install energy efficient equipment. The Willdan portion of the program includes incentives for efficient new construction and the Building Tune-Up direct install program in PY13.

3.5.1 Participation and Reported Savings by Customer Segment

Table 75 and Table 76 present the participation counts, reported energy and demand savings, and incentive payments for the ESB-Large Program in PY13 by customer segment and EDC. This program serves the Large C&I and GNI customer segments. Each separate rebate application is counted as one participant.

Table 75: ESB-Large Program Participation and Reported Impacts for Met-Ed and Penelec

Parameter	Met-Ed Large C&I (Non-GNI)	Met-Ed GNI	Met-Ed Total	Penelec Large C&I (Non-GNI)	Penelec GNI	Penelec Total
PYTD # Participants	15	2	17	13	1	14
PYRTD MWh/yr	16,525	54	16,579	1,988	161	2,149
PYRTD MW/yr	2.15	0.01	2.17	0.34	0.00	0.34
PYTD Incentives ($1000)	618	3	620	172	8	180

Table 76: ESB-Large Program Participation and Reported Impacts for Penn Power and WPP

Parameter	Penn Power Large C&I (Non-GNI)	Penn Power GNI	Penn Power Total	WPP Large C&I (Non-GNI)	WPP GNI	WPP Total
PYTD # Participants	7	1	8	12	0	12
PYRTD MWh/yr	7,221	71	7,293	11,194	0	11,194
PYRTD MW/yr	0.78	0.01	0.80	1.21	0.00	1.21
PYTD Incentives ($1000)	456	4	460	658	0	658

3.5.2 Gross Impact Evaluation

The ESB-Large Program is disaggregated into three sampling initiatives for gross impact evaluation. Each of these initiatives spans both the ESB-Large and ESB-Small programs. The gross impact evaluation of the Prescriptive initiative is described in Appendix R. The gross impact evaluation of the Custom initiative is described in Appendix S. The gross impact evaluation of the CI EMNC initiative is described in Appendix T. Table 77 summarizes program verified impacts and realization rates for each EDC.

Table 77: ESB-Large Program Gross Impact Evaluation Summary for PY13

EDC	Sampling Initiative	Gross Verified MWh	Gross Verified MW	MWh Realization Rate	MW Realization Rate
Met-Ed	CI Prescriptive	3,834	0.68	118%	105%
Met-Ed	CI Custom	13,327	1.68	100%	100%
Met-Ed	CI EMNC	0	0.00	84%	82%
Met-Ed Total		**17,162**	**2.36**	**103.5%**	**101.5%**
Penelec	CI Prescriptive	1,913	0.30	95%	86%
Penelec	CI Custom	0	0.00	100%	100%
Penelec	CI EMNC	122	0.01	86%	75%
PenelecTotal		**2,035**	**0.31**	**94.7%**	**85.7%**
Penn Power	CI Prescriptive	1,017	0.15	105%	97%
Penn Power	CI Custom	6,324	0.68	100%	100%
Penn Power	CI EMNC	0	0.00	99%	63%
Penn PowerTotal		**7,340**	**0.84**	**100.7%**	**99.4%**
WPP	CI Prescriptive	4,072	0.51	101%	87%
WPP	CI Custom	7,158	0.72	100%	100%
WPP	CI EMNC	13	0.01	95%	95%
WPP Total		**11,243**	**1.23**	**100.4%**	**94.3%**

The gross realization rates for energy savings were driven primarily by variances between assumed operational characteristics in advance of rebate approval and operational characteristics that were determined through impact evaluation activities. Key operational characteristics include lighting hours of use and equivalent full load hours for chillers, air compressors, and motors.

3.5.2.1 Evaluation Adjustments in Response to the COVID-19 Pandemic

This program's gross impact evaluation typically involves on-site visits, with occasional metering of equipment and monitoring lighting hours of use. ADM resumed on-site visits at the end of Phase III after businesses reopened and after ADM field staff became fully vaccinated. The COVID-19 pandemic did not hinder the evaluation effort for PY13, and no adjustments were made to typical evaluation processes.

3.5.3 Net Impact Evaluation

The net impact evaluation of the Prescriptive initiative is described in Appendix R. The net impact evaluation of the Custom initiative is described in Appendix S. The net impact evaluation of the CI EMNC initiative is described in Appendix T. Note that none of these initiatives were evaluated for NTG in PY13. Historical NTG values from research in Phase III were applied to other initiatives as shown in Table 78, which summarizes program verified gross and net energy impacts and net-to-gross ratios for each EDC.

Table 78: ESB-Large Program Net Impact Evaluation Summary for PY13

EDC	Sampling Initiative	Gross Verified MWh	NTG	Net Verified MWh	Net Verified MW
Met-Ed	CI Prescriptive	3,834	63.3%	2,426	0.43
Met-Ed	CI Custom	13,327	54.1%	7,204	0.91
Met-Ed	CI EMNC	0	62.5%	0	0.00
Met-Ed Total		17,162	56.1%	9,630	**1.34**
Penelec	CI Prescriptive	1,913	78.4%	1,500	0.24
Penelec	CI Custom	0	89.3%	0	0.00
Penelec	CI EMNC	122	75.4%	92	0.01
Penelec Total		2,035	78.2%	1,593	**0.24**
Penn Power	CI Prescriptive	1,017	80.4%	817	0.12
Penn Power	CI Custom	6,324	61.5%	3,892	0.42
Penn Power	CI EMNC	0	79.7%	0	0.00
Penn Power Total		7,340	64.2%	4,709	**0.54**
WPP	CI Prescriptive	4,072	65.9%	2,684	0.34
WPP	CI Custom	7,158	57.7%	4,134	0.42
WPP	CI EMNC	13	65.7%	8	0.00
WPP Total		11,243	60.7%	6,826	**0.75**

3.5.3.1 High-Impact Measure Research

No initiatives within the ESB-Large program were scheduled for net impact evaluation reporting in PY13.

3.5.4 Verified Savings Estimates

In Table 79 the realization rates and net-to-gross ratios determined by ADM and Tetra Tech are applied to the reported energy and demand savings estimates to calculate the verified savings estimates for ESB-Large Program in PY13. These totals are added to the verified savings achieved in previous program years to calculate the P4TD program impacts.

Table 79: PYTD and P4TD Savings Summary

	Met-Ed		Penelec		Penn Power		WPP	
Savings Type	Energy (MWh/yr)	Demand (MW/yr)	Energy (MWh/yr)	Demand (MW/yr)	Energy (MWh/yr)	Demand (MW/yr)	Energy (MWh/yr)	Demand (MW/yr)
PYRTD	16,579	2.32	2,149	0.36	7,293	0.84	11,194	1.31
PYVTD Gross	17,162	2.36	2,035	0.31	7,340	0.84	11,243	1.23
PYVTD Net	9,630	1.34	1,593	0.24	4,709	0.54	6,826	0.75
RTD	16,579	2.32	2,149	0.36	7,293	0.84	11,194	1.31
VTD Gross	17,162	2.36	2,035	0.31	7,340	0.84	11,243	1.23
VTD Net	9,630	1.34	1,593	0.24	4,709	0.54	6,826	0.75

3.5.5 Process Evaluation

The process evaluation effort for both C&I Programs is described in Sections 3.4.5 and 3.4.7. Most practical aspects of the programs are managed as one general effort rather than distinct

programs, but applications are placed in one of the two programs according to their associated rate classes.

3.5.6 Cost-Effectiveness Reporting

A detailed breakdown of program finances and cost-effectiveness is presented in Table 80, Table 81, Table 82, and Table 83 for Met-Ed, Penelec, Penn Power, and WPP respectively. The last two columns of the tables show benefits as calculated with net verified impacts, along with net participant costs (if applicable). The third and fourth columns show results as calculated on a gross basis. PYTD costs and benefits are net present values (NPV) expressed in 2021 dollars. NPV costs and benefits for P4TD financials are expressed in the 2021 dollars.

Table 80: Summary of Program Finances – Met-Ed

Row #	Cost Category	Gross PYTD ($1,000)		Gross P4TD ($1,000)		Net PYTD ($1,000)		Net P4TD ($1,000)	
1	**IMCs**	5,207		5,207		2,947		2,947	
2	Rebates to Participants and Trade Allies	619		619		619		619	
3	Upstream / Midstream Incentives	2		2		2		2	
4	Material Cost for Self-Install Programs (EE&C Kits)	0		0		0		0	
5	Direct Installation Program Materials and Labor	0		0		0		0	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	4,587		4,587		2,327		2,327	
		EDC	CSP	EDC	CSP	EDC	CSP	EDC	CSP
7	Program Design	1	7	1	7	1	7	1	7
8	Administration and Management	304	477	304	477	304	477	304	477
9	Marketing	0	48	0	48	0	48	0	48
10	Program Delivery	20	4	20	4	20	4	20	4
11	EDC Evaluation Costs	214		214		214		214	
12	SWE Audit Costs	83		83		83		83	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	1,159		1,159		1,159		1,159	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	**6,366**		**6,366**		**4,106**		**4,106**	
15	Total NPV Lifetime Electric Energy Benefits	6,879		6,879		3,862		3,862	
16	Total NPV Lifetime Electric Capacity Benefits	4,199		4,199		2,384		2,384	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	128		128		81		81	
18	Total NPV Lifetime Fossil Fuel Impacts	-279		-279		-177		-177	
19	Total NPV Lifetime Water Impacts	0		0		0		0	
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	**10,926**		**10,926**		**6,150**		**6,150**	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	**1.72**		**1.72**		**1.50**		**1.50**	

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

Table 81: Summary of Program Finances – Penelec

Row #	Cost Category	Gross PYTD ($1,000)		Gross P3TD ($1,000)		Net PYTD ($1,000)		Net P3TD ($1,000)	
1	**IMCs**	470		470		369		369	
2	Rebates to Participants and Trade Allies	178		178		178		178	
3	Upstream / Midstream Incentives	2		2		2		2	
4	Material Cost for Self-Install Programs (EE&C Kits)	0		0		0		0	
5	Direct Installation Program Materials and Labor	0		0		0		0	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	290		290		189		189	
		EDC	CSP	EDC	CSP	EDC	CSP	EDC	CSP
7	Program Design	1	5	1	5	1	5	1	5
8	Administration and Management	228	273	228	273	228	273	228	273
9	Marketing	0	37	0	37	0	37	0	37
10	Program Delivery	14	4	14	4	14	4	14	4
11	EDC Evaluation Costs	159		159		159		159	
12	SWE Audit Costs	60		60		60		60	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	781		781		781		781	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	**1,251**		**1,251**		**1,149**		**1,149**	
15	Total NPV Lifetime Electric Energy Benefits	834		834		653		653	
16	Total NPV Lifetime Electric Capacity Benefits	494		494		387		387	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	42		42		33		33	
18	Total NPV Lifetime Fossil Fuel Impacts	-46		-46		-36		-36	
19	Total NPV Lifetime Water Impacts	0		0		0		0	
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	**1,324**		**1,324**		**1,037**		**1,037**	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	**1.06**		**1.06**		**0.90**		**0.90**	

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

Table 82: Summary of Program Finances – Penn Power

Row #	Cost Category	Gross PYTD ($1,000)		Gross P3TD ($1,000)		Net PYTD ($1,000)		Net P3TD ($1,000)	
1	**IMCs**	7,258		7,258		4,507		4,507	
2	Rebates to Participants and Trade Allies	460		460		460		460	
3	Upstream / Midstream Incentives	0		0		0		0	
4	Material Cost for Self-Install Programs (EE&C Kits)	0		0		0		0	
5	Direct Installation Program Materials and Labor	0		0		0		0	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	6,798		6,798		4,047		4,047	
		EDC	CSP	EDC	CSP	EDC	CSP	EDC	CSP
7	Program Design	0	1	0	1	0	1	0	1
8	Administration and Management	72	183	72	183	72	183	72	183
9	Marketing	0	17	0	17	0	17	0	17
10	Program Delivery	5	2	5	2	5	2	5	2
11	EDC Evaluation Costs	39		39		39		39	
12	SWE Audit Costs	16		16		16		16	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	336		336		336		336	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	**7,594**		**7,594**		**4,843**		**4,843**	
15	Total NPV Lifetime Electric Energy Benefits	3,158		3,158		2,026		2,026	
16	Total NPV Lifetime Electric Capacity Benefits	855		855		556		556	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	4,279		4,279		2,638		2,638	
18	Total NPV Lifetime Fossil Fuel Impacts	-27		-27		-22		-22	
19	Total NPV Lifetime Water Impacts	0		0		0		0	
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	**8,265**		**8,265**		**5,198**		**5,198**	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	**1.09**		**1.09**		**1.07**		**1.07**	

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

Table 83: Summary of Program Finances – WPP

Row #	Cost Category	Gross PYTD ($1,000)		Gross P3TD ($1,000)		Net PYTD ($1,000)		Net P3TD ($1,000)	
1	**IMCs**	2,919		2,919		1,764		1,764	
2	Rebates to Participants and Trade Allies	656		656		656		656	
3	Upstream / Midstream Incentives	2		2		2		2	
4	Material Cost for Self-Install Programs (EE&C Kits)	0		0		0		0	
5	Direct Installation Program Materials and Labor	0		0		0		0	
6	Participant Costs (Row 1 minus the sum of Rows 2 through 5)	2,261		2,261		1,106		1,106	
		EDC	CSP	EDC	CSP	EDC	CSP	EDC	CSP
7	Program Design	1	5	1	5	1	5	1	5
8	Administration and Management	223	369	223	369	223	369	223	369
9	Marketing	0	31	0	31	0	31	0	31
10	Program Delivery	12	3	12	3	12	3	12	3
11	EDC Evaluation Costs	154		154		154		154	
12	SWE Audit Costs	57		57		57		57	
13	**Program Overhead Costs (Sum of rows 7 through 12)**	856		856		856		856	
14	**Total NPV TRC Costs (Sum of rows 1 and 13)**	**3,774**		**3,774**		**2,620**		**2,620**	
15	Total NPV Lifetime Electric Energy Benefits	4,879		4,879		2,960		2,960	
16	Total NPV Lifetime Electric Capacity Benefits	1,139		1,139		696		696	
17	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	125		125		82		82	
18	Total NPV Lifetime Fossil Fuel Impacts	-186		-186		-122		-122	
19	Total NPV Lifetime Water Impacts	0		0		0		0	
20	**Total NPV TRC Benefits (Sum of rows 15 through 19)**	**5,957**		**5,957**		**3,616**		**3,616**	
21	**TRC Benefit-Cost Ratio (Row 20 divided by Row 14)**	**1.58**		**1.58**		**1.38**		**1.38**	

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

3.5.7 Status of Recommendations

Recommendations for the nonresidential programs are listed in Section 3.4.7.

4 Portfolio Finances and Cost Recovery

This section provides an overview of the expenditures associated with the Companies' portfolios and the recovery of those costs from ratepayers

4.1 Program Finances

Program-specific and portfolio total finances for PY13 are shown in Table 84, Table 85, Table 86, and Table 87 for Met-Ed, Penelec, Penn Power, and WPP. The columns in these tables Table 84 through Table 91 are adapted from the 'Direct Program Cost' categories in the Commission's EE&V Plan template[8] for Phase IV. Non-incentives include EDC Materials, Labor, and Administration costs (including costs associated with an EDC's own employees) as well as ICSP Materials, Labor, and Administration costs (including both the program implementation contractor and the costs of any other outside vendors and EDCs employs to support program delivery). The dollar figures shown in Table 84 through Table 91 are based on EDC tracking of expenditures with no adjustments to account for inflation.[9]

Table 84: Met-Ed PY13 Program and Portfolio total Finances ($1,000)

Program	Incentives	Non-Incentives	Total Cost
Energy Efficient Homes	2,223	995	3,218
Energy Efficient Products	1,248	1,328	2,576
Low Income Energy Efficiency	989	640	1,629
C&I Energy Solutions for Business - Small	584	1,104	1,688
C&I Energy Solutions for Business - Large	620	1,075	1,696
Common Portfolio Costs[1]		0	0
Portfolio Total	**5,664**	**5,144**	**10,808**
SWE Costs[2]	**N/A**	**N/A**	**253**
Total	**5,664**	**5,144**	**11,061**

1. Common portolio costs are zero because all costs are distributed among programs as in the Company's EE&C plan.
2. Statewide Evaluation costs are outside of the 2% spending cap.

[8] https://www.puc.pa.gov/pcdocs/1676672.docx

[9] 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.

Table 85: Penelec PY13 Program and Portfolio total Finances ($1,000)

Program	Incentives	Non-Incentives	Total Cost
Energy Efficient Homes	1,368	620	1,988
Energy Efficient Products	772	1,015	1,787
Low Income Energy Efficiency	1,504	750	2,254
C&I Energy Solutions for Business - Small	1,280	1,749	3,029
C&I Energy Solutions for Business - Large	180	720	900
Common Portfolio Costs[1]		0	0
Portfolio Total	**5,104**	**4,855**	**9,959**
SWE Costs[2]	**N/A**	**N/A**	**230**
Total	**5,104**	**4,855**	**10,188**

1. Common portolio costs are zero because all costs are distributed among programs as in the Company's EE&C plan.
2. Statewide Evaluation costs are outside of the 2% spending cap.

Table 86: Penn Power PY13 Program and Portfolio total Finances ($1,000)

Program	Incentives	Non-Incentives	Total Cost
Energy Efficient Homes	612	386	997
Energy Efficient Products	343	359	702
Low Income Energy Efficiency	411	280	691
C&I Energy Solutions for Business - Small	240	384	624
C&I Energy Solutions for Business - Large	460	320	779
Common Portfolio Costs[1]		0	0
Portfolio Total	**2,066**	**1,729**	**3,795**
SWE Costs[2]	**N/A**	**N/A**	**71**
Total	**2,066**	**1,729**	**3,866**

1. Common portolio costs are zero because all costs are distributed among programs as in the Company's EE&C plan.
2. Statewide Evaluation costs are outside of the 2% spending cap.

Table 87: WPP PY13 Program and Portfolio total Finances ($1,000)

Program	Incentives	Non-Incentives	Total Cost
Energy Efficient Homes	2,149	1,078	3,227
Energy Efficient Products	971	1,279	2,250
Low Income Energy Efficiency	1,044	641	1,685
C&I Energy Solutions for Business - Small	1,713	1,410	3,123
C&I Energy Solutions for Business - Large	658	799	1,457
Common Portfolio Costs[1]		0	0
Portfolio Total	**6,536**	**5,206**	**11,742**
SWE Costs[2]	**N/A**	**N/A**	**238**
Total	**6,536**	**5,206**	**11,979**

1. Common portolio costs are zero because all costs are distributed among programs as in the Company's EE&C plan.
2. Statewide Evaluation costs are outside of the 2% spending cap.

Program-specific and portfolio total finances since the inception of Phase IV are shown in Table 88, Table 89, Table 90, and Table 91 for Met-Ed, Penn Power, Penelec, and WPP.

Table 88: Met-Ed P4TD Program and Portfolio total Finances ($1,000)

Program	Incentives	Non-Incentives	Total Cost
Energy Efficient Homes	2,223	995	3,218
Energy Efficient Products	1,248	1,328	2,576
Low Income Energy Efficiency	989	640	1,629
C&I Energy Solutions for Business - Small	584	1,104	1,688
C&I Energy Solutions for Business - Large	620	1,075	1,696
Common Portfolio Costs[1]		0	0
Portfolio Total	**5,664**	**5,144**	**10,808**
SWE Costs[2]	**N/A**	**N/A**	**253**
Total	**5,664**	**5,144**	**11,061**

1. Common portolio costs are zero because all costs are distributed among programs as in the Company's EE&C plan.
2. Statewide Evaluation costs are outside of the 2% spending cap.

Table 89: Penelec P4TD Program and Portfolio total Finances ($1,000)

Program	Incentives	Non-Incentives	Total Cost
Energy Efficient Homes	1,368	620	1,988
Energy Efficient Products	772	1,015	1,787
Low Income Energy Efficiency	1,504	750	2,254
C&I Energy Solutions for Business - Small	1,280	1,749	3,029
C&I Energy Solutions for Business - Large	180	720	900
Common Portfolio Costs[1]		0	0
Portfolio Total	**5,104**	**4,855**	**9,959**
SWE Costs[2]	**N/A**	**N/A**	**230**
Total	**5,104**	**4,855**	**10,188**

1. Common portolio costs are zero because all costs are distributed among programs as in the Company's EE&C plan.
2. Statewide Evaluation costs are outside of the 2% spending cap.

Table 90: Penn Power P4TD Program and Portfolio total Finances ($1,000)

Program	Incentives	Non-Incentives	Total Cost
Energy Efficient Homes	612	386	997
Energy Efficient Products	343	359	702
Low Income Energy Efficiency	411	280	691
C&I Energy Solutions for Business - Small	240	384	624
C&I Energy Solutions for Business - Large	460	320	779
Common Portfolio Costs[1]		0	0
Portfolio Total	**2,066**	**1,729**	**3,795**
SWE Costs[2]	**N/A**	**N/A**	**71**
Total	**2,066**	**1,729**	**3,866**

1. Common portolio costs are zero because all costs are distributed among programs as in the Company's EE&C plan.
2. Statewide Evaluation costs are outside of the 2% spending cap.

Table 91: WPP P4TD Program and Portfolio total Finances ($1,000)

Program	Incentives	Non-Incentives	Total Cost
Energy Efficient Homes	2,149	1,078	3,227
Energy Efficient Products	971	1,279	2,250
Low Income Energy Efficiency	1,044	641	1,685
C&I Energy Solutions for Business - Small	1,713	1,410	3,123
C&I Energy Solutions for Business - Large	658	799	1,457
Common Portfolio Costs[1]		0	0
Portfolio Total	**6,536**	**5,206**	**11,742**
SWE Costs[2]	**N/A**	**N/A**	**238**
Total	**6,536**	**5,206**	**11,979**

1. Common portolio costs are zero because all costs are distributed among programs as in the Company's EE&C plan.
2. Statewide Evaluation costs are outside of the 2% spending cap.

4.2 Cost Recovery

Act 129 allows Pennsylvania EDCs to recover EE&C plan costs through a cost-recovery mechanism. Each EDC's cost-recovery charges are organized separately by five customer sectors to ensure that the electric rate classes that finance the programs are the rate classes that receive the direct energy and 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 the tables below and Section 2.3. For example, the low-income customer segments are subsets of the residential tariff(s) and therefore not listed separately in Table 92, Table 93, Table 94, and Table 95.

Table 92: Met-Ed EE&C Expenditures by Cost-Recovery Category[10] ($1,000)

Cost Recovery Sector	Rate Classes Included	PYTD $ Spending ($1,000)	P3TD $ Spending ($1,000)
Residential (incl Low Income)	Rate RS	$7,530	$7,530
Small C&I	Rate GS-Small, Rate GS-Medium, and Outdoor Lighting Service	$1,751	$1,751
Large C&I	Rate GS-Large, Rate GP and Rate TP	$1,779	$1,779
Street Lighting	Street Lighting Service, LED Street Lighting Service and Ornamental Street Lighting Service	$2	$2
Portfolio Total		**$11,061**	**$11,061**

Table 93: Penelec EE&C Expenditures by Cost-Recovery Category[11] ($1,000)

Cost Recovery Sector	Rate Classes Included	PYTD $ Spending ($1,000)	P3TD $ Spending ($1,000)
Residential (incl Low Income)	Rate RS	$6,128	$6,128
Small C&I	Rate GS-Small, Rate GS-Medium, and Outdoor Lighting Service	$3,098	$3,098
Large C&I	Rate GS-Large, Rate GP, and Rate LP	$961	$961
Street Lighting	Street Lighting Service, LED Street Lighting Service, and Ornamental Street Lighting Service	$2	$2
Portfolio Total		**$10,188**	**$10,188**

Table 94: Penn Power EE&C Expenditures by Cost-Recovery Category[12] ($1,000)

Cost Recovery Sector	Rate Classes Included	PYTD $ Spending ($1,000)	P3TD $ Spending ($1,000)
Residential (incl Low Income)	Rate RS	$2,426	$2,426
Small C&I	Rate GS, GS Special Rider GSDS, Rate GM, Rate GS-Large and POL	$643	$643
Large C&I	Rate GP, and Rate GT	$796	$796
Street Lighting	Rate Schedules SV, SVD, SM and LED	$1	$1
Portfolio Total		**$3,866**	**$3,866**

[10] Includes SWE costs
[11] Includes SWE costs
[12] Includes SWE costs

Table 95: WPP EE&C Expenditures by Cost-Recovery Category[13] ($1,000)

Cost Recovery Sector	Rate Classes Included	PYTD $ Spending ($1,000)	P3TD $ Spending ($1,000)
Residential (incl Low Income)	Rate 10	$7,280	$7,280
Small C&I	Rate GS 20, Rate GS 30	$3,183	$3,183
Large C&I	Rate GS 35, 40, 44, 46, and Tariff No. 38	$1,514	$1,514
Street Lighting	Rate Schedules 51 through 58, 71, 72	$2	$2
Portfolio Total		**$11,979**	**$11,979**

[13] Includes SWE costs

Appendix A Site Inspection Summary

Table 96: PY13 Site Visit Summary

EDC	Program	Inspection Firm	Number of Inspections Conducted	Number of Virtual Inspections Conducted	Number of Sites with Discrepancies from Reported Values	Summary of Common Discrepancies
Met-Ed	Energy Efficient Products Program - HVAC Rebates (CAC, ASHP, Mini-Splits)	Honeywell	527	0	6	Address and phone numbers differ than what was entered on the application
Penelec		Honeywell	730	0	0	
Penn Power		Honeywell	155	0	0	
WPP		Honeywell	662	0	5	
Met-Ed	Energy Efficient Homes Program - New Construction	PSD	8	0	Please refer to the gross realization rates in past reports as a measure of consistency between reported and verified values.	The most common discrepancies are incorrect equipment capacities, using REM/Rate defaults for furnace fan energy usage rating rather than looking them up by model #, estimating the % of lamps that are efficient, window sizes, and building orientation.
Met-Ed		ADM	0	0		
Penelec		PSD	2	0		
Penelec		ADM	0	0		
Penn Power		PSD	38	0		
Penn Power		ADM	0	0		
WPP		PSD	22	0		
WPP		ADM	0	0		
Met-Ed	Low Income Direct Install Programs	PSD, Honeywell	76	0	0	No discrepancies found for PY13
Penelec			76	0	0	
Penn Power			54	0	0	
WPP			83	0	0	
Met-Ed	C/I Programs	ADM	32	0	Please refer to gross realizaion rates as a measure of consistency.	The main discrepancy is lamp fixture counts/types. Other measures are verified essentially 100% of the time.
Penelec	C/I Programs	ADM	29	0		
Penn Power	C/I Programs	ADM	20	0		
WPP	C/I Programs	ADM	30	0		
TOTAL	**TOTAL**		**2544**	**0**	**n/a**	

Appendix B HER Impact Evaluation Detail

B.1 Gross Impact Evaluation

The Behavioral Modification subprogram provides home energy reports to residential customers in the FirstEnergy PA service territory. These reports detail customers' historical energy usage, providing tips on ways customers can save energy, and promoting other programs in FirstEnergy's residential energy efficiency portfolio. The subprogram is divided between standard residential customers and Low-Income customers, with Low-Income customers receiving reports more frequently than participants in the standard residential subprogram and exclusively receiving low-cost or no-cost tips in their reports. The subprogram is administered as a randomized control trial (RCT) and participants are enrolled in experimental cohorts, with the frequency and start date of each cohort differing for the four EDCs. A monthly billing analysis regression is the primary activity used to calculate savings. Each participant cohort is modeled separately to generate verified gross usage savings. The following section describes ADM's gross impact evaluation methodology.

B.1.1 Data Preparation and Analysis Procedure

B.1.1.1 Data Gathering

Monthly billing data dating back to 12 months prior to each experimental cohort's treatment start date through May 2020 was requested from FirstEnergy for all participants. Monthly billing data was provided with indicators identifying whether the monthly bill was estimated or based on an actual meter read. Control vs. treatment indicators were also provided in the billing data set. Demographic information such as participant account number, etc. were masked in the billing data set. ADM utilized a map of customer IDs to utility account numbers for use in dual participation analysis.

B.1.1.2 Data Preparation

During Phase III, FirstEnergy converted most residential accounts to AMI. Thus, ADM leveraged the daily AMI extract provided by FirstEnergy to conduct the billing data analysis for Home Energy Reports in Phase IV.

ADM's preparation of AMI data is as follows:

- Residential AMI data is filtered by cohort by the treatment and comparison group account numbers.
- Estimated AMI data may be present in the AMI data as a means of backfilling missing reads. Rather than interpolating estimated AMI data, estimated AMI data and any calendar day containing estimated AMI data is removed from the data set on a per-customer basis.
- Calendar days with missing/incomplete data are excluded from analysis on a per customer basis.
- The total daily kWh per customer is taken for each customer for each day by summing across the kWh for each calendar day.

- An outlier filter of +/- 300 kWh per day was applied to the data set.

An average daily kWh per month for each customer is taken by averaging the total daily kWh for each customer for each calendar month. This is done to interpolate across any missing days in the calendar month.

B.1.1.3 Billing Analysis

ADM utilized a lagged seasonal (LS) multivariate regression model to estimate program savings for all experimental cohorts. The LS model is specified in the equation below:

$$kWh_{imy} = \beta_0 + \sum_{m=1}^{12}\sum_{y=2011}^{2021} \mathrm{I}_{my} * \beta_{mys} * (AvgPre_i + AvePreSummer_i + AvePreWinter_i) + \sum_{m=1}^{12}\sum_{y=2011}^{2021} \mathrm{I}_{my} * \tau_{my} * \mathrm{treatment}_{imy} + \varepsilon_{imy}$$

Equation 1: Formula specifying the lagged seasonal regression model

The variables above are defined in Table 97 below. The regression coefficient of the interaction between the month post-treatment and the treatment dummy variable represents the average treatment effect per home for that given month. A negative regression coefficient represents a savings in the overall billed usage for the treatment group. Taking the negative of that coefficient will represents the daily kWh savings attributable to the treatment effect for that month per home.

Table 97: Definition of variables in the lagged seasonal regression model

Variable	Definition
kWh_{imy}	Customer i's average daily energy usage in bill month m in year y.
β_0	Intercept of the regression equation.
I_{my}	Equal to one for each monthly bill month m, year y, and zero otherwise.
β_{mys}	The coefficient on the bill month m, year y indicator variable interacted with season s.
$AvgPre_i$	Average daily usage for customer i in the pre-treatment period.
$AvePreSummer_i$	Average daily usage for customer i in the pre-treatment period during June through September.
$AvePreWinter_i$	Average daily usage for customer i in the pre-treatment period during December through March.
$treatment_{imy}$	The treatment indicator variable. Equal to one when the treatment is in effect for the treatment group. Zero otherwise. Always zero for the control group.

τ_{my}	The estimated treatment effect in kWh per day per customer; the main parameter of interest.
$\varepsilon_{\mathrm{imy}}$	The error terms.

B.1.1.4 Dual Participation Analysis

Participants in both the treatment and control groups participate in other FirstEnergy energy efficiency programs. Furthermore, the "Home Energy Report" measure received by participants in the treatment group may cause treatment group participants to seek out other programs and measures offered in the FirstEnergy efficiency portfolio to a greater extent than the control group. To the extent that the treatment group participates in other FirstEnergy programs at a rate above and beyond that of the control group, those incremental savings will be reflected in the gross energy savings calculated using the method above. However, savings for these items will also have been attributed to their respective programs and subprograms. ADM corrected for dual participation that occurred after treatment began to the extent that the treatment group participated at a higher rate than the control group.

Adjustment for Downstream Measures

For downstream measures, ADM conducted a review of the tracking and reporting system for each experimental cohort to identify EE program participation that occurred from the treatment start date onwards. The following steps detail the process of correcting for these measures:

1. The measures for the treatment group and control group were assigned to an appropriate month based on the reported date of installation for measures installed after the treatment start date.
2. For each month of the program year, the annual savings for all measures installed prior to the month of interest dating back to the treatment start date that had not yet reached the end of their effective useful life were summed for all active participants for each group. For measures installed prior to the current Program Year, ADM used verified savings for dual participation analysis. For measures installed during the Program Year, ADM utilized reported savings as verification activities occurred concurrently to the evaluation of the Behavioral Modification subprogram.
3. The totaled savings for each group was then divided by 365.25 and then divided by the number of active customers in each group to create a daily average dual participation savings value per home.
4. For each month, the daily average dual participation savings value per home for the control group was then subtracted from the daily average dual participation savings value per home from the treatment group. This resulted in an adjustment factor which was then subtracted from the daily savings value extrapolated from the billing analysis prior to using these values to calculate gross verified energy savings.

B.1.1.5 Gross Energy Savings Calculation

Gross energy savings can be calculated by taking the treatment effect in a given month (the negative of the regression coefficient of the treatment effect for a given month minus the downstream dual participation adjustment factor for that month), multiplying it by the number of days in the month, the number of active treatment group participants in that month, and the upstream adjustment multiplier. Equation 2 demonstrates the algorithm for calculating verified savings for the model for each month in the program year.

$$kWh\ savings_{my} = \tau_{my} \times days_{my} \times number\ of\ participants_{my} \times upstream\ adjustment\ multiplier$$

Equation 2: kWh savings calculation

The variables in the above equation are defined in Table 98 below.

Table 98: Definition of variables for kWh savings calculation

Variable	Definition
τ_{my}	The average daily treatment effect for month *my*—the inverse of the regression coefficient from the regression model minus the downstream dual participation correction factor.
my	The month of interest.
$upstream\ adjustment\ multiplier$	The upstream adjustment multiplier for the experimental cohort.

Savings were calculated for each wave separately and then summed together to determine the total savings for each initiative (standard residential v. Low-Income) per EDC. Monthly savings were added together to generate annual savings.

Table 99: Dual participation correction results by EDC and participation wave

Wave	Treat	Control	Delta	Wave	Treat	Control	Delta
ME-1	83	83	1	PN-1	30	41	10
ME-1-LI	25	37	12	PN-1-LI	53	49	-5
PP-1	33	50	16	WP-1	81	111	29
PP-1-LI	35	34	-2	WP-1-LI	33	41	8

B.1.1.6 Gross Demand Savings Calculation

ADM developed a model for predicting gross demand savings using the monthly gross energy savings calculated above and 8,760 load profiles for three residential end uses (heat pumps, interior lighting, and flat).

Step 1: Normalize kWh Usage

ADM normalized the kWh savings value predicted by the impact evaluation regression model into a percent savings value by dividing each month's savings by the total annual savings as follows:

$$\%\ savings_{my} = {kWh\ savings_{my}}/{kWh\ savings_{y}}$$

Equation 3: Monthly savings normalization calculation

Step 2: Calculate Monthly Load Factors for Component Variables

The model assumes a linear relationship between the end uses of interest and the percent savings calculated above. Because load shape information is available for multiple residential end uses at an 8,760 resolution, ADM can estimate the relationship between end use load shapes and percent savings in order to estimate total demand savings. In order to make sure that the model is interpretable, hourly load factors must be aggregated to a monthly resolution, providing a monthly load shape with 12 data points. To calculate monthly load shapes, ADM will take the sum of all hourly loads in a given month for each end use of interest.

Step 3: Multivariate Regression

In order to determine the relationship between the percent savings and the residential end uses, ADM used a multivariate regression approach. Because the model was used to assign weights to each end use, ADM held the intercept constant at 0 to ensure that the model produced percent weights for each end use. The following equation provides the model specification:

$$\%\ savings_{my} = \beta_1 end\ use_{heat\ pump} + \beta_2 end\ use_{interior\ lighting} + \beta_3 end\ use_{flat}$$

Equation 4: End use weight regression model

The regression coefficients for the above regression equation represent the relationship of each of the component variables to percent savings. Because both independent and dependent variables are calculated in units of months, the numerator of the regression weights are time invariant and can be used to estimate the percent contribution across any unit of time.

Step 4: Demand Savings Calculation

After obtaining the percent weight of each of the three end uses, the 8,760 end use load profiles are then scaled by applying the percent weight to the normalized end use load profile. The total normalized whole house load can then be assumed to be the sum of the weighted load of the three end uses at a given hour. Averaging this value for all hours of the peak demand window will provide an average peak demand whole building load. Multiplying this value by the total annual kWh savings will then predict the kW savings for the program year.

As with gross energy savings, ADM anticipates that some participants in the treatment group will also participate in other FirstEnergy programs. Because the peak demand savings is predicted from the dual participation adjusted monthly savings, an additional adjustment does not be made.

Note that the PY13 programs launched late due to delays in the contracting process. While ADM stated in its PY13 evaluation plan that an hourly load shape would be applied to the annual measured savings, the Companies report zero demand impacts because the programs launched after summer 2021.

B.1.2 Program Participation Levels

Table 100 provides a table of the participation levels. The nomenclature in the table includes a prefix to denote the EDC, a suffix of "-LI" for low-income groups, and a number that identifies waves of participants sequentially. The first wave started in October 2021.

Table 100: PY13 Participation Bill Counts by Month and Cohort

Wave	Jun-21	Jul-21	Aug-21	Sep-21	Oct-21	Nov-21	Dec-21	Jan-22	Feb-22	Mar-22	Apr-22	May-22
ME-1	0	0	0	0	33,560	33,371	33,071	32,841	32,560	32,310	32,032	31,726
ME-1-LI	0	0	0	0	12,414	12,205	11,957	11,774	11,598	11,458	11,286	11,048
PN-1	0	0	0	0	18,560	18,483	18,451	18,327	18,171	18,086	17,916	17,753
PN-1-LI	0	0	0	0	11,601	11,420	11,268	11,117	10,949	10,834	10,661	10,438
PP-1	0	0	0	0	18,116	18,004	17,847	17,768	17,636	17,574	17,423	17,303
PP-1-LI	0	0	0	0	6,410	6,340	6,236	6,178	6,103	6,054	5,966	5,856
WP-1	0	0	0	0	43,505	43,399	43,247	42,970	42,736	42,500	42,164	41,840
WP-1-LI	0	0	0	0	9,664	9,571	9,401	9,284	9,178	9,087	8,934	8,749

B.1.3 Results

The reported and verified energy savings are shown in Table 101 below. The values below include dual participation adjustments. The last column of the table shows model absolute precisions for each cohort, and also combined for each distinct initiative. Table 102 shows the reported and verified demand reduction for each EDC and initiative.

Table 101: Verified Energy Savings and Absolute Precisions by EDC and Wave

Operating Company	Experimental Cohort	PYRTD (MWh)	PYVTD (MWh)	Relative Savings (%)	Absolute Precision at 95% CL
Met-Ed	ME-1	1,308	1,436	0.69%	0.27%
Met-Ed	**Total for EEH Program**	**1,308**	**1,436**	**0.69%**	**0.27%**
Met-Ed	ME-1-LI	322	197	0.21%	0.36%
Met-Ed	**Total for LI Program**	**322**	**197**	**0.21%**	**0.36%**
Penelec	PN-1	-103	189	0.19%	0.33%
Penelec	**Total for EEH Program**	**-103**	**189**	**0.19%**	**0.33%**
Penelec	PN-1-LI	457	645	0.86%	0.42%
Penelec	**Total for LI Program**	**457**	**645**	**0.86%**	**0.42%**
Penn Power	PP-1	643	602	0.52%	0.28%
Penn Power	**Total for EEH Program**	**643**	**602**	**0.52%**	**0.28%**
Penn Power	PP-1-LI	251	275	0.58%	0.51%
Penn Power	**Total for LI Program**	**251**	**275**	**0.58%**	**0.51%**
WPP	WP-1	1,750	1,975	0.73%	0.25%
WPP	**Total for EEH Program**	**1,750**	**1,975**	**0.73%**	**0.25%**
WPP	WP-1-LI	1,036	1,498	1.89%	0.39%
WPP	**Total for LI Program**	**1,036**	**1,498**	**1.89%**	**0.39%**

Table 102: Reported and verified demand reductions for the HER Initiative

Operating Company	Experimental Cohort	PYRTD MW/yr	PYVTD MW/yr	Demand Realization Rate
Met-Ed	ME-1	0.24	0.00	0.00%
Met-Ed	**Total for EEH Program**	**0.24**	**0.00**	**0.00%**
Met-Ed	ME-1-LI	0.05	0.00	0.00%
Met-Ed	**Total for LI Program**	**0.05**	**0.00**	**0.00%**
Penelec	PN-1	-0.02	0.00	0.00%
Penelec	**Total for EEH Program**	**-0.02**	**0.00**	**0.00%**
Penelec	PN-1-LI	0.09	0.00	0.00%
Penelec	**Total for LI Program**	**0.09**	**0.00**	**0.00%**
Penn Power	PP-1	0.12	0.00	0.00%
Penn Power	**Total for EEH Program**	**0.12**	**0.00**	**0.00%**
Penn Power	PP-1-LI	0.05	0.00	0.00%
Penn Power	**Total for LI Program**	**0.05**	**0.00**	**0.00%**
WPP	WP-1	0.35	0.00	0.00%
WPP	**Total for EEH Program**	**0.35**	**0.00**	**0.00%**
WPP	WP-1-LI	0.23	0.00	0.00%
WPP	**Total for LI Program**	**0.23**	**0.00**	**0.00%**

Appendix C PYTD and P4TD Summary by Customer Segment and LI Carveout

Table 103 presents a summary of the programs, components / initiatives and customer segments that contribute to the low-income carveout in PY13 and P4TD.

Table 103: Reported and verified demand reductions for the HER Initiative

EDC	Program	Component / Initiative	Customer Segment	PYVTD Gross (MWh/yr)	VTD Gross (MWh/yr)
Met-Ed	Low Income Energy Efficiency	Appliances	Residential	12	12
Met-Ed	Low Income Energy Efficiency	Appliance Turn-In	Residential	625	625
Met-Ed	Low Income Energy Efficiency	Direct Install	Residential	783	783
Met-Ed	Low Income Energy Efficiency	Home Energy Reports	Residential	197	197
Met-Ed	Low Income Energy Efficiency	Kits	Residential	2,043	2043
Met-Ed	Low Income Energy Efficiency	New Homes	Residential	102	102
Met-Ed	Low Income Energy Efficiency	Online Audits	Residential	0	0
Met-Ed	C&I Energy Solutions for Business - Small	CI Multifamily	Master Metered MF	60	60
Met-Ed Total				**3,822**	**3822**
Penelec	Low Income Energy Efficiency	Appliances	Residential	14	14
Penelec	Low Income Energy Efficiency	Appliance Turn-In	Residential	596	596
Penelec	Low Income Energy Efficiency	Direct Install	Residential	1,267	1267
Penelec	Low Income Energy Efficiency	Home Energy Reports	Residential	645	645
Penelec	Low Income Energy Efficiency	Kits	Residential	3,412	3412
Penelec	Low Income Energy Efficiency	New Homes	Residential	8	8
Penelec	Low Income Energy Efficiency	Online Audits	Residential	0	0
Penelec	C&I Energy Solutions for Business - Small	CI Multifamily	Master Metered MF	445	445
PenelecTotal				**6,387**	**6387**
Penn Power	Low Income Energy Efficiency	Appliances	Residential	4	4
Penn Power	Low Income Energy Efficiency	Appliance Turn-In	Residential	134	134
Penn Power	Low Income Energy Efficiency	Direct Install	Residential	487	487
Penn Power	Low Income Energy Efficiency	Home Energy Reports	Residential	275	275
Penn Power	Low Income Energy Efficiency	Kits	Residential	816	816
Penn Power	Low Income Energy Efficiency	New Homes	Residential	0	0
Penn Power	Low Income Energy Efficiency	Online Audits	Residential	0	0
Penn Power	C&I Energy Solutions for Business - Small	CI Multifamily	Master Metered MF	120	120
Penn PowerTotal				**1,836**	**1836**
WPP	Low Income Energy Efficiency	Appliances	Residential	21	21
WPP	Low Income Energy Efficiency	Appliance Turn-In	Residential	513	513
WPP	Low Income Energy Efficiency	Direct Install	Residential	1,233	1233
WPP	Low Income Energy Efficiency	Home Energy Reports	Residential	1,498	1498
WPP	Low Income Energy Efficiency	Kits	Residential	2,551	2551
WPP	Low Income Energy Efficiency	New Homes	Residential	0	0
WPP	Low Income Energy Efficiency	Online Audits	Residential	0	0
WPP	C&I Energy Solutions for Business - Small	CI Multifamily	Master Metered MF	1,157	1157
WPP Total				**6,974**	**6974**

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

D.1 Program and Initiative-Level Impacts Summary

A summary of energy impacts by program and component / initiative through PY13 is presented in Table 27.

Table 104: Met-Ed Annual Energy Savings by Program & Initiative (MWh/Year)

Program	Initiative	PYRTD (MWh/yr)	PYVTD Gross (MWh/yr)	PYVTD Net (MWh/yr)	RTD (MWh/yr)	VTD Gross (MWh/yr)	VTD Net (MWh/yr)
Energy Efficient Homes	EE Kits	9,720	6,629	5,436	9,720	6,629	5,436
Energy Efficient Homes	Home Energy Reports	1,308	1,436	1,436	1,308	1,436	1,436
Energy Efficient Homes	Direct Install	28	31	29	28	31	29
Energy Efficient Homes	New Homes	2,213	2,171	1,585	2,213	2,171	1,585
Energy Efficient Homes	Multifamily	0	0	0	0	0	0
Energy Efficient Homes	Online Audits	737	0	0	737	0	0
Energy Efficient Products	Appliance Recycling	4,379	4,502	1,756	4,379	4,502	1,756
Energy Efficient Products	Upstream Electronics	0	0	0	0	0	0
Energy Efficient Products	HVAC	721	826	419	721	826	419
Energy Efficient Products	Appliances	410	405	203	410	405	203
Energy Efficient Products	Midstream Appliances	3,788	3,970	1,874	3,788	3,970	1,874
Low Income Program	Appliances	12	12	12	12	12	12
Low Income Program	Appliance Turn-In	546	625	625	546	625	625
Low Income Program	Direct Install	781	783	783	781	783	783
Low Income Program	Home Energy Reports	322	197	197	322	197	197
Low Income Program	Kits	2,235	2,043	2,043	2,235	2,043	2,043
Low Income Program	New Homes	104	102	102	104	102	102
Low Income Program	Online Audits	60	0	0	60	0	0
C&I Solutions for Business Programs - Small and Large	CI Prescriptive	6,612	7,795	4,933	6,612	7,795	4,933
C&I Solutions for Business Programs - Small and Large	CI Custom	13,639	13,639	7,373	13,639	13,639	7,373
C&I Solutions for Business Programs - Small and Large	CI EMNC	1,398	1,176	735	1,398	1,176	735
C&I Solutions for Business Program - Small	CI Multifamily	122	60	60	122	60	60
C&I Solutions for Business Program - Small	Appliance Recycling	52	54	21	52	54	21
Portfolio Total		**49,187**	**46,455**	**29,620**	**49,187**	**46,455**	**29,620**

Table 105: Penelec Annual Energy Savings by Program & Initiative (MWh/Year)

Program	Initiative	PYRTD (MWh/yr)	PYVTD Gross (MWh/yr)	PYVTD Net (MWh/yr)	RTD (MWh/yr)	VTD Gross (MWh/yr)	VTD Net (MWh/yr)
Energy Efficient Homes	EE Kits	7,812	7,156	5,978	7,812	7,156	5,978
Energy Efficient Homes	Home Energy Reports	-103	189	189	-103	189	189
Energy Efficient Homes	Direct Install	5	6	6	5	6	6
Energy Efficient Homes	New Homes	215	221	161	215	221	161
Energy Efficient Homes	Multifamily	2	2	2	2	2	2
Energy Efficient Homes	Online Audits	477	0	0	477	0	0
Energy Efficient Products	Appliance Recycling	3,180	3,450	2,242	3,180	3,450	2,242
Energy Efficient Products	Upstream Electronics	0	0	0	0	0	0
Energy Efficient Products	HVAC	364	565	295	364	565	295
Energy Efficient Products	Appliances	190	181	108	190	181	108
Energy Efficient Products	Midstream Appliances	2,749	2,869	1,523	2,749	2,869	1,523
Low Income Program	Appliances	15	14	14	15	14	14
Low Income Program	Appliance Turn-In	591	596	596	591	596	596
Low Income Program	Direct Install	1,262	1,267	1,267	1,262	1,267	1,267
Low Income Program	Home Energy Reports	457	645	645	457	645	645
Low Income Program	Kits	3,501	3,412	3,412	3,501	3,412	3,412
Low Income Program	New Homes	8	8	8	8	8	8
Low Income Program	Online Audits	85	0	0	85	0	0
C&I Solutions for Business Programs - Small and Large	CI Prescriptive	4,392	4,188	3,284	4,392	4,188	3,284
C&I Solutions for Business Programs - Small and Large	CI Custom	9,548	9,580	8,552	9,548	9,580	8,552
C&I Solutions for Business Programs - Small and Large	CI EMNC	1,371	1,179	889	1,371	1,179	889
C&I Solutions for Business Program - Small	CI Multifamily	619	445	445	619	445	445
C&I Solutions for Business Program - Small	Appliance Recycling	47	50	33	47	50	33
Portfolio Total		**36,788**	**36,021**	**29,649**	**36,788**	**36,021**	**29,649**

Table 106: Penn Power Annual Energy Savings by Program & Initiative (MWh/Year)

Program	Initiative	PYRTD (MWh/yr)	PYVTD Gross (MWh/yr)	PYVTD Net (MWh/yr)	RTD (MWh/yr)	VTD Gross (MWh/yr)	VTD Net (MWh/yr)
Energy Efficient Homes	EE Kits	2,366	1,818	1,528	2,366	1,818	1,528
Energy Efficient Homes	Home Energy Reports	643	602	602	643	602	602
Energy Efficient Homes	Direct Install	19	22	22	19	22	22
Energy Efficient Homes	New Homes	733	692	505	733	692	505
Energy Efficient Homes	Multifamily	0	0	0	0	0	0
Energy Efficient Homes	Online Audits	153	0	0	153	0	0
Energy Efficient Products	Appliance Recycling	1,011	958	364	1,011	958	364
Energy Efficient Products	Upstream Electronics	0	0	0	0	0	0
Energy Efficient Products	HVAC	160	170	93	160	170	93
Energy Efficient Products	Appliances	111	118	66	111	118	66
Energy Efficient Products	Midstream Appliances	1,267	1,335	587	1,267	1,335	587
Low Income Program	Appliances	4	4	4	4	4	4
Low Income Program	Appliance Turn-In	133	134	134	133	134	134
Low Income Program	Direct Install	489	487	487	489	487	487
Low Income Program	Home Energy Reports	251	275	275	251	275	275
Low Income Program	Kits	845	816	816	845	816	816
Low Income Program	New Homes	0	0	0	0	0	0
Low Income Program	Online Audits	17	0	0	17	0	0
C&I Solutions for Business Programs - Small and Large	CI Prescriptive	1,617	1,692	1,360	1,617	1,692	1,360
C&I Solutions for Business Programs - Small and Large	CI Custom	6,325	6,327	3,894	6,325	6,327	3,894
C&I Solutions for Business Programs - Small and Large	CI EMNC	361	356	283	361	356	283
C&I Solutions for Business Program - Small	CI Multifamily	132	120	120	132	120	120
C&I Solutions for Business Program - Small	Appliance Recycling	9	8	3	9	8	3
Portfolio Total		**16,643**	**15,934**	**11,144**	**16,643**	**15,934**	**11,144**

Table 107: WPP Annual Energy Savings by Program & Initiative (MWh/Year)

Program	Initiative	PYRTD (MWh/yr)	PYVTD Gross (MWh/yr)	PYVTD Net (MWh/yr)	RTD (MWh/yr)	VTD Gross (MWh/yr)	VTD Net (MWh/yr)
Energy Efficient Homes	EE Kits	10,901	7,901	8,713	10,901	7,901	8,713
Energy Efficient Homes	Home Energy Reports	1,750	1,975	1,975	1,750	1,975	1,975
Energy Efficient Homes	Direct Install	24	28	29	24	28	29
Energy Efficient Homes	New Homes	1,430	1,469	1,073	1,430	1,469	1,073
Energy Efficient Homes	Multifamily	1	2	1	1	2	1
Energy Efficient Homes	Online Audits	579	0	0	579	0	0
Energy Efficient Products	Appliance Recycling	4,198	4,192	2,934	4,198	4,192	2,934
Energy Efficient Products	Upstream Electronics	0	0	0	0	0	0
Energy Efficient Products	HVAC	672	1,020	530	672	1,020	530
Energy Efficient Products	Appliances	389	407	264	389	407	264
Energy Efficient Products	Midstream Appliances	2,534	2,651	1,347	2,534	2,651	1,347
Low Income Program	Appliances	20	21	21	20	21	21
Low Income Program	Appliance Turn-In	504	513	513	504	513	513
Low Income Program	Direct Install	1,234	1,233	1,233	1,234	1,233	1,233
Low Income Program	Home Energy Reports	1,036	1,498	1,498	1,036	1,498	1,498
Low Income Program	Kits	2,556	2,551	2,551	2,556	2,551	2,551
Low Income Program	New Homes	0	0	0	0	0	0
Low Income Program	Online Audits	48	0	0	48	0	0
C&I Solutions for Business Programs - Small and Large	CI Prescriptive	8,508	8,602	5,669	8,508	8,602	5,669
C&I Solutions for Business Programs - Small and Large	CI Custom	7,211	7,217	4,167	7,211	7,217	4,167
C&I Solutions for Business Programs - Small and Large	CI EMNC	1,223	1,162	763	1,223	1,162	763
C&I Solutions for Business Program - Small	CI Multifamily	1,482	1,157	1,157	1,482	1,157	1,157
C&I Solutions for Business Program - Small	Appliance Recycling	37	37	26	37	37	26
Portfolio Total		**46,338**	**43,638**	**34,466**	**46,338**	**43,638**	**34,466**

Table 108, Table 109, Table 110, and Table 111 present summaries of the peak demand impacts by energy efficiency program and initiative through the current reporting period.

Table 108: Met-Ed Peak Demand Savings by Program & Initiative (MW/Year)

Program	Initiative	PYRTD (MW/yr)	PYVTD Gross (MW/yr)	PYVTD Net (MW/yr)	RTD (MW/yr)	VTD Gross (MW/yr)	VTD Net (MW/yr)
Energy Efficient Homes	EE Kits	1.05	0.64	0.53	1.05	0.64	0.53
Energy Efficient Homes	Home Energy Reports	0.24	0.00	0.00	0.24	0.00	0.00
Energy Efficient Homes	Direct Install	0.01	0.00	0.00	0.01	0.00	0.00
Energy Efficient Homes	New Homes	0.90	0.62	0.45	0.90	0.62	0.45
Energy Efficient Homes	Multifamily	0.00	0.00	0.00	0.00	0.00	0.00
Energy Efficient Homes	Online Audits	0.00	0.00	0.00	0.00	0.00	0.00
Energy Efficient Products	Appliance Recycling	1.02	1.00	0.39	1.02	1.00	0.39
Energy Efficient Products	Upstream Electronics	0.00	0.00	0.00	0.00	0.00	0.00
Energy Efficient Products	HVAC	0.13	0.16	0.08	0.13	0.16	0.08
Energy Efficient Products	Appliances	0.06	0.06	0.03	0.06	0.06	0.03
Energy Efficient Products	Midstream Appliances	0.72	0.75	0.36	0.72	0.75	0.36
Low Income Program	Appliances	0.00	0.00	0.00	0.00	0.00	0.00
Low Income Program	Appliance Turn-In	0.12	0.14	0.14	0.12	0.14	0.14
Low Income Program	Direct Install	0.09	0.10	0.10	0.09	0.10	0.10
Low Income Program	Home Energy Reports	0.05	0.00	0.00	0.05	0.00	0.00
Low Income Program	Kits	0.24	0.22	0.22	0.24	0.22	0.22
Low Income Program	New Homes	0.02	0.01	0.01	0.02	0.01	0.01
Low Income Program	Online Audits	0.00	0.00	0.00	0.00	0.00	0.00
C&I Solutions for Business Programs - Small and Large	CI Prescriptive	1.29	1.36	0.86	1.29	1.36	0.86
C&I Solutions for Business Programs - Small and Large	CI Custom	1.71	1.71	0.93	1.71	1.71	0.93
C&I Solutions for Business Programs - Small and Large	CI EMNC	0.25	0.20	0.13	0.25	0.20	0.13
C&I Solutions for Business Program - Small	CI Multifamily	0.02	0.01	0.01	0.02	0.01	0.01
C&I Solutions for Business Program - Small	Appliance Recycling	0.01	0.01	0.00	0.01	0.01	0.00
Portfolio Total		**7.94**	**7.02**	**4.24**	**7.94**	**7.02**	**4.24**

Table 109: Penelec Peak Demand Savings by Program & Initiative (MW/Year)

Program	Initiative	PYRTD (MW/yr)	PYVTD Gross (MW/yr)	PYVTD Net (MW/yr)	RTD (MW/yr)	VTD Gross (MW/yr)	VTD Net (MW/yr)
Energy Efficient Homes	EE Kits	0.78	0.66	0.55	0.78	0.66	0.55
Energy Efficient Homes	Home Energy Reports	-0.02	0.00	0.00	-0.02	0.00	0.00
Energy Efficient Homes	Direct Install	0.00	0.00	0.00	0.00	0.00	0.00
Energy Efficient Homes	New Homes	0.10	0.08	0.06	0.10	0.08	0.06
Energy Efficient Homes	Multifamily	0.00	0.00	0.00	0.00	0.00	0.00
Energy Efficient Homes	Online Audits	0.00	0.00	0.00	0.00	0.00	0.00
Energy Efficient Products	Appliance Recycling	0.71	0.74	0.48	0.71	0.74	0.48
Energy Efficient Products	Upstream Electronics	0.00	0.00	0.00	0.00	0.00	0.00
Energy Efficient Products	HVAC	0.03	0.05	0.03	0.03	0.05	0.03
Energy Efficient Products	Appliances	0.03	0.03	0.02	0.03	0.03	0.02
Energy Efficient Products	Midstream Appliances	0.60	0.62	0.33	0.60	0.62	0.33
Low Income Program	Appliances	0.00	0.00	0.00	0.00	0.00	0.00
Low Income Program	Appliance Turn-In	0.13	0.13	0.13	0.13	0.13	0.13
Low Income Program	Direct Install	0.15	0.15	0.15	0.15	0.15	0.15
Low Income Program	Home Energy Reports	0.09	0.00	0.00	0.09	0.00	0.00
Low Income Program	Kits	0.36	0.33	0.33	0.36	0.33	0.33
Low Income Program	New Homes	0.00	0.00	0.00	0.00	0.00	0.00
Low Income Program	Online Audits	0.00	0.00	0.00	0.00	0.00	0.00
C&I Solutions for Business Programs - Small and Large	CI Prescriptive	0.90	0.78	0.61	0.90	0.78	0.61
C&I Solutions for Business Programs - Small and Large	CI Custom	3.10	3.10	2.76	3.10	3.10	2.76
C&I Solutions for Business Programs - Small and Large	CI EMNC	0.13	0.10	0.07	0.13	0.10	0.07
C&I Solutions for Business Program - Small	CI Multifamily	0.09	0.06	0.06	0.09	0.06	0.06
C&I Solutions for Business Program - Small	Appliance Recycling	0.01	0.01	0.01	0.01	0.01	0.01
Portfolio Total		**7.20**	**6.84**	**5.59**	**7.20**	**6.84**	**5.59**

Table 110: Penn Power Peak Demand Savings by Program & Initiative (MW/Year)

Program	Initiative	PYRTD (MW/yr)	PYVTD Gross (MW/yr)	PYVTD Net (MW/yr)	RTD (MW/yr)	VTD Gross (MW/yr)	VTD Net (MW/yr)
Energy Efficient Homes	EE Kits	0.26	0.17	0.14	0.26	0.17	0.14
Energy Efficient Homes	Home Energy Reports	0.12	0.00	0.00	0.12	0.00	0.00
Energy Efficient Homes	Direct Install	0.00	0.00	0.00	0.00	0.00	0.00
Energy Efficient Homes	New Homes	0.37	0.22	0.16	0.37	0.22	0.16
Energy Efficient Homes	Multifamily	0.00	0.00	0.00	0.00	0.00	0.00
Energy Efficient Homes	Online Audits	0.00	0.00	0.00	0.00	0.00	0.00
Energy Efficient Products	Appliance Recycling	0.21	0.20	0.07	0.21	0.20	0.07
Energy Efficient Products	Upstream Electronics	0.00	0.00	0.00	0.00	0.00	0.00
Energy Efficient Products	HVAC	0.03	0.03	0.02	0.03	0.03	0.02
Energy Efficient Products	Appliances	0.02	0.02	0.01	0.02	0.02	0.01
Energy Efficient Products	Midstream Appliances	0.26	0.28	0.12	0.26	0.28	0.12
Low Income Program	Appliances	0.00	0.00	0.00	0.00	0.00	0.00
Low Income Program	Appliance Turn-In	0.03	0.03	0.03	0.03	0.03	0.03
Low Income Program	Direct Install	0.06	0.06	0.06	0.06	0.06	0.06
Low Income Program	Home Energy Reports	0.05	0.00	0.00	0.05	0.00	0.00
Low Income Program	Kits	0.09	0.08	0.08	0.09	0.08	0.08
Low Income Program	New Homes	0.00	0.00	0.00	0.00	0.00	0.00
Low Income Program	Online Audits	0.00	0.00	0.00	0.00	0.00	0.00
C&I Solutions for Business Programs - Small and Large	CI Prescriptive	0.26	0.25	0.20	0.26	0.25	0.20
C&I Solutions for Business Programs - Small and Large	CI Custom	0.69	0.69	0.42	0.69	0.69	0.42
C&I Solutions for Business Programs - Small and Large	CI EMNC	0.05	0.03	0.03	0.05	0.03	0.03
C&I Solutions for Business Program - Small	CI Multifamily	0.02	0.01	0.01	0.02	0.01	0.01
C&I Solutions for Business Program - Small	Appliance Recycling	0.00	0.00	0.00	0.00	0.00	0.00
Portfolio Total		**2.52**	**2.08**	**1.37**	**2.52**	**2.08**	**1.37**

Table 111: WPP Peak Demand Savings by Program & Initiative (MW/Year)

Program	Initiative	PYRTD (MW/yr)	PYVTD Gross (MW/yr)	PYVTD Net (MW/yr)	RTD (MW/yr)	VTD Gross (MW/yr)	VTD Net (MW/yr)
Energy Efficient Homes	EE Kits	1.24	0.89	0.98	1.24	0.89	0.98
Energy Efficient Homes	Home Energy Reports	0.35	0.00	0.00	0.35	0.00	0.00
Energy Efficient Homes	Direct Install	0.00	0.00	0.00	0.00	0.00	0.00
Energy Efficient Homes	New Homes	0.67	0.39	0.28	0.67	0.39	0.28
Energy Efficient Homes	Multifamily	0.00	0.00	0.00	0.00	0.00	0.00
Energy Efficient Homes	Online Audits	0.00	0.00	0.00	0.00	0.00	0.00
Energy Efficient Products	Appliance Recycling	0.91	0.86	0.61	0.91	0.86	0.61
Energy Efficient Products	Upstream Electronics	0.00	0.00	0.00	0.00	0.00	0.00
Energy Efficient Products	HVAC	0.10	0.12	0.06	0.10	0.12	0.06
Energy Efficient Products	Appliances	0.06	0.06	0.04	0.06	0.06	0.04
Energy Efficient Products	Midstream Appliances	0.53	0.56	0.28	0.53	0.56	0.28
Low Income Program	Appliances	0.00	0.00	0.00	0.00	0.00	0.00
Low Income Program	Appliance Turn-In	0.12	0.12	0.12	0.12	0.12	0.12
Low Income Program	Direct Install	0.16	0.16	0.16	0.16	0.16	0.16
Low Income Program	Home Energy Reports	0.23	0.00	0.00	0.23	0.00	0.00
Low Income Program	Kits	0.29	0.28	0.28	0.29	0.28	0.28
Low Income Program	New Homes	0.00	0.00	0.00	0.00	0.00	0.00
Low Income Program	Online Audits	0.00	0.00	0.00	0.00	0.00	0.00
C&I Solutions for Business Programs - Small and Large	CI Prescriptive	1.37	1.19	0.79	1.37	1.19	0.79
C&I Solutions for Business Programs - Small and Large	CI Custom	0.72	0.72	0.42	0.72	0.72	0.42
C&I Solutions for Business Programs - Small and Large	CI EMNC	0.23	0.22	0.14	0.23	0.22	0.14
C&I Solutions for Business Program - Small	CI Multifamily	0.21	0.16	0.16	0.21	0.16	0.16
C&I Solutions for Business Program - Small	Appliance Recycling	0.01	0.01	0.01	0.01	0.01	0.01
Portfolio Total		**7.20**	**5.74**	**4.33**	**7.20**	**5.74**	**4.33**

D.2 PROGRAM-LEVEL COST-EFFECTIVENESS SUMMARY

Table 112, Table 113, Table 114, and Table 115 show the TRC ratios by program and for the portfolio for Met-Ed, Penelec, Penn Power, and WPP respectively. The benefits in the tables were calculated using gross verified impacts. PYTD costs and benefits are expressed in the base dollars for the calendar year in which the program starts. For PY13, cost and benefits are expressed in 2021 dollars.

Table 112: PY13 Gross TRC Ratios by Program ($1,000) for Met-Ed

Program	TRC NPV Benefits	TRC NPV Costs	TRC Ratio	TRC Net Benefits (Benefits – Costs)
Energy Efficient Homes	$7,993	$4,467	1.79	$3,526
Energy Efficient Products	$4,764	$5,032	0.95	-$269
Low Income Energy Efficiency	$2,365	$1,710	1.38	$655
Residential Subtotal	**$15,121**	**$11,209**	**1.35**	**$3,912**
C&I Energy Solutions for Business - Small	$4,039	$3,339	1.21	$700
C&I Energy Solutions for Business - Large	$10,926	$6,366	1.72	$4,560
Non-Residential Subtotal	**$14,965**	**$9,705**	**1.54**	**$5,261**
Portfolio Total	**$30,087**	**$20,914**	**1.44**	**$9,173**
1 Costs and benefits are expressed as follows: PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025				

Table 113: PY14 Gross TRC Ratios by Program ($1,000) for Penelec

Program	TRC NPV Benefits	TRC NPV Costs	TRC Ratio	TRC Net Benefits (Benefits – Costs)
Energy Efficient Homes	$6,266	$2,198	2.85	$4,068
Energy Efficient Products	$3,276	$3,935	0.83	-$659
Low Income Energy Efficiency	$3,014	$2,308	1.31	$706
Residential Subtotal	**$12,556**	**$8,441**	**1.49**	**$4,115**
C&I Energy Solutions for Business - Small	$7,926	$5,201	1.52	$2,726
C&I Energy Solutions for Business - Large	$1,324	$1,251	1.06	$73
Non-Residential Subtotal	**$9,251**	**$6,452**	**1.43**	**$2,799**
Portfolio Total	**$21,806**	**$14,893**	**1.46**	**$6,914**
1 Costs and benefits are expressed as follows: PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025				

Table 114: PY13 Gross TRC Ratios by Program ($1,000) for Penn Power

Program	TRC NPV Benefits	TRC NPV Costs	TRC Ratio	TRC Net Benefits (Benefits – Costs)
Energy Efficient Homes	$2,131	$1,609	1.32	$521
Energy Efficient Products	$1,239	$1,290	0.96	-$51
Low Income Energy Efficiency	$790	$704	1.12	$86
Residential Subtotal	**$4,160**	**$3,604**	**1.15**	**$557**
C&I Energy Solutions for Business - Small	$654	$783	0.84	-$129
C&I Energy Solutions for Business - Large	$8,265	$7,594	1.09	$671
Non-Residential Subtotal	**$8,920**	**$8,378**	**1.06**	**$542**
Portfolio Total	**$13,080**	**$11,981**	**1.09**	**$1,099**
1 Costs and benefits are expressed as follows: PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025				

Table 115: PY13 Gross TRC Ratios by Program ($1,000) for WPP

Program	TRC NPV Benefits	TRC NPV Costs	TRC Ratio	TRC Net Benefits (Benefits – Costs)
Energy Efficient Homes	$7,477	$4,440	1.68	$3,036
Energy Efficient Products	$3,324	$4,550	0.73	-$1,226
Low Income Energy Efficiency	$2,654	$1,730	1.53	$924
Residential Subtotal	**$13,455**	**$10,720**	**1.26**	**$2,734**
C&I Energy Solutions for Business - Small	$4,075	$4,245	0.96	-$170
C&I Energy Solutions for Business - Large	$5,957	$3,774	1.58	$2,183
Non-Residential Subtotal	**$10,032**	**$8,019**	**1.25**	**$2,013**
Portfolio Total	**$23,486**	**$18,739**	**1.25**	**$4,747**
1 Costs and benefits are expressed as follows: PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025				

Table 116, Table 117, Table 118, and Table 119 present PY13 cost-effectiveness for Met-Ed, Penelec, Penn Power, and WPP respectively, using net verified savings to calculate benefits.

Table 116: PY13 Net TRC Ratios by Program ($1,000) for Met-Ed

Program	TRC NPV Benefits	TRC NPV Costs	TRC Ratio	TRC Net Benefits (Benefits – Costs)
Energy Efficient Homes	$6,371	$3,683	1.73	$2,688
Energy Efficient Products	$2,181	$3,145	0.69	-$964
Low Income Energy Efficiency	$2,365	$1,710	1.38	$655
Residential Subtotal	**$10,917**	**$8,539**	**1.28**	**$2,379**
C&I Energy Solutions for Business - Small	$2,544	$2,549	1.00	-$4
C&I Energy Solutions for Business - Large	$6,150	$4,106	1.50	$2,044
Non-Residential Subtotal	**$8,694**	**$6,655**	**1.31**	**$2,039**
Portfolio Total	**$19,611**	**$15,193**	**1.29**	**$4,418**
1 Costs and benefits are expressed as follows: PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025				

Table 117: PY13 Net TRC Ratios by Program ($1,000) for Penelec

Program	TRC NPV Benefits	TRC NPV Costs	TRC Ratio	TRC Net Benefits (Benefits – Costs)
Energy Efficient Homes	$5,211	$2,021	2.58	$3,189
Energy Efficient Products	$1,857	$2,625	0.71	-$768
Low Income Energy Efficiency	$3,014	$2,308	1.31	$706
Residential Subtotal	**$10,082**	**$6,954**	**1.45**	**$3,128**
C&I Energy Solutions for Business - Small	$6,807	$4,632	1.47	$2,175
C&I Energy Solutions for Business - Large	$1,037	$1,149	0.90	-$113
Non-Residential Subtotal	**$7,844**	**$5,782**	**1.36**	**$2,063**
Portfolio Total	**$17,926**	**$12,736**	**1.41**	**$5,190**
1 Costs and benefits are expressed as follows: PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025				

Table 118: PY13 Net TRC Ratios by Program ($1,000) for Penn Power

Program	TRC NPV Benefits	TRC NPV Costs	TRC Ratio	TRC Net Benefits (Benefits – Costs)
Energy Efficient Homes	$1,733	$1,327	1.31	$406
Energy Efficient Products	$560	$826	0.68	-$265
Low Income Energy Efficiency	$790	$704	1.12	$86
Residential Subtotal	**$3,084**	**$2,857**	**1.08**	**$227**
C&I Energy Solutions for Business - Small	$537	$723	0.74	-$186
C&I Energy Solutions for Business - Large	$5,198	$4,843	1.07	$355
Non-Residential Subtotal	**$5,735**	**$5,566**	**1.03**	**$169**
Portfolio Total	**$8,819**	**$8,423**	**1.05**	**$396**
1 Costs and benefits are expressed as follows: PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025				

Table 119: PY13 Net TRC Ratios by Program ($1,000) for WPP

Program	TRC NPV Benefits	TRC NPV Costs	TRC Ratio	TRC Net Benefits (Benefits – Costs)
Energy Efficient Homes	$7,830	$4,188	1.87	$3,642
Energy Efficient Products	$1,926	$3,126	0.62	-$1,200
Low Income Energy Efficiency	$2,654	$1,730	1.53	$924
Residential Subtotal	**$12,411**	**$9,044**	**1.37**	**$3,366**
C&I Energy Solutions for Business - Small	$2,913	$3,500	0.83	-$587
C&I Energy Solutions for Business - Large	$3,616	$2,620	1.38	$996
Non-Residential Subtotal	**$6,529**	**$6,120**	**1.07**	**$409**
Portfolio Total	**$18,940**	**$15,164**	**1.25**	**$3,776**
1 Costs and benefits are expressed as follows: PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025				

Table 120, Table 121, Table 122, and Table 123 summarize cost-effectiveness by program respectively for Met-Ed, Penelec, Penn Power, and WPP for Phase IV of Act 129. P4TD costs and benefits are expressed in 2021 dollars regardless of program or reporting year.

Table 120: P4TD Gross TRC Ratios by Program ($1,000) for Met-Ed

Program	TRC NPV Benefits	TRC NPV Costs	TRC Ratio	TRC Net Benefits (Benefits – Costs)
Energy Efficient Homes	$7,993	$4,467	1.79	$3,526
Energy Efficient Products	$4,764	$5,032	0.95	-$269
Low Income Energy Efficiency	$2,365	$1,710	1.38	$655
Residential Subtotal	**$15,121**	**$11,209**	**1.35**	**$3,912**
C&I Energy Solutions for Business - Small	$4,039	$3,339	1.21	$700
C&I Energy Solutions for Business - Large	$10,926	$6,366	1.72	$4,560
Non-Residential Subtotal	**$14,965**	**$9,705**	**1.54**	**$5,261**
Portfolio Total	**$30,087**	**$20,914**	**1.44**	**$9,173**
1 Costs and benefits are expressed as follows: PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025				

Table 121: P4TD Gross TRC Ratios by Program ($1,000) for Penelec

Program	TRC NPV Benefits	TRC NPV Costs	TRC Ratio	TRC Net Benefits (Benefits – Costs)
Energy Efficient Homes	$6,266	$2,198	2.85	$4,068
Energy Efficient Products	$3,276	$3,935	0.83	-$659
Low Income Energy Efficiency	$3,014	$2,308	1.31	$706
Residential Subtotal	**$12,556**	**$8,441**	**1.49**	**$4,115**
C&I Energy Solutions for Business - Small	$7,926	$5,201	1.52	$2,726
C&I Energy Solutions for Business - Large	$1,324	$1,251	1.06	$73
Non-Residential Subtotal	**$9,251**	**$6,452**	**1.43**	**$2,799**
Portfolio Total	**$21,806**	**$14,893**	**1.46**	**$6,914**
1 Costs and benefits are expressed as follows: PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025				

Table 122: P4TD Gross TRC Ratios by Program ($1,000) for Penn Power

Program	TRC NPV Benefits	TRC NPV Costs	TRC Ratio	TRC Net Benefits (Benefits – Costs)
Energy Efficient Homes	$2,131	$1,609	1.32	$521
Energy Efficient Products	$1,239	$1,290	0.96	-$51
Low Income Energy Efficiency	$790	$704	1.12	$86
Residential Subtotal	**$4,160**	**$3,604**	**1.15**	**$557**
C&I Energy Solutions for Business - Small	$654	$783	0.84	-$129
C&I Energy Solutions for Business - Large	$8,265	$7,594	1.09	$671
Non-Residential Subtotal	**$8,920**	**$8,378**	**1.06**	**$542**
Portfolio Total	**$13,080**	**$11,981**	**1.09**	**$1,099**
1 Costs and benefits are expressed as follows: PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025				

Table 123: P4TD Gross TRC Ratios by Program ($1,000) for WPP

Program	TRC NPV Benefits	TRC NPV Costs	TRC Ratio	TRC Net Benefits (Benefits – Costs)
Energy Efficient Homes	$7,477	$4,440	1.68	$3,036
Energy Efficient Products	$3,324	$4,550	0.73	-$1,226
Low Income Energy Efficiency	$2,654	$1,730	1.53	$924
Residential Subtotal	**$13,455**	**$10,720**	**1.26**	**$2,734**
C&I Energy Solutions for Business - Small	$4,075	$4,245	0.96	-$170
C&I Energy Solutions for Business - Large	$5,957	$3,774	1.58	$2,183
Non-Residential Subtotal	**$10,032**	**$8,019**	**1.25**	**$2,013**
Portfolio Total	**$23,486**	**$18,739**	**1.25**	**$4,747**
1 Costs and benefits are expressed as follows: PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025				

Table 124, Table 125, Table 126, and Table 127 present P4TD cost-effectiveness results for Met-Ed, Penelec, Penn Power, and WPP respectively using net verified savings to calculate benefits. Cost and benefits are expressed in 2021 Dollars.

Table 124: P4TD Net TRC Ratios by Program ($1,000) for Met-Ed

Program	TRC NPV Benefits	TRC NPV Costs	TRC Ratio	TRC Net Benefits (Benefits – Costs)
Energy Efficient Homes	$6,371	$3,683	1.73	$2,688
Energy Efficient Products	$2,181	$3,145	0.69	-$964
Low Income Energy Efficiency	$2,365	$1,710	1.38	$655
Residential Subtotal	**$10,917**	**$8,539**	**1.28**	**$2,379**
C&I Energy Solutions for Business - Small	$2,544	$2,549	1.00	-$4
C&I Energy Solutions for Business - Large	$6,150	$4,106	1.50	$2,044
Non-Residential Subtotal	**$8,694**	**$6,655**	**1.31**	**$2,039**
Portfolio Total	**$19,611**	**$15,193**	**1.29**	**$4,418**
1 Costs and benefits are expressed as follows: PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025				

Table 125: P4TD Net TRC Ratios by Program ($1,000) for Penelec

Program	TRC NPV Benefits	TRC NPV Costs	TRC Ratio	TRC Net Benefits (Benefits – Costs)
Energy Efficient Homes	$5,211	$2,021	2.58	$3,189
Energy Efficient Products	$1,857	$2,625	0.71	-$768
Low Income Energy Efficiency	$3,014	$2,308	1.31	$706
Residential Subtotal	**$10,082**	**$6,954**	**1.45**	**$3,128**
C&I Energy Solutions for Business - Small	$6,807	$4,632	1.47	$2,175
C&I Energy Solutions for Business - Large	$1,037	$1,149	0.90	-$113
Non-Residential Subtotal	**$7,844**	**$5,782**	**1.36**	**$2,063**
Portfolio Total	**$17,926**	**$12,736**	**1.41**	**$5,190**
1 Costs and benefits are expressed as follows: PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025				

Table 126: P4TD Net TRC Ratios by Program ($1,000) for Penn Power

Program	TRC NPV Benefits	TRC NPV Costs	TRC Ratio	TRC Net Benefits (Benefits – Costs)
Energy Efficient Homes	$1,733	$1,327	1.31	$406
Energy Efficient Products	$560	$826	0.68	-$265
Low Income Energy Efficiency	$790	$704	1.12	$86
Residential Subtotal	**$3,084**	**$2,857**	**1.08**	**$227**
C&I Energy Solutions for Business - Small	$537	$723	0.74	-$186
C&I Energy Solutions for Business - Large	$5,198	$4,843	1.07	$355
Non-Residential Subtotal	**$5,735**	**$5,566**	**1.03**	**$169**
Portfolio Total	**$8,819**	**$8,423**	**1.05**	**$396**
1 Costs and benefits are expressed as follows: PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025				

Table 127: P4TD Net TRC Ratios by Program ($1,000) for WPP

Program	TRC NPV Benefits	TRC NPV Costs	TRC Ratio	TRC Net Benefits (Benefits – Costs)
Energy Efficient Homes	$7,830	$4,188	1.87	$3,642
Energy Efficient Products	$1,926	$3,126	0.62	-$1,200
Low Income Energy Efficiency	$2,654	$1,730	1.53	$924
Residential Subtotal	**$12,411**	**$9,044**	**1.37**	**$3,366**
C&I Energy Solutions for Business - Small	$2,913	$3,500	0.83	-$587
C&I Energy Solutions for Business - Large	$3,616	$2,620	1.38	$996
Non-Residential Subtotal	**$6,529**	**$6,120**	**1.07**	**$409**
Portfolio Total	**$18,940**	**$15,164**	**1.25**	**$3,776**
1 Costs and benefits are expressed as follows: PY13 = 2021, PY14 = 2022, PY15 = 2023, PY16 = 2024, PY17 = 2025				

D.3 High Impact Measure Net-to-Gross

Findings from net-to-gross research are not used to adjust compliance savings in Pennsylvania. Instead, net-to-gross research provides directional information for program planning purposes. Table 128 and Table 129 present net-to-gross findings for the one HIM studied in PY13[14].

Table 128: High-Impact Measure Net-to-Gross for Met-Ed and Penelec

HIM	Met-Ed			Penelec		
	Free ridership	Spillover	Net to Gross Ratio	Free ridership	Spillover	Net to Gross Ratio
Res Appliance Turn-In	61.0%	0.0%	39.0%	35.0%	0.0%	65.0%

Table 129: High-Impact Measure Net-to-Gross for Penn Power and WPP

HIM	Penn Power			West Penn Power		
	Free ridership	Spillover	Net to Gross Ratio	Free ridership	Spillover	Net to Gross Ratio
Res Appliance Turn-In	62.0%	0.0%	38.0%	30.0%	0.0%	70.0%

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

Table 130, Table 131, Table 132, and Table 133 present PY13 expenditures, by program, compared to the budget estimates set forth in the EE&C plan for PY13 for Met-Ed, Penelec, Penn Power, and WPP. All the dollars in these tables are presented in 2021 Dollars.

Table 130: Comparison of PYTD Expenditures to EE&C Plan ($1,000) Met-Ed

Program	PY13 Budget from EE&C Plan	PY13 Actual Expenditures	Ratio (Actual/Plan)
Energy Efficient Homes Program	$ 4,508.00	$ 3,259.93	0.72
Energy Efficient Products Program	$ 2,753.00	$ 2,616.02	0.95
Low Income Energy Efficiency Program	$ 3,104.00	$ 1,653.74	0.53
C&I Energy Solutions for Business Program - Small	$ 6,016.00	$ 1,752.70	0.29
C&I Energy Solutions for Business Program - Large	$ 7,469.00	$ 1,779.07	0.24
Total	**$ 23,850.00**	**$ 11,061.47**	**0.46**

[14] The Phase IV Evaluation Framework provides guidance to the 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 some program-level NTG information – that is, to over-sample HIMs, but they may also include non-HIMs in the research, as appropriate.

Table 131: Comparison of PYTD Expenditures to EE&C Plan ($1,000) Penelec

Program	PY13 Budget from EE&C Plan	PY13 Actual Expenditures	Ratio (Actual/Plan)
Energy Efficient Homes Program	$ 3,633.00	$ 2,021.38	0.56
Energy Efficient Products Program	$ 2,466.00	$ 1,825.83	0.74
Low Income Energy Efficiency Program	$ 3,378.00	$ 2,280.49	0.68
C&I Energy Solutions for Business Program - Small	$ 6,724.00	$ 3,100.08	0.46
C&I Energy Solutions for Business Program - Large	$ 5,817.00	$ 960.57	0.17
Total	**$ 22,018.00**	**$ 10,188.34**	**0.46**

Table 132: Comparison of PYTD Expenditures to EE&C Plan ($1,000) Penn Power

Program	PY13 Budget from EE&C Plan	PY13 Actual Expenditures	Ratio (Actual/Plan)
Energy Efficient Homes Program	$ 1,619.00	$ 1,012.28	0.63
Energy Efficient Products Program	$ 727.00	$ 714.04	0.98
Low Income Energy Efficiency Program	$ 850.00	$ 700.04	0.82
C&I Energy Solutions for Business Program - Small	$ 1,764.00	$ 643.79	0.36
C&I Energy Solutions for Business Program - Large	$ 1,499.00	$ 795.69	0.53
Total	**$ 6,459.00**	**$ 3,865.83**	**0.60**

Table 133: Comparison of PYTD Expenditures to EE&C Plan ($1,000) WPP

Program	PY13 Budget from EE&C Plan	PY13 Actual Expenditures	Ratio (Actual/Plan)
Energy Efficient Homes Program	$ 4,720.00	$ 3,273.96	0.69
Energy Efficient Products Program	$ 3,018.00	$ 2,295.92	0.76
Low Income Energy Efficiency Program	$ 3,308.00	$ 1,710.39	0.52
C&I Energy Solutions for Business Program - Small	$ 6,207.00	$ 3,185.20	0.51
C&I Energy Solutions for Business Program - Large	$ 5,913.00	$ 1,513.65	0.26
Total	**$ 23,166.00**	**$ 11,979.13**	**0.52**

Table 134, Table 135, Table 136, and Table 137 present P4TD expenditures, by program, compared to the budget estimates set forth in the EE&C plan through PY13 for Met-Ed, Penelec, Penn Power, and WPP respectively. All the dollars in these tables are presented in 2021 Dollars.

Table 134: Comparison of P4TD Expenditures to EE&C Plan ($1,000) Met-Ed

Program	Phase IV Budget from EE&C Plan through PY13	P3TD Actual Expenditures	Ratio (Actual/Plan)
Energy Efficient Homes Program	$ 4,508.00	$ 3,259.93	0.72
Energy Efficient Products Program	$ 2,753.00	$ 2,616.02	0.95
Low Income Energy Efficiency Program	$ 3,104.00	$ 1,653.74	0.53
C&I Energy Solutions for Business Program - Small	$ 6,016.00	$ 1,752.70	0.29
C&I Energy Solutions for Business Program - Large	$ 7,469.00	$ 1,779.07	0.24
Total	**$ 23,850.00**	**$ 11,061.47**	**0.46**

Table 135: Comparison of P4TD Expenditures to EE&C Plan ($1,000) Penelec

Program	Phase IV Budget from EE&C Plan through PY13	P3TD Actual Expenditures	Ratio (Actual/Plan)
Energy Efficient Homes Program	$ 3,633.00	$ 2,021.38	0.56
Energy Efficient Products Program	$ 2,466.00	$ 1,825.83	0.74
Low Income Energy Efficiency Program	$ 3,378.00	$ 2,280.49	0.68
C&I Energy Solutions for Business Program - Small	$ 6,724.00	$ 3,100.08	0.46
C&I Energy Solutions for Business Program - Large	$ 5,817.00	$ 960.57	0.17
Total	**$ 22,018.00**	**$ 10,188.34**	**0.46**

Table 136: Comparison of P4TD Expenditures to EE&C Plan ($1,000) Penn Power

Program	Phase IV Budget from EE&C Plan through PY13	P3TD Actual Expenditures	Ratio (Actual/Plan)
Energy Efficient Homes Program	$ 1,619.00	$ 1,012.28	0.63
Energy Efficient Products Program	$ 727.00	$ 714.04	0.98
Low Income Energy Efficiency Program	$ 850.00	$ 700.04	0.82
C&I Energy Solutions for Business Program - Small	$ 1,764.00	$ 643.79	0.36
C&I Energy Solutions for Business Program - Large	$ 1,499.00	$ 795.69	0.53
Total	**$ 6,459.00**	**$ 3,865.83**	**0.60**

Table 137: Comparison of P4TD Expenditures to EE&C Plan ($1,000) WPP

Program	Phase IV Budget from EE&C Plan through PY13	P3TD Actual Expenditures	Ratio (Actual/Plan)
Energy Efficient Homes Program	$ 4,720.00	$ 3,273.96	0.69
Energy Efficient Products Program	$ 3,018.00	$ 2,295.92	0.76
Low Income Energy Efficiency Program	$ 3,308.00	$ 1,710.39	0.52
C&I Energy Solutions for Business Program - Small	$ 6,207.00	$ 3,185.20	0.51
C&I Energy Solutions for Business Program - Large	$ 5,913.00	$ 1,513.65	0.26
Total	**$ 23,166.00**	**$ 11,979.13**	**0.52**

Table 138, Table 139, Table 140, and Table 141 compare PYTD verified gross program savings compare to the energy savings projections filed in the EE&C plan for Met-Ed, Penelec, Penn Power, and WPP respectively.

Table 138: Comparison of PYTD Actual Program Savings to EE&C Plan Projections for Met-Ed

Program	EE&C Plan Projections for PY13	PY13 VTD Gross MWh Savings	Ratio (Actual/Plan)
Energy Efficient Homes Program	15,584	10,266	0.66
Energy Efficient Products Program	8,978	9,703	1.08
Low Income Energy Efficiency Program	4,857	3,762	0.77
C&I Energy Solutions for Business Program - Small	19,418	5,562	0.29
C&I Energy Solutions for Business Program - Large	37,398	17,162	0.46
Total	**86,235**	**46,455**	**0.54**

Table 139: Comparison of PYTD Actual Program Savings to EE&C Plan Projections for Penelec

Program	EE&C Plan Projections for PY13	PY13 VTD Gross MWh Savings	Ratio (Actual/Plan)
Energy Efficient Homes Program	12,818	7,573	0.59
Energy Efficient Products Program	7,936	7,064	0.89
Low Income Energy Efficiency Program	5,155	5,942	1.15
C&I Energy Solutions for Business Program - Small	25,392	13,407	0.53
C&I Energy Solutions for Business Program - Large	32,592	2,035	0.06
Total	**83,893**	**36,021**	**0.43**

Table 140: Comparison of PYTD Actual Program Savings to EE&C Plan Projections for Penn Power

Program	EE&C Plan Projections for PY13	PY13 VTD Gross MWh Savings	Ratio (Actual/Plan)
Energy Efficient Homes Program	5,218	3,135	0.60
Energy Efficient Products Program	2,481	2,580	1.04
Low Income Energy Efficiency Program	1,418	1,716	1.21
C&I Energy Solutions for Business Program - Small	7,454	1,162	0.16
C&I Energy Solutions for Business Program - Large	7,720	7,340	0.95
Total	**24,291**	**15,934**	**0.66**

Table 141: Comparison of PYTD Actual Program Savings to EE&C Plan Projections for WPP

Program	EE&C Plan Projections for PY13	PY13 VTD Gross MWh Savings	Ratio (Actual/Plan)
Energy Efficient Homes Program	15,915	11,375	0.71
Energy Efficient Products Program	10,368	8,270	0.80
Low Income Energy Efficiency Program	5,677	5,817	1.02
C&I Energy Solutions for Business Program - Small	22,447	6,933	0.31
C&I Energy Solutions for Business Program - Large	34,263	11,243	0.33
Total	**88,670**	**43,638**	**0.49**

Table 142, Table 143, Table 144, and Table 145 compare Phase IV verified gross program savings compare to the energy savings projections filed in the EE&C plan for Met-Ed, Penelec, Penn Power, and WPP respectively.

Table 142: Comparison of Phase IV Actual Program Savings to EE&C Plan Projections for Phase IV for Met-Ed

Program	EE&C Plan through PY13	VTD Gross MWh Savings	Ratio (Actual/Plan)
Energy Efficient Homes Program	15,584	10,266	0.66
Energy Efficient Products Program	8,978	9,703	1.08
Low Income Energy Efficiency Program	4,857	3,762	0.77
C&I Energy Solutions for Business Program - Small	19,418	5,562	0.29
C&I Energy Solutions for Business Program - Large	37,398	17,162	0.46
Total	**86,235**	**46,455**	**0.54**

Table 143: Comparison of Phase IV Actual Program Savings to EE&C Plan Projections for Phase IV for Penelec

Program	EE&C Plan through PY13	VTD Gross MWh Savings	Ratio (Actual/Plan)
Energy Efficient Homes Program	12,818	7,573	0.59
Energy Efficient Products Program	7,936	7,064	0.89
Low Income Energy Efficiency Program	5,155	5,942	1.15
C&I Energy Solutions for Business Program - Small	25,392	13,407	0.53
C&I Energy Solutions for Business Program - Large	32,592	2,035	0.06
Total	**83,893**	**36,021**	**0.43**

Table 144: Comparison of Phase IV Actual Program Savings to EE&C Plan Projections for Phase IV for Penn Power

Program	EE&C Plan through PY13	VTD Gross MWh Savings	Ratio (Actual/Plan)
Energy Efficient Homes Program	5,218	3,135	0.60
Energy Efficient Products Program	2,481	2,580	1.04
Low Income Energy Efficiency Program	1,418	1,716	1.21
C&I Energy Solutions for Business Program - Small	7,454	1,162	0.16
C&I Energy Solutions for Business Program - Large	7,720	7,340	0.95
Total	**24,291**	**15,934**	**0.66**

Table 145: Comparison of Phase IV Actual Program Savings to EE&C Plan Projections for Phase IV for WPP

Program	EE&C Plan through PY13	VTD Gross MWh Savings	Ratio (Actual/Plan)
Energy Efficient Homes Program	15,915	11,375	0.71
Energy Efficient Products Program	10,368	8,270	0.80
Low Income Energy Efficiency Program	5,677	5,817	1.02
C&I Energy Solutions for Business Program - Small	22,447	6,933	0.31
C&I Energy Solutions for Business Program - Large	34,263	11,243	0.33
Total	**88,670**	**43,638**	**0.49**

Appendix E Evaluation Detail – EE Kits Sub-Initiative

E.1 Gross Impact Evaluation

The Energy Efficiency Kits (EE Kits) initiative has two sub-initiatives – EE Kits and Low-Income EE Kits. Each sub-initiative has two sub-components: EE Kits and School Education. Both components are administered by AMGC. The EE Kits component distributes kits to customers that submit an online or telephonic request for conservation kits and also provides "new mover" kits to customers who open new accounts. The School Education program component also distributes kits by mail but collaborates with local schools to develop an energy efficiency oriented educational component for children.

E.1.1 Gross Impact Evaluation Methodology

ADM's gross impact evaluation methodology was identical for all four EDCs and for all kit types, although separate samples and realization rates are developed for each kit type (School Kits, and EE Kits). In the EE Kit subprogram, distinct types of energy conservation kits were sent to customers depending on their hot water fuel source. The kits provided to customers with electric water heating included LED lamps, LED night lights, energy saving aerators, a furnace whistle, an energy saving showerhead, and electrical outlet gaskets. The kits provided to customers with non-electric water heating excludes the showerhead and aerators. School kits included LED lamps, LED night lights, a furnace whistle, and electrical outlet gaskets. Low-Income kits included advanced power strips instead of electrical outlet gaskets.

In evaluating the gross impact analysis for the energy conservation kits, four items must be determined:

1. The average energy savings and demand reduction for the kit elements that are installed;
2. The number and type of kits mailed to customers during the program year;
3. The installation rate or in-service rate (ISR) for the various kit elements;
4. The delivery rate, or percentage of reported kits sent to customers that were not received by customers, either because of shipping problems, customers moving, or other such scenarios.

The first item has been determined through application of the partially deemed savings protocols in the 2021 TRM. The second item, the total number and type of kits mailed to customers, is determined by reviewing the program tracking and reporting system.

The third item, installation rates, are determined through online and telephone customer verification surveys, except for LED lamps which are given "deemed" installation rates of 0.92 (later multiplied by the kit receipt rate as determined through surveys), consistent with the TRM.

For a particular site in a sample, the installation rate for each kit element takes on a binary value of 1, if the element is installed in accordance to the principles that define that element as an energy efficiency measure, and 0 otherwise. In particular, faucet aerators and energy saving

showerheads are only counted as “installed” if they are installed in a home that has electric water heating.

The final item, the delivery rate is determined through the online and phone survey instrument. Online and phone survey respondents are asked to indicate whether they received the conservation kit that was mailed to them. The reported in-service rates reflect the kit non-receipt rate as they are calculated as the ratio of the number of items installed to the number of items claimed to be delivered.

The survey instrument that was used to verify that the shipped energy conservation kits were installed asks a series of questions that determine how many of each item was installed and where each item was installed.

Both telephone and online surveys were conducted in PY13. The two modes yielded compatible results, so each survey response for a given stratum was given equal weight.

The gross realization rates for energy savings and demand reductions were driven primarily by in-service rates for the kit components. The realization rates for EE Kits were lower than expected in PY13. The ADM team examined results from over 600 completed surveys statewide to better understand the nature of the relatively low realization rates in PY13. The following factors contributed to the low realization rate:

- The in-service rates for showerheads and furnace whistles were markedly lower than historical results for the standard and electric water heating kits, while the same kits and components had typical in-service rates when distributed to the low-income sector.
- The in-service rate for aerators were also lower than historical norms, but only by about 10%.
- Kit receipt rates were reported to be approximately 91.5% (weighted over all EE Kits), which is about 5% lower than historical receipt rates.

While ISRs can fluctuate from survey to survey, the general trend indicated a systematic shift toward lower ISRs. The evaluators considered whether customer recall could be a potential cause, but survey lag times were similar to past efforts. Most kits in PY13 were sent in the final two months of the program year, so the survey lag time was necessarily less than three months. A related question is whether the surveys occurred before customers had a chance to install the kit contents? While this cannot be ruled out, it also seems unlikely to have suppressed the ISR measurement as research from past phases indicates that ISRs for non-lighting measures within kits do not climb appreciably after the first two months. Most of the PY13 verification surveys had two months of survey lag. Survey question formulation and wording were similar to past efforts, so the instrument itself is unlikely to cause such a shift in apparent ISRs. Other variables include a change in the program ICSP (however, the ICSP is an experienced implementer of kit programs and the School Education component, also administered by the ICSP, exhibited much higher ISRs for non-lighting components), and a change in outreach/recruitment approach – particularly with the “new mover kits”. It may be that customers that recently moved to a new home are less willing or likely to install efficiency features on their plumbing fixtures and furnaces. As of this writing, the ADM team is conducting

quantitative process evaluation activities to better understand the nature of the apparent ISR decline for the non-low-income subset of participants.

E.1.2 Sampling

The low-income kits are treated as a separate sub-initiative and are discussed in Appendix P. Each kit type was treated as a separate stratum within the sampling initiative. The sample designs for the four EDCs are shown in Table 146, Table 147, Table 148, and Table 149.

Table 146: EE Kits Sub-Initiative Gross Impact Sample Design for Met-Ed

Stratum	Population Size	Achieved Sample Size	Evaluation Activity
EE Kits - Electric	25,985	81	Survey (phone + online)
EE Kits - Standard	18,264	85	
School Education kits	4,535	524	
Program Total	**48,784**	**690**	

Table 147: EE Kits Sub-Initiative Gross Impact Sample Design for Penelec

Stratum	Population Size	Achieved Sample Size	Evaluation Activity
EE Kits - Electric	19,417	68	Survey (phone + online)
EE Kits - Standard	18,559	82	
School Education kits	2,629	323	
Program Total	**40,605**	**473**	

Table 148: EE Kits Sub-Initiative Gross Impact Sample Design for Penn Power

Stratum	Population Size	Achieved Sample Size	Evaluation Activity
EE Kits - Electric	5,588	33	Survey (phone + online)
EE Kits - Standard	5,548	77	
School Education kits	856	8	
Program Total	**11,992**	**118**	

Table 149: EE Kits Sub-Initiative Gross Impact Sample Design for WPP

Stratum	Population Size	Achieved Sample Size	Evaluation Activity
EE Kits - Electric	29,346	86	Survey (phone + online)
EE Kits - Standard	21,642	92	
School Education kits	2,422	179	
Program Total	**53,410**	**357**	

E.1.3 Results for Energy

The gross realization rates for energy, along with relative precisions, are shown in Table 150, Table 151, Table 152, and Table 153 for Met-Ed, Penelec, Penn Power, and WPP respectively.

Table 150: EE Kits Sub-Initiative Energy Gross Realization Rates for Met-Ed

Stratum	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
EE Kits - Electric	6,077	57%	1.0	16.0%
EE Kits - Standard	2,918	79%	1.0	15.6%
School Education kits	724	121%	1.0	5.9%
Program Total	**9,720**	**68.2%**	**1.0**	**10.0%**

Table 151: EE Kits Sub-Initiative Energy Gross Realization Rates for Penelec

Stratum	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
EE Kits - Electric	4,443	92%	1.0	17.4%
EE Kits - Standard	2,951	85%	1.0	15.9%
School Education kits	418	129%	1.0	7.5%
Program Total	**7,812**	**91.6%**	**1.0**	**11.5%**

Table 152: EE Kits Sub-Initiative Energy Gross Realization Rates for Penn Power

Stratum	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
EE Kits - Electric	1,312	72%	1.0	25.0%
EE Kits - Standard	913	74%	1.0	16.3%
School Education kits	141	138%	1.0	50.7%
Program Total	**2,366**	**76.9%**	**1.0**	**15.4%**

Table 153: EE Kits Sub-Initiative Energy Gross Realization Rates for WPP

Stratum	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
EE Kits - Electric	6,932	62%	1.0	15.5%
EE Kits - Standard	3,570	87%	1.0	15.0%
School Education kits	400	124%	1.0	10.4%
Program Total	**10,901**	**72.5%**	**1.0**	**10.3%**

E.1.4 Results for Demand

The gross realization rates for demand, along with relative precisions, are shown in Table 154, Table 155, Table 156, Table 157 for Met-Ed, Penelec, Penn Power, and WPP respectively.

Table 154: EE Kits Sub-Initiative Demand Gross Realization Rates for Met-Ed

Stratum	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
EE Kits - Electric	0.64	49.4%	1.0	16%
EE Kits - Standard	0.32	75.1%	1.0	16%
School Education kits	0.08	101.5%	1.0	6%
Program Total	**1.05**	**61.3%**	**1.0**	**9.9%**

Table 155: EE Kits Sub-Initiative Demand Gross Realization Rates for Penelec

Stratum	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
EE Kits - Electric	0.44	84.4%	1.0	17%
EE Kits - Standard	0.29	81.8%	1.0	16%
School Education kits	0.04	106.0%	1.0	8%
Program Total	**0.78**	**84.6%**	**1.0**	**11.5%**

Table 156: EE Kits Sub-Initiative Gross Realization Rates for Penn Power

Stratum	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
EE Kits - Electric	0.14	61.5%	1.0	25%
EE Kits - Standard	0.10	71.6%	1.0	16%
School Education kits	0.02	91.5%	1.0	51%
Program Total	**0.26**	**67.3%**	**1.0**	**14.8%**

Table 157: EE Kits Sub-Initiative Demand Gross Realization Rates for WPP

Stratum	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
EE Kits - Electric	0.76	59.6%	1.0	16%
EE Kits - Standard	0.43	89.2%	1.0	15%
School Education kits	0.05	104.7%	1.0	10%
Program Total	**1.24**	**71.7%**	**1.0**	**10.3%**

Note that the overall precision for the EE Kits initiative is the combined precision of the low income and non-low-income components. The combined precisions for each EDC are shown in Table 158 below.

Table 158: EE Kits Initiative Sampling Precisions

EDC	Relative Precision at 85% C.L., Energy	Relative Precision at 85% C.L., Demand
Met-Ed	8.9%	8.9%
Penelec	9.3%	9.3%
Penn Power	11.7%	11.2%
West Penn Power	8.4%	8.4%

E.2 Net Impact Evaluation

E.2.1 Net Impact Evaluation Methodology

A net impact evaluation was not conducted in PY13. Net impact evaluation results from the Phase III evaluation effort will be applied to the initiative for PY13 and PY14. The net-to-gross evaluation for the Energy Efficiency Kits measures in Phase III was based on self-report data from program participants. The following sections provide information related to the historical net impact evaluation effort that informs the initiative's NTG values for PY13 and PY14.

E.2.2 Sampling

The sample designs for the four EDCs are shown Table 159. Note that the survey effort crossed program years, with one effort targeting PY8 and PY9 participants, and the more recent Online Audit Kit survey targeting PY10 customers. PY10 population counts are listed in the table below, though the counts are similar to those of PY8 and PY9.

Table 159: EE Kits Initiative Net-to-Gross Sampling

EDC	Population Size	Achieved Sample Size (PY8/9)	Achieved Sample Size (PY10 Online Audits Only)	Achieved Sample Size (Normalized)	Response Rate
Met-Ed	48,784	172	97	172	14.0%
Penelec	40,605	171	71	162	13.3%
Penn Power	11,992	181	72	72	9.3%
WPP	53,410	193	90	102	9.0%

E.2.3 Net Impact Evaluation Results

The PYTD verified gross energy impacts, free ridership, spillover, net-to-gross ratios, and relative precisions for net-to-gross are shown in Table 160. Results below are weighted for the PY8 and PY10 survey efforts as described above for survey counts.

Table 160: EE Kits Initiative Net-to-Gross Results

Stratum	PYVTD MWh	Free Ridership (%)	Spillover (%)	NTG Ratio	Relative Precision (@ 85% CL)
Met-Ed	6,629	21.0%	3.0%	82.0%	5.5%
Penelec	7,156	20.8%	4.3%	83.5%	5.7%
Penn Power	1,818	27.0%	11.0%	84.0%	8.5%
WPP	7,901	22.7%	32.9%	110.3%	7.1%

Appendix F Evaluation Detail – Residential Direct Install Initiative

The Residential Direct Install (Res DI) Initiative is implemented by CLEAResult. A participant in this program is defined as a unique address in the program, multiple projects can be installed at one address.

This program consists of comprehensive residential energy audits performed by CLEAResult along with energy efficiency measures directly installed in customers' residences. The audit evaluates the performance of the participant's home heating and cooling system, insulation, windows, appliances, building shell and lighting equipment. The audit is used to identify energy savings opportunities. Some low-cost energy savings measures are directly installed in the consumer home during the audit. Low-cost measures can include light bulbs, nightlights, smart power strips, furnace whistles, aerators, showerheads, and pipe insulation. Major measures, (attic insulation, wall insulation, air sealing, and windows) can also be installed. These measures are usually installed after the initial audit.

For the initial in-home audit, up to $450 will be allocated to cover the costs of the customer audit fee ($150) and the rebates for the direct-install measures (capped at $300). The customer audit fee is paid as a rebate directly to the trade ally by the CSP. The audit fee covers the auditor time, blower door test, home energy education, whole-home analysis, and the home energy report. Additional energy use education and recommendations for further measure installation are also part of the service. After the audit and direct-install measures are completed, the auditor will summarize their recommended measures, inform the customer of available rebates, and provide the customer with a complete list of the audit fee and direct-install measure costs covered by the Comprehensive Audit program. They also provide a FirstEnergy leave-behind flyer that includes information to help the customer with the next steps. If customers are interested in direct-install measures above the $300 cap or additional testing not covered in the program, auditors can work with the customer to complete the requests.

F.1 Gross Impact Evaluation

F.1.1 Gross Impact Evaluation Methodology

Gross impact evaluation for the Res DI Initiative utilized a stratified sampling plan. The projects are placed into one of two following strata: projects with weatherization measures, and non-weatherization projects.

The program tracking and reporting system is at the measure level, but also identifies the rebate application and participant address associated with each measure. In general, there can be multiple measures per application and even multiple applications per household. An example of the latter scenario is when a household first undergoes an initial audit with direct installation of

low-cost measures, but later has major measures installed as identified in the audit report. The subsequent retrofits would be captured in a separate rebate application.

ADM aggregated all measures by unique address and then placed each household in one of two strata.

Evaluation activities for each measure type is described below.

F.1.1.1 Major Measures

Engineering calculation reviews were performed on all participants with major measures. Engineering calculations were checked for TRM compliance. The customer's zip code was used to determine EFLHs, HDDs, and CDDs. Reviews also consisted of a document review to verify HVAC equipment and water heating equipment.

Insulation areas, baseline and post-installation insulation R-values were provided in the rebate forms or from accompanying project documentation.

Residential air sealing measures used $CFM50_{post}$ and $CFM50_{pre}$ values found in the project rebate forms.

F.1.1.2 Non-Weatherization Measures

A sample of customers projects were used to determine measure level in-service rates. Furthermore, a document review when applicable was used to verify water heating. Non-weatherization measures include light bulbs, showerheads, night lights, smart power strips, aerators, pipe wrap insulation, and smart thermostats. All measures were evaluated according to their respective protocols in the 2021 PA TRM.

F.1.2 Sampling

Table 161, Table 162, Table 163, and Table 164 show sample sizes for Met-Ed, Penelec, Penn Power, and WPP respectively.

Table 161: Res DI Initiative Gross Impact Sample Design for Met-Ed

Stratum	MWh Threshold	Population Size	Achieved Sample Size	Evaluation Activity
Non-Weatherization	na	42	33	Inspection of QA/QC forms, desk reviews
Weatherization	na	0	0	
Program Total		**42**	**33**	

Table 162: Res DI Initiative Gross Impact Sample Design for Penelec

Stratum	MWh Threshold	Population Size	Achieved Sample Size	Evaluation Activity
Non-Weatherization	na	6	6	Inspection of QA/QC forms, desk reviews
Weatherization	na	0	0	
Program Total		**6**	**6**	

Table 163: Res DI Initiative Gross Impact Sample Design for Penn Power

Stratum	MWh Threshold	Population Size	Achieved Sample Size	Evaluation Activity
Non-Weatherization	na	30	30	Inspection of QA/QC forms, desk reviews
Weatherization	na	1	1	
Program Total		**31**	**31**	

Table 164: Res DI Initiative Gross Impact Sample Design for WPP

Stratum	MWh Threshold	Population Size	Achieved Sample Size	Evaluation Activity
Non-Weatherization	na	48	33	Inspection of QA/QC forms, desk reviews
Weatherization	na	0	0	
Program Total		**48**	**33**	

F.1.3 Results for Energy

The gross realization rates for energy, along with relative precisions, are shown in Table 165, Table 166, Table 167, and Table 168 for Met-Ed, Penelec, Penn Power, and WPP respectively.

Table 165: Res DI Initiative Energy Gross Realization Rates for Met-Ed

Stratum	MWh Threshold	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
Non-Weatherization	na	28	110.7%	0.4	5%
Weatherization	na	0	100.0%	0.4	0%
Program Total		**28**	**110.7%**	**n/a**	**5.7%**

Table 166: Res DI Initiative Energy Gross Realization Rates for Penelec

Stratum	MWh Threshold	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
Non-Weatherization	na	5	124.0%	0.4	0%
Weatherization	na	0	100.0%	0.4	0%
Program Total		**5**	**124.0%**	**n/a**	**0.0%**

Table 167: Res DI Initiative Energy Gross Realization Rates for Penn Power

Stratum	MWh Threshold	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
Non-Weatherization	na	17	119.9%	0.4	0%
Weatherization	na	2	104.2%	0.4	0%
Program Total		**19**	**118.6%**	**n/a**	**0.0%**

Table 168: Res DI Initiative Energy Gross Realization Rates for WPP

Stratum	MWh Threshold	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
Non-Weatherization	na	24	117.7%	0.4	6%
Weatherization	na	0	100.0%	0.4	0%
Program Total		**24**	**117.7%**	**n/a**	**7.8%**

F.1.4 Results for Demand

The gross realization rates for demand, along with relative precisions, are shown Table 169, Table 170, Table 171, and Table 172 for Met-Ed, Penelec, Penn Power, and WPP respectively.

Table 169: Res DI Initiative Demand Gross Realization Rates for Met-Ed

Stratum	MWh Threshold	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
Non-Weatherization	na	0.01	74.5%	0.4	5%
Weatherization	na	0.00	100.0%	0.4	0%
Program Total		**0.01**	**74.5%**	**n/a**	**2.6%**

Table 170: Res DI Initiative Demand Gross Realization Rates for Penelec

Stratum	MWh Threshold	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
Non-Weatherization	na	0.00	69.1%	0.4	0%
Weatherization	na	0.00	100.0%	0.4	0%
Program Total		**0.00**	**69.1%**	**n/a**	**0.0%**

Table 171: Res DI Initiative Gross Realization Rates for Penn Power

Stratum	MWh Threshold	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
Non-Weatherization	na	0.00	79.5%	0.4	0%
Weatherization	na	0.00	95.2%	0.4	0%
Program Total		**0.00**	**80.1%**	**n/a**	**0.0%**

Table 172: Res DI Initiative Demand Gross Realization Rates for WPP

Stratum	MWh Threshold	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
Non-Weatherization	na	0.00	84.9%	0.4	6%
Weatherization	na	0.00	100.0%	0.4	0%
Program Total		**0.00**	**84.9%**	**n/a**	**4.0%**

F.2 NET IMPACT EVALUATION

F.2.1 Net Impact Evaluation Methodology

A net impact evaluation was not conducted in PY13. Net impact evaluation results from the Phase III evaluation effort will be applied to the initiative for PY13. The net-to-gross evaluation for the Res DI initiative in Phase III was based on self-report data from program participants. The following sections provide information related to the historical net impact evaluation effort that informs the initiative's NTG values for PY13 and PY14.

F.2.2 Sampling

The sample of participants was selected from both PY9 and PY10, since the small participation counts made it difficult to reach sample quotas by drawing from participants from just one program year. The population sizes (combined for PY9 and PY10), achieved sample sizes, and response rates are shown in Table 173 below.

Table 173: Res DI Initiative Net-to-Gross Sampling

EDC	Population Size	Achieved Sample Size	Response Rate
Met-Ed	277	75	27.0%
Penelec	383	113	30.0%
Penn Power	170	70	41.0%
WPP	298	73	25.0%

F.2.3 Net Impact Evaluation Results

The PYTD verified gross energy impacts, free ridership, spillover, net-to-gross ratios, and relative precisions for net-to-gross are shown in Table 174. Overall, the program had 18% free ridership and 19% spillover, resulting in an NTG of 101% (ranging from 95% to 104% among the four PA Companies). The top five measures contributing to spillover savings were air sealing, attic insulation, wall insulation, LEDs, and pipe wrap.

Table 174: Res DI Initiative Net-to-Gross Results by EDC

Stratum	PYVTD MWh	Free Ridership (%)	Spillover (%)	NTG Ratio	Relative Precision (@ 85% CL)
Met-Ed	31	19.0%	14.0%	95.0%	7.1%
Penelec	6	16.0%	19.0%	103.0%	5.7%
Penn Power	22	19.0%	20.0%	100.0%	6.6%
WPP	28	20.0%	24.0%	104.0%	7.3%

Appendix G Evaluation Detail – Residential New Construction Initiative

The Residential New Construction program incentivizes builders to adopt energy efficient building practices. This includes building envelope improvements, high-efficiency HVAC equipment, duct sealing, and installation of ENERGY STAR® appliances, smart thermostats, and lighting. Participants are defined as each unique dwelling unit (e.g. unique mailing address).

All submitted projects used REM/Rate to generate reported energy and demand impacts.

G.1 Gross Impact Evaluation

G.1.1 Gross Impact Evaluation Methodology

Gross impact evaluation for the Residential New Construction (Res NC) Initiative involved reviewing the software models submitted with each sampled project, performing on-site verification of model inputs, and re-running modified models through the same software used by program HERS raters. Models were modified based on site-inspection information obtained by the implementer (PSD) during their quality control inspections, or ADM. Modified models were then run against the reference home to obtain ex post energy savings and demand reductions. Ex post demand reductions for lighting, appliances, and water heaters were obtained from corresponding TRM algorithms. Additional algorithm parameters required by the TRM but not required by software inputs were obtained through the on-site verification efforts.

G.1.1.1 On-Site Inspections

Two types of on-site inspections were performed for the impact evaluation effort:

- Diagnostic inspection w/blower door and duct blaster
- Visual inspection without blower door and duct blaster

Diagnostic inspections include the same activity as visual inspections with the addition of blower door and duct blaster testing to verify duct leakage and whole house infiltration rates.

Visual inspection includes the following:

- Building Characteristics
  - Orientation (N, NE, E, SE, etc.)
  - Housing type (SF detached, Townhouse inside unit, Townhouse end unit, etc.)
  - Number of floors on or above grade
  - Conditioned sq. ft.
  - Number of bedrooms
  - Window type, size and orientation
  - Ceiling heights
- Envelope
  - Foundation type (slab, conditioned basement, unconditioned basement, etc.)
  - Wall and ceiling insulation R-values

    - Slab and framed floor insulation
    - Rim/band joist insulation
    - Number of exterior doors
- HVAC
    - Make and model
    - SEER, capacity, and HSPF
    - For gas furnaces, electric auxiliary energy usage (EAE) as obtained from the AHRI database
    - Smart thermostat is installed
    - Duct location (conditioned space, attic)
    - Type of mechanical ventilation if necessary
- Water heating
    - Type (storage, instantaneous)
    - Fuel (gas, electric resistance, heat pump)
    - Size in gallons
    - Energy factor as obtained from the AHRI database
- Lighting
    - Percent efficient installed interior, exterior, and in the garage. In cases of discrepancies, lighting counts were reported in the notes section of the checklist. ADM visual inspections reported lighting counts in each of these three areas.
    - Identification of source (incandescent, LED, or CFL)
- Appliances
    - An ENERGY STAR® appliance was installed at the time of inspection
    - kWh/yr for refrigerators and dishwashers
    - Fuel for ranges and cooktops
    - ADM visual inspections included make and model of each installed appliance

G.1.1.2 Engineering Model Reviews

Submitted building models were reviewed as part of the evaluation activities. These reviews included the following activities:

- Baseline specifications are accurate per the TRM
- Model inputs are reasonable and self-consistent
- Models are consistent with actual as-built homes

  Each sampled home was reviewed for consistency with actual as-built homes. In cases where submitted models differed from as-built homes, models were modified prior to generating ex post values.

G.1.1.3 TRM Impact Evaluation

The PA TRM requires that demand impacts from lighting and appliances are evaluated with relevant TRM protocols rather than within engineering simulation models. Since REM/Rate does not produce peak load outputs for end uses other than cooling equipment, demand impacts for efficient lighting and appliances must be calculated externally with TRM protocols.

G.1.2 Sampling

Table 175, Table 176, Table 177, and Table 178 show sample sizes for Met-Ed, Penelec, Penn Power, and WPP respectively. New Homes and smart thermostats within those homes make up the two qualitative sampling strata.

Table 175: RES NC Initiative Gross Impact Sample Design for Met-Ed

Stratum	Population Size	Achieved Sample Size	Evaluation Activity
New Homes	1,001	23	Model Review / On-Site
Smart Thermostats	89	45	
Program Total	**1,090**	**68**	

Table 176: RES NC Initiative Gross Impact Sample Design for Penelec

Stratum	Population Size	Achieved Sample Size	Evaluation Activity
New Homes	133	39	Model Review / On-Site
Smart Thermostats	1	1	
Program Total	**134**	**40**	

Table 177: RES NC Initiative Gross Impact Sample Design for Penn Power

Stratum	Population Size	Achieved Sample Size	Evaluation Activity
New Homes	406	25	Model Review / On-Site
Smart Thermostats	240	72	
Program Total	**646**	**97**	

Table 178: RES NC Initiative Gross Impact Sample Design for WPP

Stratum	Population Size	Achieved Sample Size	Evaluation Activity
New Homes	808	25	Model Review / On-Site
Smart Thermostats	203	59	
Program Total	**1,011**	**84**	

G.1.3 Results for Energy

The gross realization rates for energy, along with relative precisions, are shown in Table 179, Table 180, Table 181, and Table 182 for Met-Ed, Penelec, Penn Power, and WPP respectively. Gross realization rates for Smart Thermostats were low primarily due to a simplified ex ante calculation methodology which assigned energy savings on a per square-foot basis. While the ex-ante calculations appear to be reasonable, the main cause of the initial overestimation is that the new homes in the program are so energy efficient that the installed tonnage is very low relative to the building's floorspace (on average, 1,300 sqft per ton). The reduced HVAC tonnage relative to the floorspace resulted in reduced energy impacts as calculated by the algorithm. Evaluation results from PY13 will be used to adjust ex-ante energy savings estimates for PY14.

Table 179: RES NC Initiative Energy Gross Realization Rates for Met-Ed

Stratum	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
New Homes	2,289	98.6%	0.5	14.8%
Smart Thermostats	28	52.7%	0.5	7.5%
Program Total	**2,317**	**98.1%**	**0.5**	**14.7%**

Table 180: RES NC Initiative Energy Gross Realization Rates for Penelec

Stratum	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
New Homes	223	102.8%	0.5	9.7%
Smart Thermostats	0	68.2%	0.5	0.0%
Program Total	**223**	**102.8%**	**0.5**	**9.7%**

Table 181: RES NC Initiative Energy Gross Realization Rates for Penn Power

Stratum	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
New Homes	664	101.5%	0.5	13.9%
Smart Thermostats	69	26.5%	0.5	7.1%
Program Total	**733**	**94.5%**	**0.5**	**13.6%**

Table 182: Res DI Initiative Energy Gross Realization Rates for WPP

Stratum	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
New Homes	1,369	106.1%	0.5	14.2%
Smart Thermostats	61	26.7%	0.5	7.9%
Program Total	**1,430**	**102.7%**	**0.5**	**14.0%**

G.1.4 Results for Demand

The gross realization rates for demand, along with relative precisions, are shown Table 183, Table 184, Table 185, and Table 186 for Met-Ed, Penelec, Penn Power, and WPP respectively.

Table 183: RES NC Initiative Demand Gross Realization Rates for Met-Ed

Stratum	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
New Homes	0.91	69.0%	0.5	14.8%
Smart Thermostats	0.01	64.7%	0.5	7.5%
Program Total	**0.92**	**69.0%**	**0.5**	**14.7%**

Table 184: RES NC Initiative Demand Gross Realization Rates for Penelec

Stratum	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
New Homes	0.11	79.8%	0.5	9.7%
Smart Thermostats	0.00	86.8%	0.5	0.0%
Program Total	**0.11**	**79.8%**	**0.5**	**9.7%**

Table 185: RES NC Initiative Gross Realization Rates for Penn Power

Stratum	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
New Homes	0.35	60.6%	0.5	13.9%
Smart Thermostats	0.02	34.1%	0.5	7.1%
Program Total	**0.37**	**59.4%**	**0.5**	**13.6%**

Table 186: RES NC Initiative Demand Gross Realization Rates for WPP

Stratum	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
New Homes	0.66	58.2%	0.5	14.2%
Smart Thermostats	0.02	33.0%	0.5	7.9%
Program Total	**0.67**	**57.6%**	**0.5**	**14.0%**

G.2 Net Impact Evaluation

G.2.1 Net Impact Evaluation Methodology

A net impact evaluation was not conducted in PY13. Net impact evaluation results from the Phase III evaluation effort will be applied to the initiative for PY13. In Phase III, Tetra Tech performed retrospective net-to-gross (NTG) analysis by tailoring the common approach defined in the Pennsylvania Act 129 Phase III Statewide Evaluation Framework to the New Homes program design. A series of free-ridership and spillover questions included in the participant

interviews ask program participants about the actions they would have taken if the program had not been offered and whether various program aspects influenced their actions. A total of ten builders were interviewed from the 42 total builders that participate in the program, across the four PA Companies. The top five builders were selected with certainty, and five of the smaller builders were randomly selected. Builder responses resulted in a free ridership rate of 27 percent for PY10. The net-to-gross research did not identify any participant spillover. Most commonly, builders reported that they submitted all homes that they built to the FirstEnergy program. Any homes that were not submitted to the program were reported as either not meeting program requirements (resulting in no savings) or the builder reported the program did not influence the efficiency of the homes they built outside the program. Due to the homogeneity of the program approach across the four PA Companies, and the relatively small number of builders, the same NTG ratio (73%) is applied to all four Companies' programs.

Appendix H Evaluation Detail – Residential Multifamily Direct Install Initiative

The Residential Multifamily Direct Install (Res MF) Initiative is implemented by CLEAResult. A participant in this program is defined as a unique address in the program, multiple projects can be installed at one address.

This program consists of brief energy audits performed by CLEAResult along with energy efficiency measures directly installed in customers' dwelling units. The audit is used to identify low-cost energy savings opportunities, with associated energy savings measures directly installed in the unit during the audit. Low-cost measures installed in PY13 included light bulbs, nightlights, smart power strips.

H.1 Gross Impact Evaluation

H.1.1 Gross Impact Evaluation Methodology

Gross impact evaluation for the Res DI Initiative utilized a stratified sampling plan. The projects are placed into one of two following strata: projects with capital cost measures, and projects with only low-cost measures.

The program tracking and reporting system is at the measure level, but also identifies the rebate application and participant address associated with each measure. ADM aggregated all measures by unique address and then placed each household in one of the two strata.

Evaluation activities for each measure type is described below.

H.1.1.1 Capital Cost Measures

While the EE&C plan allows for installation of efficient appliances or PTACs and PTHPs, there were only 11 audits completed statewide in PY13 and opportunities to install such measures did not arise.

H.1.1.2 Low-Cost Measures

Due to the low participation and impacts in this initiative in PY13, desk reviews were the most appropriate evaluation activity. ADM evaluators compared audit reports and invoices to program tracking and reporting data to reconcile quantities of installed measures. The evaluators also independently calculated impacts for all measures according to their respective protocols in the 2021 PA TRM.

H.1.2 Sampling

Table 187, Table 188, Table 189, and Table 190 show sample sizes for Met-Ed, Penelec, Penn Power, and WPP respectively.

Table 187: Res MF Initiative Gross Impact Sample Design for Met-Ed

Stratum	MWh Threshold	Population Size	Achieved Sample Size	Evaluation Activity
Low-Cost	na	0	0	Inspection of QA/QC verification forms, desk reviews
Capital Cost	na	0	0	
Program Total		**0**	**0**	

Table 188: Res MF Initiative Gross Impact Sample Design for Penelec

Stratum	MWh Threshold	Population Size	Achieved Sample Size	Evaluation Activity
Low-Cost	na	7	7	Inspection of QA/QC verification forms, desk reviews
Capital Cost	na	0	0	
Program Total		**7**	**7**	

Table 189: Res MF Initiative Gross Impact Sample Design for Penn Power

Stratum	MWh Threshold	Population Size	Achieved Sample Size	Evaluation Activity
Low-Cost	na	0	0	Inspection of QA/QC verification forms, desk reviews
Capital Cost	na	0	0	
Program Total		**0**	**0**	

Table 190: Res MF Initiative Gross Impact Sample Design for WPP

Stratum	MWh Threshold	Population Size	Achieved Sample Size	Evaluation Activity
Low-Cost	na	4	4	Inspection of QA/QC verification forms, desk reviews
Capital Cost	na	0	0	
Program Total		**4**	**4**	

H.1.3 Results for Energy

The gross realization rates for energy, along with relative precisions, are shown in Table 191, Table 192, Table 193, and Table 194 for Met-Ed, Penelec, Penn Power, and WPP respectively.

Table 191: Res MF Initiative Energy Gross Realization Rates for Met-Ed

Stratum	MWh Threshold	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
Low-Cost	na	0	0.0%	0.4	100%
Capital Cost	na	0	0.0%	0.4	100%
Program Total		**0**	**0.0%**	**n/a**	**100.0%**

Table 192: Res MF Initiative Energy Gross Realization Rates for Penelec

Stratum	MWh Threshold	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
Low-Cost	na	2	140.3%	0.4	0%
Capital Cost	na	0	0.0%	0.4	100%
Program Total		**2**	**140.3%**	**n/a**	**0.0%**

Table 193: Res MF Initiative Energy Gross Realization Rates for Penn Power

Stratum	MWh Threshold	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
Low-Cost	na	0	0.0%	0.4	100%
Capital Cost	na	0	0.0%	0.4	100%
Program Total		**0**	**0.0%**	**n/a**	**100.0%**

Table 194: Res MF Initiative Energy Gross Realization Rates for WPP

Stratum	MWh Threshold	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
Low-Cost	na	1	131.5%	0.4	0%
Capital Cost	na	0	0.0%	0.4	100%
Program Total		**1**	**131.5%**	**n/a**	**0.0%**

H.1.4 Results for Demand

The gross realization rates for demand, along with relative precisions, are shown in Table 195, Table 196, Table 197, and Table 198 for Met-Ed, Penelec, Penn Power, and WPP respectively.

Table 195: Res MF Initiative Demand Gross Realization Rates for Met-Ed

Stratum	MWh Threshold	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
Low-Cost	na	0.00	0.0%	0.4	100%
Capital Cost	na	0.00	0.0%	0.4	100%
Program Total		**0.00**	**0.0%**	**n/a**	**100.0%**

Table 196: Res MF Initiative Demand Gross Realization Rates for Penelec

Stratum	MWh Threshold	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
Low-Cost	na	0.00	72.9%	0.4	0%
Capital Cost	na	0.00	0.0%	0.4	0%
Program Total		**0.00**	**72.9%**	**n/a**	**0.0%**

Table 197: Res MF Initiative Gross Realization Rates for Penn Power

Stratum	MWh Threshold	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
Low-Cost	na	0.00	0.0%	0.4	100%
Capital Cost	na	0.00	0.0%	0.4	100%
Program Total		**0.00**	**0.0%**	**n/a**	**100.0%**

Table 198: Res MF Initiative Demand Gross Realization Rates for WPP

Stratum	MWh Threshold	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
Low-Cost	na	0.00	88.5%	0.4	0%
Capital Cost	na	0.00	0.0%	0.4	0%
Program Total		**0.00**	**88.5%**	**n/a**	**0.0%**

H.2 Net Impact Evaluation

H.2.1 Net Impact Evaluation Methodology

A net impact evaluation was not conducted in PY13. Net impact evaluation results from the Phase III evaluation effort for the similar single-family audit and direct install program will be applied to the initiative for PY13, with the exception that spillover is set to zero for this program on grounds that additional energy efficiency opportunities are limited due to the tenant needing permission to make significant efficiency changes to the dwelling unit (the Phase III net impact evaluation attributed spillover to measures such as air sealing, insulation, pipe wrap, and additional LEDs). The population sizes, achieved sample sizes, and response rates for the proxy evaluation effort from Phase III are shown in Table 199 below.

Table 199: Res MF Initiative Net-to-Gross Sampling

EDC	Population Size	Achieved Sample Size	Response Rate
Met-Ed	277	75	27.0%
Penelec	383	113	30.0%
Penn Power	170	70	41.0%
WPP	298	73	25.0%

H.2.2 Net Impact Evaluation Results

The PYTD verified gross energy impacts, free ridership, spillover, net-to-gross ratios, and relative precisions for net-to-gross are shown in Table 200.

Table 200: Res MF Initiative Net-to-Gross Results by EDC

Stratum	PYVTD MWh	Free Ridership (%)	Spillover (%)	NTG Ratio	Relative Precision (@ 85% CL)
Met-Ed	31	19.0%	0.0%	81.0%	7.1%
Penelec	6	16.0%	0.0%	84.0%	5.7%
Penn Power	22	19.0%	0.0%	100.0%	6.6%
WPP	28	20.0%	0.0%	80.0%	7.3%

Appendix I Evaluation Detail – Residential Online Audit Initiative

Online Audit is a component of the Behavioral subprogram—a subprogram administered as part of both the Energy Efficient Homes and Low-Income Energy Efficiency programs. The Online Audit component provides residential customers with a web-based platform that provides: (1) visualizations of a customers' energy use, (2) tips on ways customers can save energy, and (3) promoting other programs in FirstEnergy's residential energy efficiency portfolio. The administration of this component is divided between standard residential customers, as part of the Energy Efficient Homes Program, or Low-Income customers, as part of the Low-Income Energy Efficiency Program. Online Audits are administered as a customer opt-in program, meaning that customers can freely enroll in the program at any time.

I.1 Gross Impact Evaluation

I.1.1.1 Data Gathering

ADM receives an extract of monthly billing data from FirstEnergy twice a month and an extract of hourly AMI data daily. ADM receives a monthly extract of FirstEnergy's T&R system. Additionally, ADM's team has access to run custom extracts directly from the T&R system as well.

I.1.1.2 Data Preparation

During Phase III, FirstEnergy converted most residential accounts to AMI. Thus, ADM leveraged the daily AMI extract provided by FirstEnergy to conduct the billing data analysis for Online Audits in Phase IV.

ADM's preparation of AMI data is as follows:

- Residential AMI data is filtered by cohort by the treatment and comparison group account numbers.
- Estimated AMI data may be present in the AMI data as a means of backfilling missing reads. Rather than interpolating estimated AMI data, estimated AMI data and any calendar day containing estimated AMI data is removed from the data set on a per-customer basis.
- Calendar days with missing/incomplete data are excluded from analysis on a per customer basis.
- The total daily kWh per customer is taken for each customer for each day by summing across the kWh for each calendar day.
- An outlier filter of +/- 300 kWh per day was applied to the data set.
- An average daily kWh per month for each customer is taken by averaging the total daily kWh for each customer for each calendar month. This is done to interpolate across any missing days in the calendar month.

I.1.1.3 Billing Analysis

Analysis Population

As part of the development of FirstEnergy's PY13 EM&V Plan, a resampling exercise was undertaken to determine the optimal number of customers needed to measure a statistically significant result at the 85% confidence level at the projected per-customer savings level proposed by the EE&C Plan (approximately 4,000 customers per EDC). Because Penn Power lacked enough customers (1,307 across standard residential and low-income components), the EDCs and standard residential/low-income components were aggregated into a single consolidated regression (16,589 customers total). During the PY13 analysis, concerns were raised at the potential impact of behavioral savings ramp-up impacting the measurement of incremental first-year savings. Additionally, overlap with the HER Behavioral component may introduce undue bias in the regression results. Therefore, the regression analysis was limited to the subset of non-HER customers with opt-in dates prior to December 1, 2021, to ensure a minimum of six months of post-exposure data (4,642 customers total).

Propensity Score Matching

The Phase IV Online Audit subprogram functions as an opt-in program, meaning that customers enroll in the program at their own discretion rather than being enrolled in the program automatically. Thus, a control group is not defined prior to program start. To develop a comparison group, ADM leveraged the population of residential AMI data and perform a nearest neighbor matching to develop a comparison group. To ensure customers were matched to appropriate comparison groups, matching occurred on a per-customer sector by EDC basis. I.e., treatment customers for the standard residential group for Met-Ed were matched to comparison customers from the standard residential population, etc. Standard and Low-Income populations for the comparison group were defined using enrollment in Health & Human Services Programs as defined by FirstEnergy's Customer Information System.

For PY13, ADM used the 12-month period of June 1, 2020, through May 31, 2021, as the baseline period for matching. ADM generated five pre-treatment variables for use in the matching algorithm: a pre-treatment annual variable (average daily kWh across the 12-month period), a pre-winter variable (average daily kWh for December, January, and February), a pre-spring variable (average daily kWh for March, April, and May), a pre-summer variable (average daily kWh for June, July, and August), and a pre-fall variable (average daily kWh for September, October, and November). Additionally, customer zip codes were used to look up approximate latitude and longitude for each customer address.

These seven variables were included in the nearest neighbor matching. The nearest neighbor match used "greedy" matching without replacement, meaning that the algorithm matched treatment group customers serially and sequentially. A match was considered "good" if a MANOVA of the five pre-treatment variables are not found to be statistically different. After testing various comparison group to treatment group ratios (from 5:1 to as low as 1:1), a 1:1 was used to meet the testing criteria.

Regression Model

Because the Online Audit component relies on a non-RCT design, ADM's method for evaluation draws from "Chapter 8: Whole-Building Retrofit with Consumption Data Analysis Evaluation Protocol" of Uniform Methods Project (UMP) (Agnew & Goldberg, 2017). The UMP protocol for whole building retrofit provides guidance for performing pooled billing analysis using a matched comparison group. The regression model recommended by the UMP is a form of the LFER model found in the Behavioral section of the Phase IV Evaluation Framework. ADM used a form of this regression model to evaluate savings for the Online Audits component.

Degree day bases were optimized for each customer by testing a range of potential CDD bases (65-85 degrees Fahrenheit) and HDD bases (55-75 degrees Fahrenheit) at all potential whole-number combinations and selecting the pair that provides the highest R-squared value when regressing against each customer's monthly billing data.

Although ADM used a comparison group that should theoretically match the treatment group on pre-treatment characteristics, ADM will opt to include weather terms in the Online Audit analysis to better control for potential variability between the treatment and control group. The model is specified in the equation below:

$$\mathrm{kWh_{imy}} = \beta_i + \sum_{m=1}^{12}\sum_{y=2021}^{2026} \mathrm{I_{my}} * \beta_{my} + \tau_{my} * \sum_{m=1}^{12}\sum_{y=2021}^{2026} \mathrm{I_{my}} * \mathrm{treatment_{imy}} + \beta_{cdd} * \mathrm{CDD}_{imy} + \beta_{hdd} * \mathrm{HDD}_{imy} +$$

$$\tau_{cdd} * \mathrm{CDD}_{imy} * \mathrm{treatment}_{imy} + \tau_{hdd} * \mathrm{HDD}_{imy} * \mathrm{treatment}_{imy} + \varepsilon_{\mathrm{imy}}$$

Equation 5: Formula specifying the Online Audits regression model

The variables above are defined in Table 201 below.

Table 201: Definition of variables in the lagged seasonal regression model

Variable	Definition
$\mathbf{kWh_{imy}}$	Customer i's average daily electric usage in month m of year y.
$\boldsymbol{\beta_i}$	The intercept term for customer i, or the "fixed effect" term. Equal to the mean daily energy use for each customer.
$\mathbf{I_{my}}$	An indicator variable that equals one during month m, year y, and zero otherwise. This variable estimates each month's deviation from average.
$\boldsymbol{\beta_{my}}$	The coefficient on the month-year indicator variable.
$\boldsymbol{\beta_{cdd}}$	The coefficient on the main effect of CDD.
$\boldsymbol{\beta_{hdd}}$	The coefficient on the main effect of HDD.
$\mathbf{treatment_{imy}}$	The treatment variable. Equal to one when the treatment is in effect for the treatment group. Zero otherwise. Always zero for the control group.
$CDD_{\mathbf{imy}}$	Customer I's CDD in month m of year y.
$HDD_{\mathbf{imy}}$	Customer I's HDD in month my of year y.
$\boldsymbol{\tau_{my}}$	The estimated treatment effect in kWh per day; the main parameter of interest. Estimated separately for each month and year
$\boldsymbol{\tau_{cdd}}$	The estimated treatment effect in kWh per CDD.
$\boldsymbol{\tau_{hdd}}$	The estimated treatment effect in kWh per HDD.
$\boldsymbol{\varepsilon_{imy}}$	The error term.

I.1.1.4 Dual Participation Analysis

The following sub-section provides a formal description of ADM's Dual Participation Analysis for Online Audits. It is important to note that savings for Online Audits were not found to be statistically significant and the correction for Dual Participation did not exceed the observed error of the regression model. Therefore, the savings reported for the program were reported as 0 kWh and 0 kW regardless of the impact of Dual Participation. On average, ADM found an annual impact of Dual Participation of 6.7 kWh per customer.

Participants in both the treatment and comparison groups participate in other FirstEnergy energy efficiency programs. Furthermore, the Online Audits measure may cause treatment group participants to seek out other programs and measures offered in the FirstEnergy efficiency portfolio to a greater extent than the control group. To the extent that the treatment group participates in other FirstEnergy programs at a rate above and beyond that of the comparison group, those incremental savings were reflected in the gross energy savings calculated using the method above. However, savings for these items will also have been attributed to their respective programs and subprograms. ADM corrected for dual participation that occurred after treatment began to the extent that the treatment group participated at a higher rate than the comparison group.

It is important to note that dual participation with the HER component was controlled prior to the regression analysis by removing these participants from the treatment and comparison group. This is because, unlike other EE measures, participation in HER is compulsory. Thus, any savings estimated via regression analysis for Online Audits does not contain any cross-savings with HER.

Adjustment for Downstream Measures

For downstream measures, ADM conducted a review of the tracking and reporting system for each experimental cohort to identify EE program participation that occurred from the treatment start date onwards. The following steps detail the process of correcting for these measures:

1. The measures for the treatment group and control group were assigned to an appropriate month based on the reported date of installation for measures installed after the treatment start date.
2. For each month of the program year, the annual savings for all measures installed prior to the month of interest dating back to the treatment start date that had not yet reached the end of their effective useful life were summed for all active participants for each group. For measures installed prior to the current Program Year, ADM used verified savings for dual participation analysis. For measures installed during the Program Year, ADM utilized reported savings as verification activities occurred concurrently to the evaluation of the Behavioral Modification subprogram.
3. The totaled savings for each group was then divided by 365.25 and then divided by the number of active customers in each group to create a daily average dual participation savings value per home.

4. For each month, the daily average dual participation savings value per home for the control group was then subtracted from the daily average dual participation savings value per home from the treatment group. This resulted in an adjustment factor which was then subtracted from the daily savings value extrapolated from the billing analysis prior to using these values to calculate gross verified energy savings.

Adjustment for Upstream Measures

The Phase IV Evaluation Framework recommends adjustment for upstream measures based on years of exposure to upstream lighting programs. Because FirstEnergy did not administer an upstream lighting program in PY13, an upstream adjustment did not occur.

I.1.1.5 Gross Energy Savings Calculation

The regression model provides a series of regression coefficients for the measure month interacted with the treatment term. A negative coefficient represents a daily savings that can be attributed to the treatment effect for that measure month. Multiplying the inverse of the coefficient by the number of days in the month and the number of participants in that month provides the total kWh saved for that month. Summing the savings for the months corresponding to the program year provides the savings attributable to the component for the program year prior to adjusting for dual participation in other programs. Additionally, interactive effects of the main effect of treatment by HDD and CDD can be multiplied by the total HDDs and CDDs for all participants for the program year of interest to obtain the weather-dependent savings of interest. Equation 2 demonstrates the algorithm for calculating verified savings for the model prior to correcting for dual participation in order FirstEnergy energy efficiency programs.

$$kWh\ savings = n \times \{(\tau_{base} \times days_y) + (\tau_{cdd} \times CDD_y) + (\tau_{hdd} \times HDD_y) - Dual\ Participation/yr\}$$

Equation 6: kWh savings calculation

The variables in the above equation are defined in Table 202 below.

Table 202: Definition of variables for kWh savings calculation

Variable	Definition
τ_{base}	The regression coefficient of the treatment effect that represents savings that are not weather-related.
τ_{cdd}	The estimated treatment effect in kWh per CDD.
τ_{hdd}	The estimated treatment effect in kWh per HDD.
CDD_y	The total annual CDD in year y.
HDD_y	The total annual HDD for customer X.
n	The total number of participants in the program year of interest.
y	The program year of interest

I.1.1.6 Gross Demand Savings Calculation

Because the Online Audits program allows customers to have a floating start date at any point between the beginning and end of the program year, directly measuring gross demand savings is not a feasible task for this program. Therefore, ADM generated an ETDF using residential load profiles corresponding to the treatment group for the period beginning June 1, 2021, and ending May 31, 2022. This ETDF was then applied to energy savings to estimate demand savings. An ETDF of 0.000156029 was used for PY13.

I.1.2 Results for Energy and Demand

The participant counts, reported and verified energy savings are shown in Table 203 below. The nomenclature in the table includes a prefix to denote the EDC, a suffix of "-LI" for low-income groups, and a number that identifies waves of participants sequentially. The verified values below include dual participation adjustments. Table 204 shows the reported and verified demand reductions for the program.

Based on the Phase IV Evaluation Framework, non-RCT analyses should be statistically significant at the 85% confidence level. Because the Online Audits component failed to achieve this level of significance, savings has been reported as 0 kWh and 0 kW for PY13.

Table 203: Res Online Audit Initiative Energy Gross Realization Rates

Operating Company	Experimental Cohort	Participants	PYRTD (MWh)	PYVTD (MWh)	Energy Realization Rate	Absolute Precision at 95% CL
Met-Ed	ME-1	5,668	737	0	0.00%	254.44%
Met-Ed	**Total for EEH Program**	**5,668**	**737**	**0**	**0.00%**	**254.44%**
Met-Ed	ME-1-LI	462	60	0	0.00%	254.44%
Met-Ed	**Total for LI Program**	**462**	**60**	**0**	**0.00%**	**254.44%**
Penelec	PN-1	3,672	477	0	0.00%	254.44%
Penelec	**Total for EEH Program**	**3,672**	**477**	**0**	**0.00%**	**254.44%**
Penelec	PN-1-LI	655	85	0	0.00%	254.44%
Penelec	**Total for LI Program**	**655**	**85**	**0**	**0.00%**	**254.44%**
Penn Power	PP-1	1,177	153	0	0.00%	254.44%
Penn Power	**Total for EEH Program**	**1,177**	**153**	**0**	**0.00%**	**254.44%**
Penn Power	PP-1-LI	130	17	0	0.00%	254.44%
Penn Power	**Total for LI Program**	**130**	**17**	**0**	**0.00%**	**254.44%**
WPP	WP-1	4,454	579	0	0.00%	254.44%
WPP	**Total for EEH Program**	**4,454**	**579**	**0**	**0.00%**	**254.44%**
WPP	WP-1-LI	371	48	0	0.00%	254.44%
WPP	**Total for LI Program**	**371**	**48**	**0**	**0.00%**	**254.44%**

Table 204: Res Online Audit Initiative Demand Gross Realization Rates

Operating Company	Experimental Cohort	PYRTD MW/yr	PYVTD MW/yr	Demand Realization Rate
Met-Ed	ME-1	0.00	0.00	100.00%
Met-Ed	**Total for EEH Program**	**0.00**	**0.00**	**100.00%**
Met-Ed	ME-1-LI	0.00	0.00	100.00%
Met-Ed	**Total for LI Program**	**0.00**	**0.00**	**100.00%**
Penelec	PN-1	0.00	0.00	100.00%
Penelec	**Total for EEH Program**	**0.00**	**0.00**	**100.00%**
Penelec	PN-1-LI	0.00	0.00	100.00%
Penelec	**Total for LI Program**	**0.00**	**0.00**	**100.00%**
Penn Power	PP-1	0.00	0.00	100.00%
Penn Power	**Total for EEH Program**	**0.00**	**0.00**	**100.00%**
Penn Power	PP-1-LI	0.00	0.00	100.00%
Penn Power	**Total for LI Program**	**0.00**	**0.00**	**100.00%**
WPP	WP-1	0.00	0.00	100.00%
WPP	**Total for EEH Program**	**0.00**	**0.00**	**100.00%**
WPP	WP-1-LI	0.0	0.00	100.00%
WPP	**Total for LI Program**	**0.00**	**0.00**	**100.00%**

I.2 Net Impact Evaluation

I.2.1 Net Impact Evaluation Methodology

The net-to-gross ratios are 100% because the gross impact evaluation methodology measures net impacts.

Appendix J Evaluation Detail – Residential Appliance Recycling Sub-Initiative

J.1 Gross Impact Evaluation

The Appliance Recycling (ATI) Initiative has three sub-initiatives: Appliance Recycling, Low-Income Appliance Recycling, and Nonresidential Appliance Recycling. Gross impact evaluation for the ATI Initiative involved customer verification surveys and TRM calculations of measure-level impacts. There are four distinct measures offered by the program: refrigerator recycling, freezer recycling, room AC (RAC) recycling, and dehumidifier recycling.

J.1.1 Gross Impact Evaluation Methodology

ADM's gross impact evaluation methodology was identical for all four EDCs. A TRM-based calculation was performed for each entry in the tracking and reporting system. The parameter values from the TRM (or for dehumidifiers, IMP) algorithms were taken from project-specific data from the tracking and reporting system when applicable, from TRM defaults, or from customer verification surveys. For refrigerators and freezers, measure attributes that participants would readily recall were determined from participant surveys, and the average parameter values were applied to all measures. Apart from measure verification, these attributes include the part-use factor, the location in the home where the appliance was used, and for refrigerators, whether the appliance was a primary or secondary unit. Technical attributes of the appliances, such as the age, capacity, and configuration, as collected by ARCA, were taken from program tracking and reporting data. TRM or IMP default parameters were used for room air conditioners (RACs) and dehumidifiers. Table 205 lists the data sources for gross impact calculation algorithms.

Table 205: Data Sources for the ATI Initiative Gross Impact Evaluation

Measure	TRM Parameter	Data Source
Refrigerator, Freezer	Appliance Age	Tracking and Reporting System
Refrigerator, Freezer	Pre-1990	Tracking and Reporting System
Refrigerator, Freezer	Appliance Size / Capacity	Tracking and Reporting System
Refrigerator, Freezer	Configuration/Type	Tracking and Reporting System
Refrigerator	Primary Usage	Participant Surveys
Refrigerator, Freezer	Part Use Factor	Participant Surveys
Refrigerator, Freezer	In Unconditioned Space?	Participant Surveys
Refrigerator, Freezer	CDD and HDD	TRM - Zip Code Lookup
RAC	Capacity	Tracking and Reporting System
RAC	EER	TRM Default
RAC	RAC EFLH	TRM - Zip Code Lookup
RAC	CF	TRM - Zip Code Lookup
Dehumidifier	Capacity	Tracking and Reporting System
Dehumidifier	Region (to determine kWh)	TRM - Zip Code Lookup
All Measures	Verification Rate	Participant Surveys

The gross realization rates for energy savings were driven primarily by part-use factors for refrigerators and freezers as determined through verification surveys, and by the unit energy consumptions for refrigerators and freezers, as determined through measure attributes recorded in the tracking and reporting system.

J.1.2 Sampling

Each measure was treated as a separate stratum within the sampling initiative. The sample designs for the four EDCs are shown in Table 206, Table 207, Table 208, and Table 209. The population sizes and sample sizes represent individual appliances rather than individual customers.

Table 206: ATI Initiative Gross Impact Sample Design for Met-Ed

Stratum	Population Size	Achieved Sample Size	Evaluation Activity
Refrigerators	3,694	89	Survey (online)
Freezers	930	12	
RACs	984	6	
Dehumidifiers	512	13	
Mini Friges	119	2	
Program Total	**6,239**	**122**	

Table 207: ATI Initiative Gross Impact Sample Design for Penelec

Stratum	Population Size	Achieved Sample Size	Evaluation Activity
Refrigerators	2,682	81	Survey (online)
Freezers	695	26	
RACs	580	7	
Dehumidifiers	363	12	
Mini Friges	56	3	
Program Total	**4,376**	**129**	

Table 208: ATI Initiative Gross Impact Sample Design for Penn Power

Stratum	Population Size	Achieved Sample Size	Evaluation Activity
Refrigerators	838	42	Survey (online)
Freezers	261	14	
RACs	121	9	
Dehumidifiers	105	7	
Mini Friges	22	2	
Program Total	**1,347**	**74**	

Table 209: ATI Initiative Gross Impact Sample Design for WPP

Stratum	Population Size	Achieved Sample Size	Evaluation Activity
Refrigerators	3,500	83	Survey (online)
Freezers	971	26	
RACs	583	7	
Dehumidifiers	481	8	
Mini Friges	73	2	
Program Total	**5,608**	**126**	

J.1.3 Results for Energy

The gross realization rates for energy, along with relative precisions, are shown in Table 210, Table 211, Table 212, and Table 213 for Met-Ed, Penelec, Penn Power, and WPP respectively.

Table 210: ATI Initiative Energy Gross Realization Rates for Met-Ed

Stratum	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
Refrigerators	3,382	101.1%	0.5	7.6%
Freezers	550	106.7%	0.5	20.8%
RACs	125	81.5%	0.5	29.4%
Dehumidifiers	292	124.3%	0.5	20.0%
Mini Friges	29	99.1%	0.5	50.9%
Program Total	**4,379**	**102.8%**	**0.5**	**6.6%**

Table 211: ATI Initiative Energy Gross Realization Rates for Penelec

Stratum	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
Refrigerators	2,468	105.1%	0.5	8.0%
Freezers	450	124.0%	0.5	14.1%
RACs	58	85.3%	0.5	27.2%
Dehumidifiers	189	116.0%	0.5	20.8%
Mini Friges	14	201.7%	0.5	41.6%
Program Total	**3,180**	**108.5%**	**0.5**	**6.6%**

Table 212: ATI Initiative Energy Gross Realization Rates for Penn Power

Stratum	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
Refrigerators	772	93.7%	0.5	11.1%
Freezers	163	94.0%	0.5	19.2%
RACs	14	70.9%	0.5	24.0%
Dehumidifiers	56	115.6%	0.5	27.2%
Mini Friges	5	117.7%	0.5	50.9%
Program Total	**1,011**	**94.8%**	**0.5**	**9.1%**

Table 213: ATI Initiative Energy Gross Realization Rates for WPP

Stratum	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
Refrigerators	3,245	97.0%	0.5	7.9%
Freezers	621	105.0%	0.5	14.1%
RACs	65	69.6%	0.5	27.2%
Dehumidifiers	250	122.9%	0.5	25.5%
Mini Friges	18	219.9%	0.5	50.9%
Program Total	**4,198**	**99.8%**	**0.5**	**6.6%**

J.1.4 Results for Demand

The gross realization rates for demand, along with relative precisions, are shown in Table 214, Table 215, Table 216, and Table 217 for Met-Ed, Penelec, Penn Power, and WPP respectively.

Table 214: ATI Initiative Demand Gross Realization Rates for Met-Ed

Stratum	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
Refrigerators	0.60	101.1%	0.5	7.6%
Freezers	0.10	106.7%	0.5	20.8%
RACs	0.25	83.0%	0.5	29.4%
Dehumidifiers	0.07	124.6%	0.5	20.0%
Mini Friges	0.01	99.2%	0.5	50.9%
Program Total	**1.02**	**98.7%**	**0.5**	**8.1%**

Table 215: ATI Initiative Demand Gross Realization Rates for Penelec

Stratum	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
Refrigerators	0.44	105.1%	0.5	8.0%
Freezers	0.08	124.0%	0.5	14.1%
RACs	0.14	80.2%	0.5	27.2%
Dehumidifiers	0.05	119.3%	0.5	20.8%
Mini Friges	0.00	202.0%	0.5	41.6%
Program Total	**0.71**	**103.5%**	**0.5**	**7.0%**

Table 216: ATI Initiative Gross Realization Rates for Penn Power

Stratum	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
Refrigerators	0.14	93.7%	0.5	11.1%
Freezers	0.03	94.0%	0.5	19.2%
RACs	0.03	70.8%	0.5	24.0%
Dehumidifiers	0.01	123.1%	0.5	27.2%
Mini Friges	0.00	117.8%	0.5	50.9%
Program Total	**0.21**	**92.4%**	**0.5**	**8.6%**

Table 217: ATI Initiative Demand Gross Realization Rates for WPP

Stratum	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
Refrigerators	0.57	97.0%	0.5	7.9%
Freezers	0.11	104.9%	0.5	14.1%
RACs	0.16	69.4%	0.5	27.2%
Dehumidifiers	0.06	122.7%	0.5	25.5%
Mini Friges	0.00	220.2%	0.5	50.9%
Program Total	**0.91**	**95.4%**	**0.5**	**6.8%**

Note that the overall precision for the ATI initiative is the combined precision of the low income, non-low-income, and nonresidential components. The combined precisions for each EDC are shown in Table 218 below.

Table 218: ATI Initiative Sampling Precisions

EDC	Relative Precision at 85% C.L., Energy	Relative Precision at 85% C.L., Demand
Met-Ed	7.0%	8.2%
Penelec	6.8%	7.2%
Penn Power	9.2%	8.6%
West Penn Power	7.0%	7.2%

J.2 NET IMPACT EVALUATION

J.2.1 Net Impact Evaluation Methodology

The ADM team conducted net impact evaluation for the Appliance Recycling initiative in PY13. The net-to-gross evaluation for the Appliance Recycling program followed the participant self-report methodology outlined in the PA Evaluation Framework. Net-to-gross was estimated for the program for each EDC.

The participant self-report methodology was implemented following the common approach outlined in Appendix B of the Phase IV evaluation framework. Tetra Tech added a question to identify customers who would have kept the recycled unit at least a year longer, since program results represent first-year annual savings. This clarifies that customers who respond they would have removed the unit, but at some point in the future, are really more appropriately characterized as keeping the unit for at least the program year in question. Individual free-ridership rates from the participant survey were weighted to adjust for sampling differences, non-response, and claimed energy savings to calculate overall estimates.

The Appliance Recycling program is not designed to promote spillover since it does not push customers to implement energy efficiency projects outside of FirstEnergy's programs. Because the participant survey is already lengthy, containing both gross and net impact questions, the evaluation team did not collect spillover information from customers. Moreover, because the Companies offer incentives for efficient new refrigerators and freezers, it is possible that the most likely spillover may overlap with gross impacts for the Efficient Products program and lead to undesired double-counting of net impacts.

J.2.2 Sampling

The sample designs from study for the four EDCs are shown in Table 219, Table 220, Table 221, and Table 222 for Met-Ed, Penelec, Penn Power, and WPP respectively.

Table 219: ATI Initiative Net-to-Gross Sampling for Met-Ed

Stratum	Population Size	Target Sample Size	Achieved Sample Size	Response Rate
All	6,143	160	139	21.7%
Program Total	**6,143**	**160**	**139**	**21.7%**

Table 220: ATI Initiative Net-to-Gross Sampling for Penelec

Stratum	Population Size	Target Sample Size	Achieved Sample Size	Response Rate
All	5,444	143	165	28.9%
Program Total	**5,444**	**143**	**165**	**28.9%**

Table 221: ATI Initiative Net-to-Gross Sampling for Penn Power

Stratum	Population Size	Target Sample Size	Achieved Sample Size	Response Rate
All	1,947	77	86	28.0%
Program Total	**1,947**	**77**	**86**	**28.0%**

Table 222: ATI Initiative Net-to-Gross Sampling for WPP

Stratum	Population Size	Target Sample Size	Achieved Sample Size	Response Rate
All	6,673	154	155	25.2%
Program Total	**6,673**	**154**	**155**	**25.2%**

J.2.3 Net Impact Evaluation Results

The PYTD verified gross energy impacts, free ridership, spillover, net-to-gross ratios, and relative precisions for net-to-gross are shown in Table 223, Table 224, Table 225, and Table 226 for Met-Ed, Penelec, Penn Power, and WPP respectively.

Table 223: ATI Initiative Net-to-Gross Results for Met-Ed

Stratum	PYVTD MWh	Free Ridership (%)	Spillover (%)	NTG Ratio	Relative Precision (@ 85% CL)
All	4,502	61.0%	0.0%	39.0%	12.2%
Program Total	**4,502**	**61.0%**	**0.0%**	**39.0%**	**12.2%**

Table 224: ATI Initiative Net-to-Gross Results for Penelec

Stratum	PYVTD MWh	Free Ridership (%)	Spillover (%)	NTG Ratio	Relative Precision (@ 85% CL)
All	3,450	35.0%	0.0%	65.0%	11.2%
Program Total	**3,450**	**35.0%**	**0.0%**	**65.0%**	**11.2%**

Table 225: ATI Initiative Net-to-Gross Results for Penn Power

Stratum	PYVTD MWh	Free Ridership (%)	Spillover (%)	NTG Ratio	Relative Precision (@ 85% CL)
All	958	62.0%	0.0%	38.0%	15.5%
Program Total	**958**	**62.0%**	**0.0%**	**38.0%**	**15.5%**

Table 226: ATI Initiative Net-to-Gross Results for WPP

Stratum	PYVTD MWh	Free Ridership (%)	Spillover (%)	NTG Ratio	Relative Precision (@ 85% CL)
All	4,192	30.0%	0.0%	70.0%	11.6%
Program Total	**4,192**	**30.0%**	**0.0%**	**70.0%**	**11.6%**

Appendix K Evaluation Detail – Residential Upstream Electronics Initiative

The Companies did not offer this program component in PY13.

Appendix L Evaluation Detail – Residential HVAC Initiative

The Residential HVAC initiative provides rebates to customers who purchase high efficiency HVAC equipment, Tune-Up an existing HVAC system, install a new smart thermostat, bathroom fan, or circulating pump.

Participants are defined as each separate measure rebated. Thus, the rebate application, rather than the customer is the sampling unit for gross impact evaluation.

L.1 Gross Impact Evaluation

L.1.1 Gross Impact Evaluation Methodology

Each component of gross impact evaluation is described below. The gross impact evaluation included customer surveys for verification purposes, coupled with documentation reviews to support detailed TRM calculations for sampled projects. The desk review process is described below.

Table 227 lists the data sources for gross impact calculation algorithms.

Table 227: Data Sources for the Res HVAC Initiative Gross Impact Evaluation

Measure	TRM Parameter	Data Source
All Measures	Appliance Age	Tracking and Reporting System
All HVAC Equipment	AHRI or Model # (to get other TRM parameters)	Invoice Inspections and Tracking Data
All HVAC Equipment	Heating Capacity	Tracking and Reporting System
All HVAC Equipment	Cooling Capacity	Tracking and Reporting System
HVAC Maintenance	Heating Capacity	Invoice Inspections
HVAC Maintenance	Cooling Capacity	Invoice Inspections
All	SEER/EER/HSPF/COP	AHRI database reference
Minisplits	EFLH	ZIP lookup and survey for room type
Minisplits	Baseline Type	Customer Surveys
Bathroom Fans	HOU and CF	IMP defaults
Smart Thermostats	Install Type	Application Review
Smart Thermostats	Thermostat Type	Application Review
Smart Thermostats	Heating System Type	Application Review
Smart Thermostats	Cooling System Type	Application Review
Smart Thermostats	Baseline Thermostat Type	Application Review

L.1.1.1 Determination of Verification Rate

ADM conducted verification surveys on a random sample of customers selected from the tracking and reporting data. Nearly all contacted customers verified that they have purchased and installed the stated HVAC measures. The verification rates are used to inform measure-level realization rates.

L.1.1.2 Invoice and Application Review

ADM obtained invoices and applications from Franklin Energy Services. For each application, ADM verified that the manufacturer name and model number in the tracking and reporting

system matches those on the invoice and rebate application. In general, all sampled measures were matched to qualifying product lists. ADM independently retrieved the attributes necessary for TRM and IMP calculations from various supporting databases which were compiled for this purpose. These include the AHRI database and manufacturer websites.

L.1.1.3 Calculation Review using TRM algorithm and parameters

For HVAC measures with partially deemed TRM (or IMP) protocols, the T&R system reported impacts with one savings scenario rather than with specific scenarios that occur in measure implementation. For example, values from planning assumptions for capacity and efficiency are used rather than HVAC system-specific values. In general, the per-unit savings reported by the ICSP are rather conservative (the assumed average efficiency levels or capacities are lower than actual average values). For all reviewed records, ADM used project-specific attributes to calculate "On-TRM" impacts.

The average per-unit gross verified impact for a given measure is the product of the measure-specific verification rate as determined from customer surveys, and the average calculated impacts as described above.

The following provide additional details into the calculation review procedure:

CACs and ASHPs

Central HVAC systems were looked up on the AHRI database to determine individual measure attributes for use in the TRM algorithms. These attributes include heating and cooling capacities, and seasonal efficiency ratios (SEER and HSPF). EFLHs and CFs were taken from the TRM based on the reported zip code or zip code obtained through participant surveys if the reported zip code was overridden by the respondent. Baseline efficiencies were taken as TRM defaults assuming a replace on burnout scenario rather than early retirement[15].

GSHPs

Ground-source heat pump make and model numbers, or AHRI certificate numbers, are cross-referenced on the AHRI database to determine equipment parameters for use in the TRM algorithm. EFLHs and CFs were determined through zip code lookups as provided in the T&R data or with zip codes from survey data if overridden by respondents. Other TRM default values used include GSHPDF, GSER, GSOP, and GSPK. Baseline efficiencies were also taken as TRM defaults for a replace on burnout scenario with an ASHP as the baseline system.

For GSHP units larger than 65 kBtuh, the commercial algorithm in section 3.2.3 of the TRM was used to calculate impacts. Here the baseline efficiencies were taken from TRM table 3-38. In these cases, the replace on burnout scenario assumes kWh_{pump} and kW_{pump} for the baseline ASHP are zero.

Mini-Splits

[15] Although early retirements are eligible and do occur in the program, the downstream rebate program does not have any special provisions, such as mandatory pre-inspections, to accommodate early retirement. For this program, early retirement is viewed by ADM as a phenomenon that may increase net impacts, but not gross impacts.

Ductless mini-splits (ACs and heat pumps) were also looked up on AHRI similar to the other HVAC system types, and CFs were determined with zip code lookups, but several additional steps were taken to determine gross impacts. EFLHs were determined through the TRM classification of "primary zone" or "secondary zone". Participant survey responses were used to determine the TRM classification based on which room the systems were installed in as rebate applications do not include this information. The baseline system type was determined from participant surveys. Several response fields were considered to determine the baseline including whether the mini-split installation supplemented an existing HVAC system. In cases where there was no existing heating or cooling, or the respondent did not know what type of existing system they had, the baseline was taken to be an ASHP. Baseline efficiencies were taken from TRM tables 2-8 and 2-12 according to the type of baseline system.

Thermostats

Smart thermostats were evaluated according to the protocol in section 2.2.11 of the 2021 PA TRM. ADM evaluators reviewed invoices and application materials to determine the heating and cooling system types, the installation scenario described in the TRM, and baseline thermostats.

Furnace Fans

High-efficiency furnace fan energy savings relied on the deemed values in the TRM. EFLHs and CFs were taken from the TRM based on the reported zip code or zip code obtained through participant surveys if the reported zip code was overridden by the respondent. ADM used the results of participant surveys to determine the verification rate and the faction with central heating. For homes without central cooling, the kWh_{cool} term in the TRM algorithm was taken to be zero.

HVAC Maintenance

Default TRM parameters were used for HVAC Tune-Up calculations. Heating and cooling capacities were determined from the rebate application for sampled units. For tune-ups performed on AC units, the kWh_{heat} term in the TRM algorithm was taken to be zero.

Bathroom Fans

ADM used the IMP for bathroom fans with hours of use and CF for intermittent operation. Fan flow rates and efficacies were obtained from ENERGY STAR® based on reported model numbers.

Circulation Pumps

ADM used TRM Section 3.3.5 to calculate impacts for ECM circulation pumps, but with residential heating EFLH.

PTACs and PTHPs

As there were only three PTACs and zero PTHPs reported, ADM elected to pass these measures through the evaluation process with no activity.

L.1.2 Sampling

Each measure was treated as a separate stratum within the sampling initiative. The sample designs for the four EDCs are shown in Table 228, Table 229, Table 230, and Table 231.

Table 228: Res HVAC Initiative Gross Impact Sample Design for Met-Ed

Stratum	Population Size	Achieved Sample Size (Survey)	Achieved Sample Size (Desk Review)
Minisplit	165	16	16
ASHP	199	7	15
Smart Thermostat	223	5	11
GSHP	34	5	2
CAC	312	12	17
Furnace Fan	120	3	8
Tune-Up	41	4	2
Circulating Pump	1	1	0
Bathroom Fan	8	1	1
PTAC	0	0	0
PTHP	0	0	0
Program Total	**1,103**	**54**	**72**

Table 229: Res HVAC Initiative Gross Impact Sample Design for Penelec

Stratum	Population Size	Achieved Sample Size (Survey)	Achieved Sample Size (Desk Review)
Minisplit	225	20	20
ASHP	43	4	7
Smart Thermostat	28	1	1
GSHP	14	3	3
CAC	13	1	4
Furnace Fan	75	3	5
Tune-Up	53	5	8
Circulating Pump	3	2	3
Bathroom Fan	1	1	0
PTAC	0	0	0
PTHP	0	0	0
Program Total	**455**	**40**	**51**

Table 230: Res HVAC Initiative Gross Impact Sample Design for Penn Power

Stratum	Population Size	Achieved Sample Size (Survey)	Achieved Sample Size (Desk Review)
Minisplit	36	3	4
ASHP	49	10	8
Smart Thermostat	37	1	7
GSHP	8	1	1
CAC	45	7	6
Furnace Fan	141	3	14
Tune-Up	18	2	4
Circulating Pump	0	0	0
Bathroom Fan	0	0	0
PTAC	0	0	0
PTHP	0	0	0
Program Total	**334**	**27**	**44**

Table 231: Res HVAC Initiative Gross Impact Sample Design for WPP

Stratum	Population Size	Achieved Sample Size (Survey)	Achieved Sample Size (Desk Review)
Minisplit	188	15	14
ASHP	159	9	8
Smart Thermostat	166	9	6
GSHP	25	2	1
CAC	112	3	6
Furnace Fan	448	6	19
Tune-Up	120	8	5
Circulating Pump	0	0	0
Bathroom Fan	7	1	1
PTAC	0	0	0
PTHP	0	0	0
Program Total	**1,225**	**53**	**60**

L.1.3 Results for Energy

The gross realization rates for energy, along with relative precisions, are shown in Table 232, Table 233, Table 234, and Table 235 for Met-Ed, Penelec, Penn Power, and WPP respectively.

Table 232: Res HVAC Initiative Energy Gross Realization Rates for Met-Ed

Stratum	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
Minisplit	162	135.3%	0.5	17.1%
ASHP	211	93.3%	0.4	14.3%
Smart Thermostat	118	71.1%	0.5	21.2%
GSHP	85	200.3%	0.4	39.5%
CAC	117	100.0%	0.4	13.6%
Furnace Fan	23	100.8%	0.4	19.7%
Tune-Up	6	269.5%	0.4	39.7%
Circulating Pump	0	100.0%	0.4	100.0%
Bathroom Fan	0	37.6%	0.4	53.9%
PTAC	0	100.0%	0.4	100.0%
PTHP	0	100.0%	0.4	100.0%
Program Total	**721**	**114.5%**	**0.5**	**10.4%**

Table 233: Res HVAC Initiative Energy Gross Realization Rates for Penelec

Stratum	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
Minisplit	240	179.8%	0.5	15.4%
ASHP	50	113.9%	0.4	19.9%
Smart Thermostat	15	100.1%	0.5	70.7%
GSHP	36	100.4%	0.4	29.5%
CAC	4	136.3%	0.4	24.0%
Furnace Fan	14	95.4%	0.4	24.9%
Tune-Up	6	94.6%	0.4	18.8%
Circulating Pump	1	320.7%	0.4	0.0%
Bathroom Fan	0	100.0%	0.4	100.0%
PTAC	0	100.0%	0.4	100.0%
PTHP	0	100.0%	0.4	100.0%
Program Total	**364**	**155.0%**	**0.5**	**12.2%**

Table 234: Res HVAC Initiative Energy Gross Realization Rates for Penn Power

Stratum	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
Minisplit	39	128.4%	0.5	33.9%
ASHP	42	98.1%	0.4	18.6%
Smart Thermostat	21	48.3%	0.5	24.5%
GSHP	16	159.0%	0.4	53.9%
CAC	15	87.4%	0.4	21.9%
Furnace Fan	25	94.8%	0.4	14.6%
Tune-Up	2	309.2%	0.4	25.4%
Circulating Pump	0	100.0%	0.4	100.0%
Bathroom Fan	0	100.0%	0.4	100.0%
PTAC	0	100.0%	0.4	100.0%
PTHP	0	100.0%	0.4	100.0%
Program Total	**160**	**106.3%**	**0.5**	**14.0%**

Table 235: Res HVAC Initiative Energy Gross Realization Rates for WPP

Stratum	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
Minisplit	211	275.7%	0.5	18.5%
ASHP	177	100.0%	0.4	19.8%
Smart Thermostat	89	81.5%	0.5	28.9%
GSHP	62	100.0%	0.4	56.4%
CAC	34	88.9%	0.4	22.9%
Furnace Fan	82	90.5%	0.4	12.9%
Tune-Up	18	126.2%	0.4	25.2%
Circulating Pump	0	100.0%	0.4	100.0%
Bathroom Fan	0	70.2%	0.4	53.3%
PTAC	0	100.0%	0.4	100.0%
PTHP	0	100.0%	0.4	100.0%
Program Total	**672**	**151.7%**	**0.5**	**11.9%**

L.1.4 Results for Demand

The gross realization rates for demand, along with relative precisions, are shown in Table 236, Table 237, Table 238, and Table 239 for Met-Ed, Penelec, Penn Power, and WPP respectively.

Table 236: Res HVAC Initiative Demand Gross Realization Rates for Met-Ed

Stratum	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
Minisplit	0.01	294.8%	0.5	17.1%
ASHP	0.02	84.0%	0.4	14.3%
Smart Thermostat	0.01	98.2%	0.5	21.2%
GSHP	0.02	140.3%	0.4	39.5%
CAC	0.06	100.0%	0.4	13.6%
Furnace Fan	0.01	115.5%	0.4	19.7%
Tune-Up	0.00	111.1%	0.4	39.7%
Circulating Pump	0.00	100.0%	0.4	100.0%
Bathroom Fan	0.00	27.8%	0.4	53.9%
PTAC	0.00	100.0%	0.4	100.0%
PTHP	0.00	100.0%	0.4	100.0%
Program Total	**0.13**	**119.4%**	**0.5**	**9.3%**

Table 237: Res HVAC Initiative Demand Gross Realization Rates for Penelec

Stratum	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
Minisplit	0.02	236.0%	0.5	15.4%
ASHP	0.00	83.8%	0.4	19.9%
Smart Thermostat	0.00	100.0%	0.5	70.7%
GSHP	0.01	107.0%	0.4	29.5%
CAC	0.00	74.0%	0.4	24.0%
Furnace Fan	0.00	90.8%	0.4	24.9%
Tune-Up	0.00	102.1%	0.4	18.8%
Circulating Pump	0.00	100.0%	0.4	0.0%
Bathroom Fan	0.00	100.0%	0.4	100.0%
PTAC	0.00	100.0%	0.4	100.0%
PTHP	0.00	100.0%	0.4	100.0%
Program Total	**0.03**	**157.0%**	**0.5**	**11.2%**

Table 238: Res HVAC Initiative Gross Realization Rates for Penn Power

Stratum	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
Minisplit	0.00	485.1%	0.5	33.9%
ASHP	0.00	81.7%	0.4	18.6%
Smart Thermostat	0.00	101.4%	0.5	24.5%
GSHP	0.00	157.6%	0.4	53.9%
CAC	0.01	86.8%	0.4	21.9%
Furnace Fan	0.01	88.3%	0.4	14.6%
Tune-Up	0.00	103.2%	0.4	25.4%
Circulating Pump	0.00	100.0%	0.4	100.0%
Bathroom Fan	0.00	100.0%	0.4	100.0%
PTAC	0.00	100.0%	0.4	100.0%
PTHP	0.00	100.0%	0.4	100.0%
Program Total	**0.03**	**124.2%**	**0.5**	**13.7%**

Table 239: Res HVAC Initiative Demand Gross Realization Rates for WPP

Stratum	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
Minisplit	0.01	274.4%	0.5	18.5%
ASHP	0.02	84.6%	0.4	19.8%
Smart Thermostat	0.01	72.0%	0.5	28.9%
GSHP	0.01	100.0%	0.4	56.4%
CAC	0.02	86.5%	0.4	22.9%
Furnace Fan	0.02	94.2%	0.4	12.9%
Tune-Up	0.01	87.5%	0.4	25.2%
Circulating Pump	0.00	100.0%	0.4	100.0%
Bathroom Fan	0.00	51.9%	0.4	53.3%
PTAC	0.00	100.0%	0.4	100.0%
PTHP	0.00	100.0%	0.4	100.0%
Program Total	**0.10**	**114.4%**	**0.5**	**10.3%**

L.2 NET IMPACT EVALUATION

L.2.1 Net Impact Evaluation Methodology

A net impact evaluation was not conducted in PY13. Net impact evaluation results from the Phase III evaluation effort will be applied to the initiative for PY13 and PY14. The net-to-gross evaluation for the downstream HVAC measures, conducted in PY8 and PY11, was based on self-report data from program participants. The following sections provide information related to the historical net impact evaluation effort that informs the initiative's NTG values for PY13 and PY14.

L.2.2 Sampling

Tetra Tech sampled randomly from all participants on record in the Companies' tracking and reporting systems in early PY11Q4. The sample designs for the four EDCs are shown in Table 240, Table 241, Table 242, and Table 243 for Met-Ed, Penelec, Penn Power, and WPP respectively. The achieved sample sizes and response rates are from the PY11 NTG effort.

Table 240: Res HVAC Initiative Net-to-Gross Sampling for Met-Ed

Stratum	Population Size	Achieved Sample Size	Response Rate
All Rebates	2,952	72	26.2%
Program Total	**2,952**	**72**	**26.2%**

Table 241: Res HVAC Initiative Net-to-Gross Sampling for Penelec

Stratum	Population Size	Achieved Sample Size	Response Rate
All Rebates	2,155	79	28.4%
Program Total	**2,155**	**79**	**28.4%**

Table 242: Res HVAC Initiative Net-to-Gross Sampling for Penn Power

Stratum	Population Size	Achieved Sample Size	Response Rate
All Rebates	1,935	67	24.7%
Program Total	**1,935**	**67**	**24.7%**

Table 243: Res HVAC Initiative Net-to-Gross Sampling for WPP

Stratum	Population Size	Achieved Sample Size	Response Rate
All Rebates	4,320	62	2.2%
Program Total	**4,320**	**62**	**2.2%**

L.2.3 Net Impact Evaluation Results

The PYTD verified gross energy impacts, free ridership, spillover, net-to-gross ratios, and relative precisions for net-to-gross are shown in Table 244, Table 245, Table 246, and Table 247 for Met-Ed, Penelec, Penn Power, and WPP respectively.

Table 244: Res HVAC Initiative Net-to-Gross Results for Met-Ed

Stratum	PYVTD MWh	Free Ridership (%)	Spillover (%)	NTG Ratio	Relative Precision (@ 85% CL)
All Rebates	826	50.4%	1.1%	50.7%	12.7%
Program Total	**826**	**50.4%**	**1.1%**	**50.7%**	**12.7%**

Table 245: Res HVAC Initiative Net-to-Gross Results for Penelec

Stratum	PYVTD MWh	Free Ridership (%)	Spillover (%)	NTG Ratio	Relative Precision (@ 85% CL)
All Rebates	565	48.6%	0.9%	52.3%	12.2%
Program Total	**565**	**48.6%**	**0.9%**	**52.3%**	**12.2%**

Table 246 Res HVAC Initiative Net-to-Gross Results for Penn Power

Stratum	PYVTD MWh	Free Ridership (%)	Spillover (%)	NTG Ratio	Relative Precision (@ 85% CL)
All Rebates	170	52.8%	7.6%	54.8%	13.0%
Program Total	**170**	**52.8%**	**7.6%**	**54.8%**	**13.0%**

Table 247 Res HVAC Initiative Net-to-Gross Results for WPP

Stratum	PYVTD MWh	Free Ridership (%)	Spillover (%)	NTG Ratio	Relative Precision (@ 85% CL)
All Rebates	1,020	48.3%	0.3%	52.0%	13.7%
Program Total	**1,020**	**48.3%**	**0.3%**	**52.0%**	**13.7%**

Appendix M Evaluation Detail – Residential Appliances and LI Residential Appliances Initiative

Residential Appliances and LI Appliances are combined into a single initiative in ADM's PY13 evaluation plan. While the program process is the same between the two, the measures and rebate levels differ. Incentives for the low-income component are increased by $25 per appliance, while there are no specific income-qualified incentives for heat-pump and solar water heaters, variable speed pool-pumps or ceiling fans.

Participants are defined as each separate appliance rebated. Thus, the rebate application, rather than the customer is the sampling unit for gross impact evaluation.

M.1 Gross Impact Evaluation

M.1.1 Gross Impact Evaluation Methodology

Each component of gross impact is described below.

M.1.1.1 Verification Surveys

ADM performed telephone and online surveys on a random sample of customers selected from the tracking and reporting data. Nearly all contacted customers verified that they have purchased and installed the stated appliances. The verification rates are used to inform measure-level realization rates.

M.1.1.2 Invoice and Application Review

ADM obtained invoices and applications from the ICSP, Franklin Energy Services. For each application, ADM verified that the manufacturer name and model number in the tracking and reporting system matches those on the invoice and rebate application. In general, all sampled appliances were matched to the qualifying ENERGY STAR® product lists. ADM independently retrieved the attributes necessary for TRM calculations from the ENERGY STAR® database. In certain cases, the make or model numbers were entered in with minor typographic errors or with missing or inserted dashes, spaces, or other delimiting characters. In such cases, manual correction of the make or model numbers results in positive identification of the involved equipment in the supporting databases.

M.1.1.3 Saving Calculations with TRM Algorithms and Parameters

For measures with partially deemed TRM (or IMP) protocols, the T&R system reported impacts with one savings scenario rather than with specific scenarios that occur in measure implementation. For example, values from planning assumptions for capacity and efficiency are used rather than rebate-specific values For all reviewed records, ADM used project-specific attributes to calculate "On-TRM" impacts.

The average per-unit gross verified impact for a given measure is the product of the measure-specific verification rate (as determined from customer surveys or retailer invoice details) and the average calculated impacts as described above.

As there were only fifteen ceiling fans reported, ADM elected to pass these measures through the evaluation process with no activity.

Table 248 lists the data sources for gross impact calculation algorithms.

Table 248: Data Sources for the Res Appliances Initiative Gross Impact Evaluation

Measure	TRM Parameter	Data Source
All Measures	Verification Rate	Participant Surveys
All Measures	Capacity	Energy Star Database - Model Lookup
All Measures	ETDF	TRM Default
Clothes Washer	Configuration	Energy Star Database
Clothes Washer	IMEF_base	Federal Standard - Configuration Lookup
Clothes Washer	Cycles per year	TRM Default
Clothes Washer	CW_base / CW_ee	TRM Default
Clothes Washer	DHW_base / DHW_ee	TRM Default
Clothes Washer	%ElectricDHW	Participant Surveys
Clothes Washer	Dryer_base / Dryer_ee	TRM Default
Clothes Washer	%ElectricDryer	Participant Surveys
Clothes Washer	%dry/wash	TRM Default
Clothes Washer	time per cycle / CF	TRM Default
Clothes Dryer	Fuel / Configuration	Energy Star Database
Clothes Dryer	CEF_base	Federal Standard - Configuration Lookup
Clothes Dryer	Wash Cycles per year	TRM Default
Clothes Dryer	%dry/wash	TRM Default
Clothes Dryer	Load_avg	TRM - Configuration Lookup
Clothes Dryer	time per cycle /CF	TRM Default
Refrigerator/Freezer	Product Class	Energy Star Database
Refrigerator/Freezer	Adjusted Volume	Energy Star Database
Dehumidifier	HOU / CF	TRM Default
Dehumidifier	L/kWh_base / L/kWh_ee	TRM - Capacity Lookup
Air Purifier	Annual Consumption	TRM Default
Air Purifier	HOU / CF	TRM Default
Dishwasher	Annual Consumption	TRM Default
Dishwasher	Water Heater Fuel	Application / TRM Default
Pool Pump	HOU / Volume	TRM Default
Pool Pump	Energy Factor	Energy Star Database
Room Air Conditione	HOU / CF	TRM - Zip Code Lookup
HPWH	EF_ee	Energy Star Database
HPWH	F_derate	TRM Default
Smart Thermostat	EFLH Heat/Cool	Customer Zip Code
Smart Thermostat	Previous Thermostat	Application / Participant Surveys
Smart Thermostat	HVAC Equipment Type	Application / Participant Surveys

The gross realization rates for energy savings were driven primarily by the reported energy savings in the tracking and reporting system.

M.1.2 Sampling

Each measure was treated as a separate stratum within the sampling initiative. The sample designs for the four EDCs are shown in Table 249, Table 250, Table 251, and Table 252.

Table 249: Res Appliances Initiative Gross Impact Sample Design for Met-Ed

Stratum	Population Size	Achieved Sample Size (Survey)	Achieved Sample Size (Desk Review)
Air Purifier	29	2	1
Ceiling Fan	8	0	0
Clothes Dryer	334	8	11
Clothes Washer	562	14	15
Dehumidifier	83	6	4
Dishwasher	544	8	12
Freezer	66	7	6
Heat Pump Water Heater	47	5	4
Mini Refrigerator	5	0	0
Pool Pump	26	1	5
Refrigerator	602	18	11
Room Air Conditioner	32	2	0
Smart Thermostat	369	8	17
Low-Income Total	**109**	**7**	**23**
Non Low-Income Total	**2,598**	**72**	**63**
Program Total	**2,707**	**79**	**86**

Table 250: Res Appliances Initiative Gross Impact Sample Design for Penelec

Stratum	Population Size	Achieved Sample Size (Survey)	Achieved Sample Size (Desk Review)
Air Purifier	11	3	4
Ceiling Fan	3	0	0
Clothes Dryer	198	6	6
Clothes Washer	369	17	16
Dehumidifier	70	4	4
Dishwasher	430	7	16
Freezer	34	3	4
Heat Pump Water Heater	10	1	2
Mini Refrigerator	1	0	0
Pool Pump	6	0	2
Refrigerator	384	15	16
Room Air Conditioner	19	1	1
Smart Thermostat	256	14	14
Low-Income Total	**112**	**13**	**26**
Non Low-Income Total	**1,679**	**58**	**59**
Program Total	**1,791**	**71**	**85**

Table 251: Res Appliances Initiative Gross Impact Sample Design for Penn Power

Stratum	Population Size	Achieved Sample Size (Survey)	Achieved Sample Size (Desk Review)
Air Purifier	14	3	5
Ceiling Fan	1	0	0
Clothes Dryer	94	12	7
Clothes Washer	170	8	14
Dehumidifier	34	7	6
Dishwasher	176	4	12
Freezer	21	2	2
Heat Pump Water Heater	2	1	0
Mini Refrigerator	1	0	0
Pool Pump	2	0	0
Refrigerator	177	9	17
Room Air Conditioner	2	0	0
Smart Thermostat	177	9	5
Low-Income Total	**29**	**11**	**10**
Non Low-Income Total	**842**	**44**	**58**
Program Total	**871**	**55**	**68**

Table 252: Res Appliances Initiative Gross Impact Sample Design for WPP

Stratum	Population Size	Achieved Sample Size (Survey)	Achieved Sample Size (Desk Review)
Air Purifier	42	3	2
Ceiling Fan	3	0	0
Clothes Dryer	349	10	12
Clothes Washer	580	14	18
Dehumidifier	98	8	4
Dishwasher	701	7	15
Freezer	58	5	3
Heat Pump Water Heater	18	3	3
Mini Refrigerator	8	0	0
Pool Pump	9	1	3
Refrigerator	659	16	14
Room Air Conditioner	17	3	1
Smart Thermostat	515	16	11
Low-Income Total	**158**	**16**	**23**
Non Low-Income Total	**2,899**	**70**	**63**
Program Total	**3,057**	**86**	**86**

M.1.3 Results for Energy

The gross realization rates for energy, along with relative precisions, are shown in Table 253, Table 254, Table 255, and Table 256 for Met-Ed, Penelec, Penn Power, and WPP respectively.

Table 253: Res Appliances Initiative Energy Gross Realization Rates for Met-Ed

Stratum	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
Air Purifier	22	100.0%	0.5	49.1%
Ceiling Fan	0	100.0%	0.5	100.0%
Clothes Dryer	9	106.7%	0.5	21.3%
Clothes Washer	68	137.8%	0.5	18.3%
Dehumidifier	17	99.1%	0.5	28.3%
Dishwasher	15	106.9%	0.5	20.6%
Freezer	2	152.2%	0.5	25.7%
Heat Pump Water Heater	74	109.6%	0.5	30.4%
Mini Refrigerator	0	100.0%	0.5	100.0%
Pool Pump	39	132.1%	0.5	28.9%
Refrigerator	41	97.4%	0.5	16.7%
Room Air Conditioner	1	100.0%	0.5	49.3%
Smart Thermostat	133	60.5%	0.5	17.1%
Low-Income Total	**12**	**98.7%**	**0.5**	**na**
Non Low-Income Total	**410**	**98.7%**	**0.5**	**na**
Program Total	**423**	**98.7%**	**0.5**	**9.4%**

Table 254: Res Appliances Initiative Energy Gross Realization Rates for Penelec

Stratum	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
Air Purifier	8	100.0%	0.5	28.7%
Ceiling Fan	0	100.0%	0.5	100.0%
Clothes Dryer	5	105.8%	0.5	28.9%
Clothes Washer	41	147.3%	0.5	17.1%
Dehumidifier	14	98.2%	0.5	35.0%
Dishwasher	11	96.9%	0.5	17.7%
Freezer	1	128.0%	0.5	33.8%
Heat Pump Water Heater	16	109.6%	0.5	45.5%
Mini Refrigerator	0	100.0%	0.5	100.0%
Pool Pump	9	130.2%	0.5	41.6%
Refrigerator	27	98.1%	0.5	17.6%
Room Air Conditioner	1	98.8%	0.5	70.1%
Smart Thermostat	71	53.6%	0.5	18.7%
Low-Income Total	**15**	**95.1%**	**0.5**	**na**
Non Low-Income Total	**190**	**95.1%**	**0.5**	**na**
Program Total	**205**	**95.1%**	**0.5**	**8.9%**

Table 255: Res Appliances Initiative Energy Gross Realization Rates for Penn Power

Stratum	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
Air Purifier	11	100.0%	0.5	25.8%
Ceiling Fan	0	100.0%	0.5	100.0%
Clothes Dryer	2	106.4%	0.5	19.4%
Clothes Washer	19	141.5%	0.5	18.4%
Dehumidifier	7	117.2%	0.5	24.3%
Dishwasher	5	99.5%	0.5	20.1%
Freezer	1	103.8%	0.5	48.4%
Heat Pump Water Heater	2	100.0%	0.5	50.9%
Mini Refrigerator	0	100.0%	0.5	100.0%
Pool Pump	3	100.0%	0.5	100.0%
Refrigerator	13	78.9%	0.5	16.6%
Room Air Conditioner	0	100.0%	0.5	100.0%
Smart Thermostat	53	100.0%	0.5	23.4%
Low-Income Total	**4**	**105.6%**	**0.5**	**na**
Non Low-Income Total	**111**	**105.6%**	**0.5**	**na**
Program Total	**115**	**105.6%**	**0.5**	**0.0%**

Table 256: Res Appliances Initiative Energy Gross Realization Rates for WPP

Stratum	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
Air Purifier	31	100.0%	0.5	40.1%
Ceiling Fan	0	100.0%	0.5	100.0%
Clothes Dryer	10	133.5%	0.5	20.4%
Clothes Washer	68	176.0%	0.5	16.7%
Dehumidifier	20	118.1%	0.5	24.4%
Dishwasher	19	91.1%	0.5	18.4%
Freezer	2	129.6%	0.5	30.8%
Heat Pump Water Heater	22	169.6%	0.5	37.9%
Mini Refrigerator	0	100.0%	0.5	100.0%
Pool Pump	14	134.9%	0.5	33.9%
Refrigerator	46	103.2%	0.5	17.8%
Room Air Conditioner	0	111.1%	0.5	37.7%
Smart Thermostat	177	66.1%	0.5	17.7%
Low-Income Total	**20**	**104.7%**	**0.5**	**na**
Non Low-Income Total	**389**	**104.7%**	**0.5**	**na**
Program Total	**409**	**104.7%**	**0.5**	**8.6%**

M.1.4 Results for Demand

The gross realization rates for demand, along with relative precisions, are shown in Table 257, Table 258, Table 259, and Table 260 for Met-Ed, Penelec, Penn Power, and WPP respectively.

Table 257: Res Appliances Initiative Demand Gross Realization Rates for Met-Ed

Stratum	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
Air Purifier	0.00	91.4%	0.5	49.1%
Ceiling Fan	0.00	91.4%	0.5	100.0%
Clothes Dryer	0.00	98.8%	0.5	21.3%
Clothes Washer	0.01	125.7%	0.5	18.3%
Dehumidifier	0.00	90.5%	0.5	28.3%
Dishwasher	0.00	97.7%	0.5	20.6%
Freezer	0.00	139.9%	0.5	25.7%
Heat Pump Water Heater	0.01	100.2%	0.5	30.4%
Mini Refrigerator	0.00	91.4%	0.5	100.0%
Pool Pump	0.01	114.9%	0.5	28.9%
Refrigerator	0.01	89.2%	0.5	16.7%
Room Air Conditioner	0.00	91.4%	0.5	49.3%
Smart Thermostat	0.02	78.7%	0.5	17.1%
Low-Income Total	**0.00**	**98.7%**	**0.5**	**na**
Non Low-Income Total	**0.06**	**98.7%**	**0.5**	**na**
Program Total	**0.07**	**98.7%**	**0.5**	**9.7%**

Table 258: Res Appliances Initiative Demand Gross Realization Rates for Penelec

Stratum	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
Air Purifier	0.00	91.4%	0.5	28.7%
Ceiling Fan	0.00	91.4%	0.5	100.0%
Clothes Dryer	0.00	98.0%	0.5	28.9%
Clothes Washer	0.00	134.5%	0.5	17.1%
Dehumidifier	0.00	89.7%	0.5	35.0%
Dishwasher	0.00	88.6%	0.5	17.7%
Freezer	0.00	117.6%	0.5	33.8%
Heat Pump Water Heater	0.00	100.2%	0.5	45.5%
Mini Refrigerator	0.00	91.4%	0.5	100.0%
Pool Pump	0.00	113.6%	0.5	41.6%
Refrigerator	0.00	89.8%	0.5	17.6%
Room Air Conditioner	0.00	90.5%	0.5	70.1%
Smart Thermostat	0.01	78.8%	0.5	18.7%
Low-Income Total	**0.00**	**96.2%**	**0.5**	**na**
Non Low-Income Total	**0.03**	**96.2%**	**0.5**	**na**
Program Total	**0.03**	**96.2%**	**0.5**	**9.5%**

Table 259: Res Appliances Initiative Gross Realization Rates for Penn Power

Stratum	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
Air Purifier	0.00	91.3%	0.5	25.8%
Ceiling Fan	0.00	91.3%	0.5	100.0%
Clothes Dryer	0.00	98.3%	0.5	19.4%
Clothes Washer	0.00	129.1%	0.5	18.4%
Dehumidifier	0.00	107.0%	0.5	24.3%
Dishwasher	0.00	90.9%	0.5	20.1%
Freezer	0.00	95.3%	0.5	48.4%
Heat Pump Water Heater	0.00	91.3%	0.5	50.9%
Mini Refrigerator	0.00	91.3%	0.5	100.0%
Pool Pump	0.00	91.3%	0.5	100.0%
Refrigerator	0.00	72.2%	0.5	16.6%
Room Air Conditioner	0.00	91.3%	0.5	100.0%
Smart Thermostat	0.01	91.3%	0.5	23.4%
Low-Income Total	**0.00**	**95.4%**	**0.5**	**na**
Non Low-Income Total	**0.02**	**95.4%**	**0.5**	**na**
Program Total	**0.02**	**95.4%**	**0.5**	**12.5%**

Table 260: Res Appliances Initiative Demand Gross Realization Rates for WPP

Stratum	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
Air Purifier	0.00	91.4%	0.5	40.1%
Ceiling Fan	0.00	91.4%	0.5	100.0%
Clothes Dryer	0.00	106.5%	0.5	20.4%
Clothes Washer	0.01	160.5%	0.5	16.7%
Dehumidifier	0.01	108.0%	0.5	24.4%
Dishwasher	0.00	83.3%	0.5	18.4%
Freezer	0.00	119.1%	0.5	30.8%
Heat Pump Water Heater	0.00	155.0%	0.5	37.9%
Mini Refrigerator	0.00	91.4%	0.5	100.0%
Pool Pump	0.00	119.0%	0.5	33.9%
Refrigerator	0.01	94.7%	0.5	17.8%
Room Air Conditioner	0.00	95.1%	0.5	37.7%
Smart Thermostat	0.02	91.4%	0.5	17.7%
Low-Income Total	**0.00**	**107.2%**	**0.5**	**na**
Non Low-Income Total	**0.06**	**107.2%**	**0.5**	**na**
Program Total	**0.06**	**107.2%**	**0.5**	**8.5%**

M.2 NET IMPACT EVALUATION

M.2.1 Net Impact Evaluation Methodology

A net impact evaluation was not conducted in PY13. Net impact evaluation results from the Phase III evaluation effort will be applied to the initiative for PY13. Tetra Tech conducted net impact evaluation for appliances in PY8 and again in PY11. The net-to-gross evaluation for the downstream Appliances measures was based on self-report data from program participants. The following sections provide information related to the historical net impact evaluation effort that informs the initiative's NTG values for PY13.

M.2.2 Sampling

Tetra Tech sampled randomly from all participants on record in the Companies' tracking and reporting systems in early PY8Q4. The sample designs for the four EDCs are shown in Table 261, Table 262, Table 263, and Table 264 for Met-Ed, Penelec, Penn Power, and WPP. The achieved sample sizes and response rates in the table below are from the PY11 net impact evaluation effort.

Table 261: Res Appliances Initiative Net-to-Gross Sampling for Met-Ed

Stratum	Population Size	Achieved Sample Size	Response Rate
All Rebates	5,858	72	26.6%
Program Total	**5,858**	**72**	**26.6%**

Table 262: Res Appliances Initiative Net-to-Gross Sampling for Penelec

Stratum	Population Size	Achieved Sample Size	Response Rate
All Rebates	4,207	70	26.3%
Program Total	**4,207**	**70**	**26.3%**

Table 263: Res Appliances Initiative Net-to-Gross Sampling for Penn Power

Stratum	Population Size	Achieved Sample Size	Response Rate
All Rebates	2,103	76	29.1%
Program Total	**2,103**	**76**	**29.1%**

Table 264: Res Appliances Initiative Net-to-Gross Sampling for WPP

Stratum	Population Size	Achieved Sample Size	Response Rate
All Rebates	5,997	74	26.9%
Program Total	**5,997**	**74**	**26.9%**

M.2.3 Net Impact Evaluation Results

The PYTD verified gross energy impacts, free ridership, spillover, net-to-gross ratios, and relative precisions for net-to-gross are shown in Table 265, Table 266, Table 267, and Table 268 for Met-Ed, Penelec, Penn Power, and WPP.

Table 265: Res Appliances Initiative Net-to-Gross Results for Met-Ed

Stratum	PYVTD MWh	Free Ridership (%)	Spillover (%)	NTG Ratio	Relative Precision (@ 85% CL)
All Rebates	405	52.8%	3.0%	50.2%	12.7%
Program Total	**405**	**52.8%**	**3.0%**	**50.2%**	**12.7%**

Table 266: Res Appliances Initiative Net-to-Gross Results for Penelec

Stratum	PYVTD MWh	Free Ridership (%)	Spillover (%)	NTG Ratio	Relative Precision (@ 85% CL)
All Rebates	181	46.9%	6.9%	60.0%	12.9%
Program Total	**181**	**46.9%**	**6.9%**	**60.0%**	**12.9%**

Table 267: Res Appliances Initiative Net-to-Gross Results for Penn Power

Stratum	PYVTD MWh	Free Ridership (%)	Spillover (%)	NTG Ratio	Relative Precision (@ 85% CL)
All Rebates	118	56.0%	12.2%	56.2%	12.4%
Program Total	**118**	**56.0%**	**12.2%**	**56.2%**	**12.4%**

Table 268: Res Appliances Initiative Net-to-Gross Results for WPP

Stratum	PYVTD MWh	Free Ridership (%)	Spillover (%)	NTG Ratio	Relative Precision (@ 85% CL)
All Rebates	407	49.2%	13.9%	64.7%	12.6%
Program Total	**407**	**49.2%**	**13.9%**	**64.7%**	**12.6%**

Appendix N Evaluation Detail – Residential Midstream Appliances Initiative

In this initiative, rebates are paid to retailers for point-of-sale discounts on the purchase price for dehumidifiers, heat pump water heaters, ceiling fans, air purifiers, room air conditioners, and smart thermostats at participating stores. Residential customers do not file rebate applications; instead, retailers discount the appliances and invoice for rebates with point-of-sale data files as supporting documentation.

Some measures are offered in both the downstream and midstream offerings. Double-dipping is not allowed by the program, meaning that customers who purchase program measures at participating retail stores for the midstream program are not eligible to submit a mail-in rebate. For income-qualified customers, the downstream offering already has increased rebates available. If an income-qualified customer were to purchase an eligible appliance through the midstream offering, they could apply for an additional rebate, referred to as an 'enhanced rebate.' The ICSP, Franklin Energy has processes to ensure only eligible customers receive a rebate

Participants are defined as each separate appliance rebated. Additional rebates provided to LI customers are not included in participation counts. Thus, the rebate application, rather than the customer is the sampling unit for gross impact evaluation.

N.1 Gross Impact Evaluation

N.1.1 Gross Impact Evaluation Methodology

Each component of gross impact is described below.

N.1.1.1 Invoice and Application Review

For midstream appliances, ADM obtained retailer invoices with supporting documentation containing details of the rebated appliance models. Each model on the invoices was matched to the ENERGY STAR® database to obtain measure attributes. A census of the reported models was researched in this way.

N.1.1.2 Saving Calculations with TRM Algorithms and Parameters

For all reviewed records, ADM used model-specific attributes to calculate “On-TRM” impacts.

The average per-unit gross verified impact for a given measure is the product of the measure-specific verification rate (as determined from customer surveys or retailer invoice details) and the average calculated impacts as described above. The gross realization rates for energy savings were driven primarily by the reported energy savings in the tracking and reporting system. The reported impacts are based on market-average efficiency and capacity attributes while the verified impacts are calculated with model-specific attributes as derived from the ENERGY STAR® database.

N.1.2 Sampling

Each measure was treated as a separate stratum within the sampling initiative. The sample designs for the four EDCs are shown in Table 269, Table 270, Table 271, and Table 272.

Table 269: Res Midstream Appliances Initiative Gross Impact Sample Design for Met-Ed

Stratum	Population Size	Achieved Sample Size (Desk Review)
Dehumidifier	8,039	8,039
Heat Pump Water Heater	505	505
Ceiling Fan	760	760
Air Purifier	1,057	1,057
Room Air Conditioner	940	940
Smart Thermostat	1,735	1,735
Program Total	**13,036**	**13,036**

Table 270: Res Midstream Appliances Initiative Gross Impact Sample Design for Penelec

Stratum	Population Size	Achieved Sample Size (Desk Review)
Dehumidifier	7,924	7,924
Heat Pump Water Heater	170	170
Ceiling Fan	541	541
Air Purifier	962	962
Room Air Conditioner	541	541
Smart Thermostat	1,205	1,205
Program Total	**11,343**	**11,343**

Table 271: Res Midstream Appliances Initiative Gross Impact Sample Design for Penn Power

Stratum	Population Size	Achieved Sample Size (Desk Review)
Dehumidifier	3,311	3,311
Heat Pump Water Heater	83	83
Ceiling Fan	268	268
Air Purifier	406	406
Room Air Conditioner	208	208
Smart Thermostat	827	827
Program Total	**5,103**	**5,103**

Table 272: Res Midstream Appliances Initiative Gross Impact Sample Design for WPP

Stratum	Population Size	Achieved Sample Size (Desk Review)
Dehumidifier	6,634	6,634
Heat Pump Water Heater	205	205
Ceiling Fan	520	520
Air Purifier	859	859
Room Air Conditioner	527	527
Smart Thermostat	1,254	1,254
Program Total	**9,999**	**9,999**

N.1.3 Results for Energy

The gross realization rates for energy, along with relative precisions, are shown in Table 273, Table 274, Table 275, and Table 276 for Met-Ed, Penelec, Penn Power, and WPP respectively. In general, gross realization rates were near 100% for both energy and demand.

Table 273: Res Midstream Appliances Initiative Energy Gross Realization Rates for Met-Ed

Stratum	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
Dehumidifier	1,645.6	104.8%	0.5	0.0%
Heat Pump Water Heater	881.6	111.7%	0.5	0.0%
Ceiling Fan	30.4	97.2%	0.5	0.0%
Air Purifier	673.4	100.0%	0.5	0.0%
Room Air Conditioner	27.4	99.0%	0.5	0.0%
Smart Thermostat	529.9	100.0%	0.5	0.0%
Program Total	**3,788**	**104.8%**	**0.5**	**0.0%**

Table 274: Res Midstream Appliances Initiative Energy Gross Realization Rates for Penelec

Stratum	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
Dehumidifier	1,622.0	105.3%	0.5	0.0%
Heat Pump Water Heater	292.7	111.0%	0.5	0.0%
Ceiling Fan	21.6	102.9%	0.5	0.0%
Air Purifier	554.7	100.0%	0.5	0.0%
Room Air Conditioner	9.8	102.0%	0.5	0.0%
Smart Thermostat	248.4	100.0%	0.5	0.0%
Program Total	**2,749**	**104.3%**	**0.5**	**0.0%**

Table 275: Res Midstream Appliances Initiative Energy Gross Realization Rates for Penn Power

Stratum	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
Dehumidifier	677.8	107.4%	0.5	0.0%
Heat Pump Water Heater	141.2	111.7%	0.5	0.0%
Ceiling Fan	10.7	102.1%	0.5	0.0%
Air Purifier	244.0	100.4%	0.5	0.0%
Room Air Conditioner	4.6	117.3%	0.5	0.0%
Smart Thermostat	188.4	100.0%	0.5	0.0%
Program Total	**1,267**	**105.4%**	**0.5**	**0.0%**

Table 276: Res Midstream Appliances Initiative Energy Gross Realization Rates for WPP

Stratum	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
Dehumidifier	1,358.0	105.8%	0.5	0.0%
Heat Pump Water Heater	344.7	111.3%	0.5	0.0%
Ceiling Fan	20.8	102.9%	0.5	0.0%
Air Purifier	507.3	99.8%	0.5	0.0%
Room Air Conditioner	11.6	104.0%	0.5	0.0%
Smart Thermostat	291.4	100.0%	0.5	0.0%
Program Total	**2,534**	**104.6%**	**0.5**	**0.0%**

N.1.4 Results for Demand

The gross realization rates for demand, along with relative precisions, are shown in Table 277, Table 278, Table 279, and Table 280 for Met-Ed, Penelec, Penn Power, and WPP respectively.

Table 277: Res Midstream Appliances Initiative Demand Gross Realization Rates for Met-Ed

Stratum	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
Dehumidifier	0.4	104.9%	0.5	0.0%
Heat Pump Water Heater	0.1	111.7%	0.5	0.0%
Ceiling Fan	0.0	101.2%	0.5	0.0%
Air Purifier	0.1	100.0%	0.5	0.0%
Room Air Conditioner	0.1	96.0%	0.5	0.0%
Smart Thermostat	0.1	100.0%	0.5	0.0%
Program Total	**0.72**	**104.0%**	**0.5**	**0.0%**

Table 278: Res Midstream Appliances Initiative Demand Gross Realization Rates for Penelec

Stratum	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
Dehumidifier	0.4	105.4%	0.5	0.0%
Heat Pump Water Heater	0.0	111.0%	0.5	0.0%
Ceiling Fan	0.0	102.6%	0.5	0.0%
Air Purifier	0.1	100.0%	0.5	0.0%
Room Air Conditioner	0.0	98.8%	0.5	0.0%
Smart Thermostat	0.0	100.0%	0.5	0.0%
Program Total	**0.60**	**104.4%**	**0.5**	**0.0%**

Table 279: Res Midstream Appliances Initiative Gross Realization Rates for Penn Power

Stratum	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
Dehumidifier	0.2	107.4%	0.5	0.0%
Heat Pump Water Heater	0.0	111.7%	0.5	0.0%
Ceiling Fan	0.0	106.4%	0.5	0.0%
Air Purifier	0.0	100.4%	0.5	0.0%
Room Air Conditioner	0.0	117.8%	0.5	0.0%
Smart Thermostat	0.0	100.0%	0.5	0.0%
Program Total	**0.26**	**106.5%**	**0.5**	**0.0%**

Table 280: Res Midstream Appliances Initiative Demand Gross Realization Rates for WPP

Stratum	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
Dehumidifier	0.4	105.8%	0.5	0.0%
Heat Pump Water Heater	0.0	111.3%	0.5	0.0%
Ceiling Fan	0.0	112.6%	0.5	0.0%
Air Purifier	0.1	99.8%	0.5	0.0%
Room Air Conditioner	0.0	103.7%	0.5	0.0%
Smart Thermostat	0.0	100.0%	0.5	0.0%
Program Total	**0.53**	**104.9%**	**0.5**	**0.0%**

N.2 NET IMPACT EVALUATION

N.2.1 Net Impact Evaluation Methodology

A net impact evaluation was not conducted in PY13. Net impact evaluation results from the Phase III evaluation effort will be applied to the initiative for PY13. Tetra Tech conducted net impact evaluation for appliances in PY8 and again in PY11. The net-to-gross evaluation for the downstream Appliances measures was based on self-report data from program participants. The following sections provide information related to the historical net impact evaluation effort that informs the initiative's NTG values for PY13.

N.2.2 Sampling

Tetra Tech sampled randomly from all participants on record in the Companies' tracking and reporting systems in early PY8Q4. The sample designs for the four EDCs are shown in Table 281. The achieved sample sizes and response rates in the table below are from the PY11 net impact evaluation effort.

Table 281: Res Appliances Initiative Net-to-Gross Sampling

EDC	Stratum	Population Size	Achieved Sample Size	Response Rate
Met-Ed	All Rebates	5,858	72	26.6%
Met-Ed Total		**5,858**	**72**	**26.6%**
Penelec	All Rebates	4,207	70	26.3%
Penele Total		**4,207**	**70**	**26.3%**
Penn Power	All Rebates	2,103	76	29.1%
Penn Power Total		**2,103**	**76**	**29.1%**
WPP	All Rebates	5,997	74	26.9%
WPP Total		**5,997**	**74**	**26.9%**

N.2.3 Net Impact Evaluation Results

The PYTD verified gross energy impacts, free ridership, spillover, net-to-gross ratios, and relative precisions for net-to-gross are shown in Table 282.

Table 282: Res Appliances Initiative Net-to-Gross Results

EDC	PYVTD MWh	Free Ridership (%)	Spillover (%)	NTG Ratio	Relative Precision (@ 85% CL)
Met-Ed	3,970	52.8%	0.0%	47.2%	12.7%
Penelec	2,869	46.9%	0.0%	53.1%	12.9%
Penn Power	1,335	56.0%	0.0%	44.0%	12.4%
WPP	2,651	49.2%	0.0%	50.8%	12.6%

Appendix O Evaluation Detail – Low-Income Residential Appliance Recycling Sub-Initiative

O.1 Gross Impact Evaluation

Gross impact evaluation for the Low-Income Appliance Recycling (LI ATI) Sub-Initiative included customer verification surveys and TRM calculations of measure-level impacts. There are four distinct measures offered by the program: refrigerator recycling, freezer recycling, room AC (RAC) recycling, and dehumidifier recycling.

O.1.1 Gross Impact Evaluation Methodology

ADM's gross impact evaluation methodology was identical for all four EDCs. A TRM-based calculation was performed for each entry in the tracking and reporting system. The parameter values from the TRM (or for dehumidifiers, IMP) algorithms were taken from project-specific data from the tracking and reporting system when applicable, from TRM defaults, or from customer verification surveys. For refrigerators and freezers, measure attributes that participants would readily recall were determined from participant surveys, and the average parameter values were applied to all measures. Apart from measure verification, these attributes include the part-use factor, the location in the home where the appliance was used, and for refrigerators, whether the appliance was a primary or secondary unit. Technical attributes of the appliances, such as the age, capacity, and configuration, as collected by ARCA, were taken from program tracking and reporting data. TRM or IMP default parameters were used tor room air conditioners (RACs) and dehumidifiers. Table 283 lists the data sources for gross impact calculation algorithms.

Table 283: Data Sources for the LI ATI Initiative Gross Impact Evaluation

Measure	TRM Parameter	Data Source
Refrigerator, Freezer	Appliance Age	Tracking and Reporting System
Refrigerator, Freezer	Pre-1990	Tracking and Reporting System
Refrigerator, Freezer	Appliance Size / Capacity	Tracking and Reporting System
Refrigerator, Freezer	Configuration/Type	Tracking and Reporting System
Refrigerator	Primary Usage	Participant Surveys
Refrigerator, Freezer	Part Use Factor	Participant Surveys
Refrigerator, Freezer	In Unconditioned Space?	Participant Surveys
Refrigerator, Freezer	CDD and HDD	TRM - Zip Code Lookup
RAC	Capacity	Tracking and Reporting System
RAC	EER	TRM Default
RAC	RAC EFLH	TRM - Zip Code Lookup
RAC	CF	TRM - Zip Code Lookup
Dehumidifier	Capacity	Tracking and Reporting System
Dehumidifier	Region (to determine kWh)	TRM - Zip Code Lookup
All Measures	Verification Rate	Participant Surveys

The gross realization rates for energy savings were driven primarily by part-use factors for refrigerators and freezers as determined through verification surveys, and by the unit energy consumptions for refrigerators and freezers, as determined through measure attributes recorded in the tracking and reporting system.

O.1.2 Sampling

Each measure was treated as a separate stratum within the sampling initiative. The sample designs for the four EDCs are shown in Table 284, Table 285, Table 286, and Table 287. The population sizes and sample sizes represent individual appliances rather than individual customers. Most surveys were conducted online, with telephone surveys employed to meet sample quotas if only a few more sample points were needed. Note that the overall precision for the ATI initiative is the combined precision of the low income, non-low-income, and nonresidential components. The combined precisions for each EDC are shown in Table 218 in Appendix J.

Table 284: LI ATI Sub-Initiative Gross Impact Sample Design for Met-Ed

Stratum	Population Size	Achieved Sample Size	Evaluation Activity
Refrigerators	467	29	Survey (phone + online)
Freezers	116	8	
RACs	140	9	
Dehumidifiers	47	1	
Mini Friges	17	0	
Program Total	**787**	**47**	

Table 285: LI ATI Sub-Initiative Gross Impact Sample Design for Penelec

Stratum	Population Size	Achieved Sample Size	Evaluation Activity
Refrigerators	525	39	Survey (phone + online)
Freezers	111	12	
RACs	108	5	
Dehumidifiers	46	2	
Mini Friges	9	5	
Program Total	**799**	**63**	

Table 286: LI ATI Sub-Initiative Gross Impact Sample Design for Penn Power

Stratum	Population Size	Achieved Sample Size	Evaluation Activity
Refrigerators	117	16	Survey (phone + online)
Freezers	23	6	
RACs	30	9	
Dehumidifiers	14	2	
Mini Friges	2	0	
Program Total	**186**	**33**	

Table 287: LI ATI Sub-Initiative Gross Impact Sample Design for WPP

Stratum	Population Size	Achieved Sample Size	Evaluation Activity
Refrigerators	439	35	Survey (phone + online)
Freezers	111	9	
RACs	117	3	
Dehumidifiers	34	1	
Mini Friges	12	3	
Program Total	**713**	**51**	

O.1.3 Results for Energy

The gross realization rates for energy, along with relative precisions, are shown in Table 288, Table 289, Table 290, and Table 291 for Met-Ed, Penelec, Penn Power, and WPP respectively.

Table 288: LI ATI Sub-Initiative Energy Gross Realization Rates for Met-Ed

Stratum	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
Refrigerators	428	116.1%	0.5	13.4%
Freezers	69	107.7%	0.5	25.5%
RACs	13	133.1%	0.5	24.0%
Dehumidifiers	32	99.7%	0.5	72.0%
Mini Friges	4	100.0%	0.5	100.0%
Program Total	**546**	**114.4%**	**0.5**	**11.7%**

Table 289: LI ATI Sub-Initiative Energy Gross Realization Rates for Penelec

Stratum	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
Refrigerators	483	99.1%	0.5	11.5%
Freezers	72	104.4%	0.5	20.8%
RACs	11	85.1%	0.5	32.2%
Dehumidifiers	23	125.6%	0.5	50.9%
Mini Friges	2	171.6%	0.5	32.2%
Program Total	**591**	**100.8%**	**0.5**	**10.0%**

Table 290: LI ATI Sub-Initiative Energy Gross Realization Rates for Penn Power

Stratum	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
Refrigerators	108	97.3%	0.5	18.0%
Freezers	14	122.0%	0.5	29.4%
RACs	3	86.3%	0.5	24.0%
Dehumidifiers	7	120.6%	0.5	50.9%
Mini Friges	0	100.0%	0.5	100.0%
Program Total	**133**	**101.0%**	**0.5**	**15.0%**

Table 291: LI ATI Sub-Initiative Energy Gross Realization Rates for WPP

Stratum	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
Refrigerators	407	101.3%	0.5	12.2%
Freezers	71	92.4%	0.5	24.0%
RACs	12	90.7%	0.5	41.6%
Dehumidifiers	11	186.6%	0.5	72.0%
Mini Friges	3	112.5%	0.5	41.6%
Program Total	**504**	**101.8%**	**0.5**	**10.7%**

O.1.4 Results for Demand

The gross realization rates for demand, along with relative precisions, are shown in Table 292, Table 293, Table 294, and Table 295 for Met-Ed, Penelec, Penn Power, and WPP respectively.

Table 292: LI ATI Sub-Initiative Demand Gross Realization Rates for Met-Ed

Stratum	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
Refrigerators	0.08	116.1%	0.5	13.4%
Freezers	0.01	107.7%	0.5	25.5%
RACs	0.03	131.0%	0.5	24.0%
Dehumidifiers	0.01	98.9%	0.5	72.0%
Mini Friges	0.00	100.1%	0.5	100.0%
Program Total	**0.12**	**117.5%**	**0.5**	**11.0%**

Table 293: LI ATI Sub-Initiative Demand Gross Realization Rates for Penelec

Stratum	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
Refrigerators	0.09	99.1%	0.5	11.5%
Freezers	0.01	104.4%	0.5	20.8%
RACs	0.03	78.9%	0.5	32.2%
Dehumidifiers	0.01	122.2%	0.5	50.9%
Mini Friges	0.00	171.8%	0.5	32.2%
Program Total	**0.13**	**96.8%**	**0.5**	**10.1%**

Table 294: LI ATI Sub-Initiative Gross Realization Rates for Penn Power

Stratum	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
Refrigerators	0.02	97.3%	0.5	18.0%
Freezers	0.00	122.0%	0.5	29.4%
RACs	0.01	77.1%	0.5	24.0%
Dehumidifiers	0.00	128.2%	0.5	50.9%
Mini Friges	0.00	100.1%	0.5	100.0%
Program Total	**0.03**	**96.6%**	**0.5**	**13.2%**

Table 295: LI ATI Sub-Initiative Demand Gross Realization Rates for WPP

Stratum	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
Refrigerators	0.07	101.3%	0.5	12.2%
Freezers	0.01	92.4%	0.5	24.0%
RACs	0.03	87.7%	0.5	41.6%
Dehumidifiers	0.00	175.4%	0.5	72.0%
Mini Friges	0.00	112.7%	0.5	41.6%
Program Total	**0.12**	**99.0%**	**0.5**	**12.6%**

O.2 Net Impact Evaluation

O.2.1 Net Impact Evaluation Methodology

As with other programs that target income-qualified participants, an NTG ratio of 100% is used for calculation of portfolio-level net verified impacts and for net-level TRC calculations.

Appendix P Evaluation Detail – Residential Low-Income Direct Install Initiative

The Low-Income direct install initiative is comprised of three subprograms: WARM – Plus, WARM – Extra Measure, and WARM Multifamily. Each subprogram is implemented by FirstEnergy. Each sub program offers similar measures to its participants.

Participants are defined as the number of unique project numbers in the program. Participants can receive numerous measures installed over the course of the program year. Participants must have a gross household income at or below 150% of the 2020 Federal Income Poverty Guideline (FPIG).

To join this program, new participants must submit their most recent Household Income Tax Return and pay stubs for the last 30 days to FirstEnergy contractors to verify their income. FirstEnergy also maintains a list of known Low-Income customers to verify customer's income.

P.1 Gross Impact Evaluation

P.1.1 Gross Impact Evaluation Methodology

Gross impact evaluation for the LI DI Initiative involved using TRM calculations for measures installed throughout the program. Unique measure calculations were performed in accordance with the 2021 PA TRM for each measure type. The impact evaluation process is described below.

P.1.1.1 Determination of In-Service Rates

In-service rates are calculated by using QA/QC forms created by a third-party inspector. Inspectors verified measure installations during a site visit after the project was completed. The verified installed quantities were compared to reported quantities to develop the in-service rates.

In PY8, ADM performed ride along site visits with three different QA/QC contractors to ensure that the contractors were performing the QA/QC visit properly. It was found that the QA/QC contractors were indeed looking for the right measures and measure quantities. ADM verified the same quantity of measures as the QA/QC contractors. ADM continues to rely on QA/QC contractors' inspections to determine in-service rates for measures.

In-service rates were used in all savings calculations except air sealing and attic insulation measures.

P.1.1.2 TRM Calculations

For lighting measures, the efficient wattage ranges and bulb type are stated in equipment name columns of the customer tracking data. ADM used data from the upstream lighting program to determine average baseline watts and average energy efficient watts for each unique equipment name. The hours of use are assumed to be the TRM default of 3 hours because the bulb installation location is not known. TRM defaults were used for other portions of the calculation.

TRM defaults were used for the LED Nights Lights.

For refrigerator and freezer measures, each installation was assigned a category number using the equipment name and equipment description fields in the customer tracking data. If the name and description fields contradicted each other, the description field was used because the description column is more accurate and detailed. The implementer stated that the newly installed appliances are required to have the same size and configuration as the replaced appliance. Portions of the recycling part of the savings calculation come from the appliance recycling program, other portions come from the determined category number. All appliances were assumed to be primary use. The default part use factors were used in the calculation.

For domestic hot water measures, first the water heater type was verified. The housing type identified in the customer tracking data is used in showerhead and aerator measure savings calculations. The heat pump water heater measure calculation uses the efficient energy factor rating and volume stated in the customer tracking data or found in the supporting documentation. TRM defaults are assumed when specific values are not known or found. The PA 2021 TRM does not have a measure for electric resistance water heaters, therefore this type of measure saves zero energy.

Billing analysis was used to verify heating and cooling equipment types for accounts which received attic insulation. Once the heating and cooling equipment type was verified, the attic insulation savings calculation was completed. Insulation area, Rbase, Ree were provided in the project documentation. The HDDs, CDDs, and $EFLH_{cool}$ were found using the zip code lookup table to the projects reference city.

Residential air sealing measures used $CFM50_{post}$ and $CFM50_{pre}$ values found in the project audit forms. The heating equipment type was found in the customer tracking data and the cooling equipment type was in project audit forms.

The default savings values were used for the smart strip plug outlets. All smart strips were assumed to be tier 1 smart strips. The equip name or description columns were used to find the quantity of the plugs on the smart strips. Projects which have multiple smart strips installed were assigned the savings values for the “Unspecified use or multiple purchased” smart strips. The description column indicates if the smart strip was installed on an entertainment center. Descriptions which included phrases such as “TV”, “Living room”, or “entertain” were considered entertainment center installations.

Room air conditioner measures were evaluated using section 2.2.7 of the 2021 PA TRM. The capacity of the RAC is given the measures equipment name. All RACs were assumed to have louvered sides. The $CEER_{base}$ and $CEER_{ee}$ were found using the louvered sided assumption. The hours of use for room air conditioners were found using the zip code lookup table in the TRM.

Duct sealing measures were not evaluated because no supporting documentation was given to support the saving calculations. This did not adversely affect the program realization rates because there were very few duct sealing jobs[16].

P.1.1.3 Billing Based Verification of Electric Space Heat

The customer tracking data often misreported the heating and cooling equipment type for a given address which received attic insulation. To verify the heating and cooling equipment type, a billing analysis was performed on a sample of homes which received attic insulation measures. It was found that in many situations an address tracked as non-electric heat had an inoperable non-electric central furnace as the primary heat source and therefore uses electric resistance heaters to heat the residence. The billing analysis uses monthly billing data, actual weather data, house size, and energy intensity (btu/sqft for heating and tons/sqft for cooling) assumptions to predict the heating and cooling type. Once the heating and cooling equipment types are confirmed, insulation savings calculations were made. Attic insulation savings realization rates were developed and applied to the attic insulation measure population.

P.1.2 Sampling

The sampling strategy for gross impact evaluation is summarized in Table 296, Table 297, Table 298, and Table 299 for Met-Ed, Penelec, Penn Power, and WPP respectively.

Table 296: LI DI Initiative Gross Impact Sample Design for Met-Ed

Stratum	MWh Threshold	Population Size	Achieved Sample Size	Evaluation Activity
High Savings	1,900	93	22	TRM Analysis + On-Site Verification
Medium Savings	1,050	180	26	
Low Savings	0	612	28	
Program Total		**885**	**76**	

Table 297: LI DI Initiative Gross Impact Sample Design for Penelec

Stratum	MWh Threshold	Population Size	Achieved Sample Size	Evaluation Activity
High Savings	1,350	233	21	TRM Analysis + On-Site Verification
Medium Savings	700	470	28	
Low Savings	0	1,066	27	
Program Total		**1,769**	**76**	

[16] There are other measures with sparse implementation that are also not credited savings. One example is the installation of a clothesline. Although it is expected that this measure can reduce energy usage associated with clothes drying, it is difficult to quantify impacts to the level of certainty that would warrant a TRM addition or interim measure protocol.

Table 298: LI DI Initiative Gross Impact Sample Design for Penn Power

Stratum	MWh Threshold	Population Size	Achieved Sample Size	Evaluation Activity
High Savings	1,650	64	12	TRM Analysis + On-Site Verification
Medium Savings	900	146	16	
Low Savings	0	382	26	
Program Total		**592**	**54**	

Table 299: LI DI Initiative Gross Impact Sample Design for WPP

Stratum	MWh Threshold	Population Size	Achieved Sample Size	Evaluation Activity
High Savings	1,950	141	27	TRM Analysis + On-Site Verification
Medium Savings	1,050	284	28	
Low Savings	0	844	28	
Program Total		**1,269**	**83**	

P.1.3 Results for Energy

The gross realization rates for energy, along with relative precisions, are shown in Table 300, Table 301, Table 302, and Table 303 for Met-Ed, Penelec, Penn Power, and WPP respectively.

Table 300: LI DI Initiative Energy Gross Realization Rates for Met-Ed

Stratum	MWh Threshold	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
High Savings	1,900	258	97.8%	0.5	13%
Medium Savings	1,050	254	101.4%	0.5	13%
Low Savings	0	269	101.5%	0.5	13%
Program Total		**781**	**100.2%**	**0.5**	**7.7%**

Table 301: LI DI Initiative Energy Gross Realization Rates for Penelec

Stratum	MWh Threshold	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
High Savings	1,350	440	100.7%	0.5	15%
Medium Savings	700	470	99.4%	0.5	13%
Low Savings	0	352	101.3%	0.5	14%
Program Total		**1,262**	**100.4%**	**0.5**	**8.1%**

Table 302: LI DI Initiative Energy Gross Realization Rates for Penn Power

Stratum	MWh Threshold	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
High Savings	1,650	152	98.7%	0.5	19%
Medium Savings	900	176	101.3%	0.5	17%
Low Savings	0	161	98.6%	0.5	14%
Program Total		**489**	**99.6%**	**0.5**	**9.6%**

Table 303: LI DI Initiative Energy Gross Realization Rates for WPP

Stratum	MWh Threshold	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
High Savings	1,950	365	97.1%	0.5	12%
Medium Savings	1,050	415	101.1%	0.5	13%
Low Savings	0	453	101.2%	0.5	13%
Program Total		**1,234**	**100.0%**	**0.5**	**7.5%**

P.1.4 Results for Demand

The gross realization rates for demand, along with relative precisions, are shown Table 304, Table 305, Table 306, and Table 307 for Met-Ed, Penelec, Penn Power, and WPP respectively.

Table 304: LI DI Initiative Demand Gross Realization Rates for Met-Ed

Stratum	MWh Threshold	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
High Savings	1,900	0.03	99.5%	0.5	13%
Medium Savings	1,050	0.03	100.2%	0.5	13%
Low Savings	0	0.03	100.5%	0.5	13%
Program Total		**0.09**	**100.1%**	**0.5**	**7.7%**

Table 305: LI DI Initiative Demand Gross Realization Rates for Penelec

Stratum	MWh Threshold	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
High Savings	1,350	0.05	100.0%	0.5	15%
Medium Savings	700	0.06	98.4%	0.5	13%
Low Savings	0	0.04	100.7%	0.5	14%
Program Total		**0.15**	**99.5%**	**0.5**	**8.2%**

Table 306: LI DI Initiative Gross Realization Rates for Penn Power

Stratum	MWh Threshold	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
High Savings	1,650	0.02	98.6%	0.5	19%
Medium Savings	900	0.02	100.7%	0.5	17%
Low Savings	0	0.02	97.5%	0.5	14%
Program Total		**0.06**	**99.0%**	**0.5**	**9.6%**

Table 307: LI DI Initiative Demand Gross Realization Rates for WPP

Stratum	MWh Threshold	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
High Savings	1,950	0.05	98.9%	0.5	12%
Medium Savings	1,050	0.06	100.0%	0.5	13%
Low Savings	0	0.06	99.7%	0.5	13%
Program Total		**0.16**	**99.6%**	**0.5**	**7.5%**

P.2 NET IMPACT EVALUATION

P.2.1 Net Impact Evaluation Methodology

An independent net impact evaluation was not conducted for this initiative.

Appendix Q Evaluation Detail – LI EE Kits Sub-Initiative

Q.1 Gross Impact Evaluation

The Low-Income EE Kits initiative has two sub-components: Low-income EE Kits and the Low-Income School Education program, both administered by AMCG. Both program components are similar to their non-income-qualified counterparts described in Appendix E . Other than minor differences in kit contents, the low-income EE Kit program components differ from the general EE Kit program components in the way customers are targeted and enrolled. The Low-Income EE Kit program targets customers that are income qualified in the Companies' customer information systems databases. The Low-Income Schools program targets schools in low-income areas.

Q.1.1 Gross Impact Evaluation Methodology

ADM's gross impact evaluation methodology was identical to the process described for EE Kits in Appendix E. The gross realization rates and underlying in-service rates were generally higher for the Low-Income EE kits. For example, ISRs for showerheads and aerators were approximately twice as high as their non-low-income counterparts. ISRs for furnace whistles were also appreciably higher for the low-income subgroup.

Q.1.2 Sampling

Each kit type was treated as a separate stratum within the sampling initiative. The sample designs for the four EDCs are shown in Table 308, Table 309, Table 310, and Table 311. Note that the overall precision for the EE Kits initiative is the combined precision of the low income and non-low-income components. The combined precisions for each EDC are shown in Table 158 in Appendix E.2.2.

Table 308: LI EE Kits Sub-Initiative Gross Impact Sample Design for Met-Ed

Stratum	Population Size	Achieved Sample Size	Evaluation Activity
LI EE Kits - Electric	5,029	25	Survey (phone + online)
LI EE Kits - Standard	3,128	33	
LI School Education Kits	948	183	
Program Total	**9,105**	**241**	

Table 309: LI EE Kits Sub-Initiative Gross Impact Sample Design for Penelec

Stratum	Population Size	Achieved Sample Size	Evaluation Activity
LI EE Kits - Electric	5,831	23	Survey (phone + online)
LI EE Kits - Standard	5,034	78	
LI School Education Kits	3,814	322	
Program Total	**14,679**	**423**	

Table 310: LI EE Kits Sub-Initiative Gross Impact Sample Design for Penn Power

Stratum	Population Size	Achieved Sample Size	Evaluation Activity
LI EE Kits - Electric	1,019	14	Survey (phone + online)
LI EE Kits - Standard	923	46	
LI School Education Kits	1,580	166	
Program Total	**3,522**	**226**	

Table 311: LI EE Kits Sub-Initiative Gross Impact Sample Design for WPP

Stratum	Population Size	Achieved Sample Size	Evaluation Activity
LI EE Kits - Electric	5,043	47	Survey (phone + online)
LI EE Kits - Standard	2,955	45	
LI School Education Kits	2,369	226	
Program Total	**10,367**	**318**	

Q.1.3 Results for Energy

The gross realization rates for energy, along with relative precisions, are shown in Table 312, Table 313, Table 314, and Table 315 for Met-Ed, Penelec, Penn Power, and WPP respectively.

Table 312: LI EE Kits Sub-Initiative Energy Gross Realization Rates for Met-Ed

Stratum	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
LI EE Kits - Electric	1,357	96.4%	1.00	29%
LI EE Kits - Standard	668	77.1%	1.00	25%
LI School Education Kits	210	105.0%	1.00	10%
Program Total	**2,235**	**91.4%**	**1.00**	**19.5%**

Table 313: LI EE Kits Sub-Initiative Energy Gross Realization Rates for Penelec

Stratum	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
LI EE Kits - Electric	1,555	109.9%	1.00	30%
LI EE Kits - Standard	1,089	77.4%	1.00	16%
LI School Education Kits	858	100.4%	1.00	8%
Program Total	**3,501**	**97.5%**	**1.00**	**15.6%**

Table 314: LI EE Kits Sub-Initiative Energy Gross Realization Rates for Penn Power

Stratum	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
LI EE Kits - Electric	277	111.4%	1.00	38%
LI EE Kits - Standard	204	69.2%	1.00	21%
LI School Education Kits	363	100.8%	1.00	11%
Program Total	**845**	**96.6%**	**1.00**	**15.6%**

Table 315: LI EE Kits Sub-Initiative Energy Gross Realization Rates for WPP

Stratum	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
LI EE Kits - Electric	1,369	101.7%	1.00	21%
LI EE Kits - Standard	648	91.8%	1.00	21%
LI School Education Kits	539	104.7%	1.00	9%
Program Total	**2,556**	**99.8%**	**1.00**	**12.6%**

Q.1.4 Results for Demand

The gross realization rates for demand, along with relative precisions, are shown in Table 316, Table 317, Table 318, and Table 319 for Met-Ed, Penelec, Penn Power, and WPP respectively.

Table 316: LI EE Kits Sub-Initiative Demand Gross Realization Rates for Met-Ed

Stratum	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
LI EE Kits - Electric	0.15	99.1%	1.00	29%
LI EE Kits - Standard	0.08	75.1%	1.00	25%
LI School Education Kits	0.02	89.5%	1.00	10%
Program Total	**0.24**	**90.8%**	**1.00**	**19.7%**

Table 317: LI EE Kits Sub-Initiative Demand Gross Realization Rates for Penelec

Stratum	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
LI EE Kits - Electric	0.16	105.8%	1.00	30%
LI EE Kits - Standard	0.11	76.1%	1.00	16%
LI School Education Kits	0.09	86.7%	1.00	8%
Program Total	**0.36**	**91.8%**	**1.00**	**15.9%**

Table 318: LI EE Kits Sub-Initiative Gross Realization Rates for Penn Power

Stratum	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
LI EE Kits - Electric	0.03	103.0%	1.00	38%
LI EE Kits - Standard	0.02	69.6%	1.00	21%
LI School Education Kits	0.04	86.7%	1.00	11%
Program Total	**0.09**	**87.7%**	**1.00**	**15.5%**

Table 319: LI EE Kits Sub-Initiative Demand Gross Realization Rates for WPP

Stratum	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
LI EE Kits - Electric	0.15	101.6%	1.00	21%
LI EE Kits - Standard	0.08	85.8%	1.00	21%
LI School Education Kits	0.07	89.6%	1.00	9%
Program Total	**0.29**	**94.7%**	**1.00**	**12.7%**

Q.2 Net Impact Evaluation

A net impact evaluation was not conducted for the LI EE Kits Initiative.

Appendix R Evaluation Detail – Commercial and Industrial Prescriptive Initiative

R.1 Gross Impact Evaluation

The Commercial and Industrial Prescriptive (C&I Prescriptive) initiative is administered by Franklin Energy Services and includes four components: Downstream lighting, midstream lighting, downstream non-lighting, and midstream non-lighting.

Gross impact evaluation for C&I Prescriptive Initiative involved stratified sampling, on-site verifications, and project-specific data collection and calculations. For the lighting sub-initiatives, evaluation activities also include TRM Appendix C calculations with primary data collection for lighting hours of use for medium savings and high savings projects, and application of TRM deemed hours of operation for low savings projects.

R.1.1 Gross Impact Evaluation Methodology

As a first step, projects are categorized into one of the four components described above. Projects are clearly defined by subprogram names, which simplifies the process. The evaluation method for each component is described below.

R.1.1.1 Downstream Lighting

As a first step, projects are placed into one of three sampling strata as described in the next section. Each sampled lighting project first undergoes a desk review. The desk review includes reconciliation of invoices, fixture specification sheets (cut sheets), and re-calculating reported savings using TRM algorithms and/or ex-ante assumptions and identifying key parameters to be researched in the M&V plan. One aspect of the desk review is to transfer the calculation data into the PA TRM's Appendix C calculator. Although the Companies' implementation vendor processes rebates with an independent calculator that mirrors the TRM's Appendix C calculations (augmented with worksheets to suit rebate application purposes), the transferring of the data to ADM's version of Appendix C is an evaluation step to ensure that all verified impacts for lighting projects are derived using the 2021 TRM's Appendix C.

Evaluation of all but the simplest of projects requires a site-specific M&V plan (SSMVP). The first step in the M&V planning process is to check that the project is sufficiently documented. For example, contractors working on large projects often have detailed, space-by-space inventories of the baseline and new lighting fixtures. If such detailed information is found to be lacking, ADM analysts will contact the applicant or the contractor directly, or through a request to the ICSP, and ask if such documentation is available.

The desk review and M&V plan inform the data acquisition activities needed to evaluate the sampled project. For most lighting projects, the default activities are on-site verification and logging hours of use. Most lighting projects are metered unless there is a good reason not to

meter. However, all projects with ex ante savings under 120 MWh are evaluated with TRM hours of use, without exception.

In cases where projects have limited scope and complexity, the desk review process may indicate that an on-site visit would not add sufficient value to the evaluation effort. In such cases, a verification interview may suffice to reduce uncertainty regarding the project. Where loggers are used, data analysis is finalized following their retrieval. Billing analysis is a viable option for certain projects, and in some cases the verified results are determined wholly or partially by billing analysis.

R.1.1.1 Midstream Lighting

Once a project has been sampled, evaluation activities are similar to those described for downstream lighting projects. The business name and address where the lighting equipment will be installed is recorded for each project, so surveys and site inspections are possible, similar to the downstream component. Midstream lighting projects tend to be much smaller in scope than downstream projects – in PY13 the average reported savings by project was 14 MWh, with no projects exceeding 120 MWh. Therefore, logging hours of use was not needed in PY13.

R.1.1.2 Downstream Non-Lighting

As with lighting projects, each sampled prescriptive project undergoes a desk review prior to M&V activities. The desk review includes a full documentation review and if needed, additional topical research. Some projects may require M&V plans and additional verification activities, but most projects can be evaluated through documentation review. The prescriptive non-lighting projects (both downstream and midstream) accounted for less than 0.5% of nonresidential impacts in PY13. Due to the low evaluation risk posed by these projects, desk reviews were identified as the most appropriate impact evaluation activity.

R.1.1.3 Midstream Non-Lighting

Once a project has been sampled, evaluation activities are similar to those described for downstream non-lighting projects.

Figure 7 shows the fraction of verified energy savings, as averaged over the four PA Companies, by primary evaluation activities.

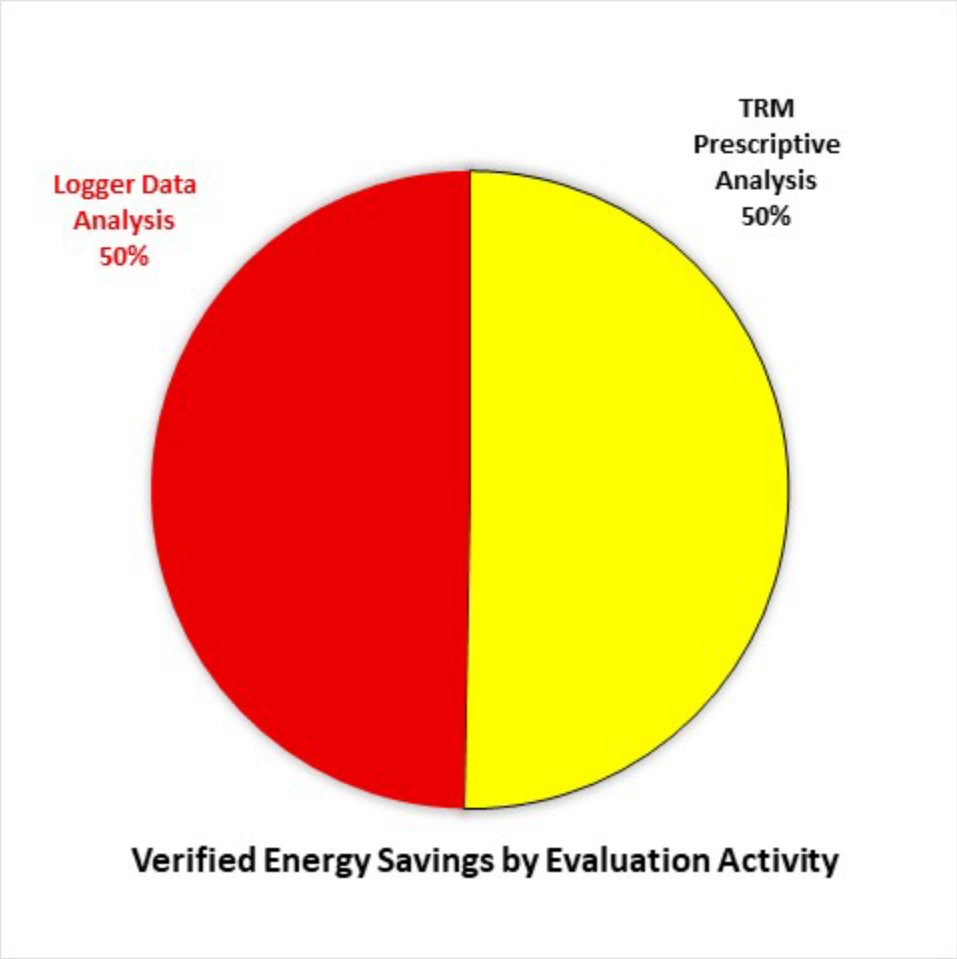


Figure 7: Fraction of verified energy savings by evaluation activity.

As a final step in the evaluation process, ADM analysts determine the incremental material and labor costs. In estimating the material and labor costs, preference is given first to invoices, then to the SWE incremental cost database, and then to the cost values from the CA DEER database, then to the costs used in the EDCs' EE&C plans.

R.1.2 Sampling

In PY13, only the downstream lighting component had the volume and heterogeneity to motivate savings-based stratification. Downstream lighting projects were placed into three strata. The first stratum or "certainty" stratum consists of projects that are expected to result in energy savings in excess of 750 MWh. All of these projects are sampled for evaluation, and nearly all of them are evaluated prior to rebate approval. Therefore, the gross realization rate for the certainty stratum is essentially 100% by design, although reported impacts may at times be lower than the 750 MWh threshold, as the threshold is on ex ante MWh, while ex post MWh are reported for these projects. The remaining projects are placed into two sampling strata according to their reported energy impacts. The sample design is not optimized for efficiency in the sense of achieving the desired precision with the absolute minimum number of sample

points. Rather, the sample is designed to facilitate specific evaluation protocols that are based on energy savings thresholds. For example, projects in the certainty stratum are evaluated with the highest level of rigor, and evaluated in advance of rebate approval to ensure that customers' incentives are determined from verified energy savings. The smallest projects, those with expected impacts under 120 MWh, are placed in a separate stratum. For these projects, hours of use are determined by application of deemed hours in the PA TRM. In addition to downstream lighting, there are three strata, one each for midstream lighting, downstream non-lighting, and midstream non-lighting. The sample designs for the four EDCs are shown in Table 320, Table 321, Table 322, and Table 323.

Table 320: CI Prescriptive Initiative Gross Impact Sample Design for Met-Ed

Stratum	MWh Threshold	Population Size	Achieved Sample Size	Evaluation Activity
Downstream Lighting-C	750	0	0	Desk Review, On-Site Verification
Downstream Lighting-2	120	20	11	
Downstream Lighting-1	0	34	11	
Downstream Nonlighting	0	5	2	
Midstream Lighting	0	13	2	
Midstream Nonlighting	0	0	0	
Program Total	**n/a**	**72**	**26**	

Table 321: CI Prescriptive Initiative Gross Impact Sample Design for Penelec

Stratum	MWh Threshold	Population Size	Achieved Sample Size	Evaluation Activity
Downstream Lighting-C	750	0	0	Desk Review, On-Site Verification
Downstream Lighting-2	120	9	4	
Downstream Lighting-1	0	52	8	
Downstream Nonlighting	0	11	2	
Midstream Lighting	0	7	3	
Midstream Nonlighting	0	1	1	
Program Total	**n/a**	**80**	**18**	

Table 322: CI Prescriptive Initiative Gross Impact Sample Design for Penn Power

Stratum	MWh Threshold	Population Size	Achieved Sample Size	Evaluation Activity
Downstream Lighting-C	750	0	0	Desk Review, On-Site Verification
Downstream Lighting-2	120	2	2	
Downstream Lighting-1	0	33	7	
Downstream Nonlighting	0	1	1	
Midstream Lighting	0	0	0	
Midstream Nonlighting	0	0	0	
Program Total	**n/a**	**36**	**10**	

Table 323: CI Prescriptive Initiative Gross Impact Sample Design for WPP

Stratum	MWh Threshold	Population Size	Achieved Sample Size	Evaluation Activity
Downstream Lighting-C	750	3	3	Desk Review, On-Site Verification
Downstream Lighting-2	120	10	3	
Downstream Lighting-1	0	60	16	
Downstream Nonlighting	0	12	1	
Midstream Lighting	0	3	1	
Midstream Nonlighting	0	0	0	
Program Total	**n/a**	**88**	**24**	

R.1.3 Results for Energy

The gross realization rates for energy, along with relative precisions, are shown in Table 324, Table 325, Table 326, and Table 327 for Met-Ed, Penelec, Penn Power, and WPP respectively. Figure 8 plots the verified energy savings against the reported energy savings for all evaluated prescriptive projects for the program year. The figure includes data points from all four EDCs and is designed to show the reader the correspondence between reported and verified impacts. The relative precision values in the following tables are calculated with a coefficient of variation of 0.4, as prescriptive projects tend to have homogeneous realization rates.

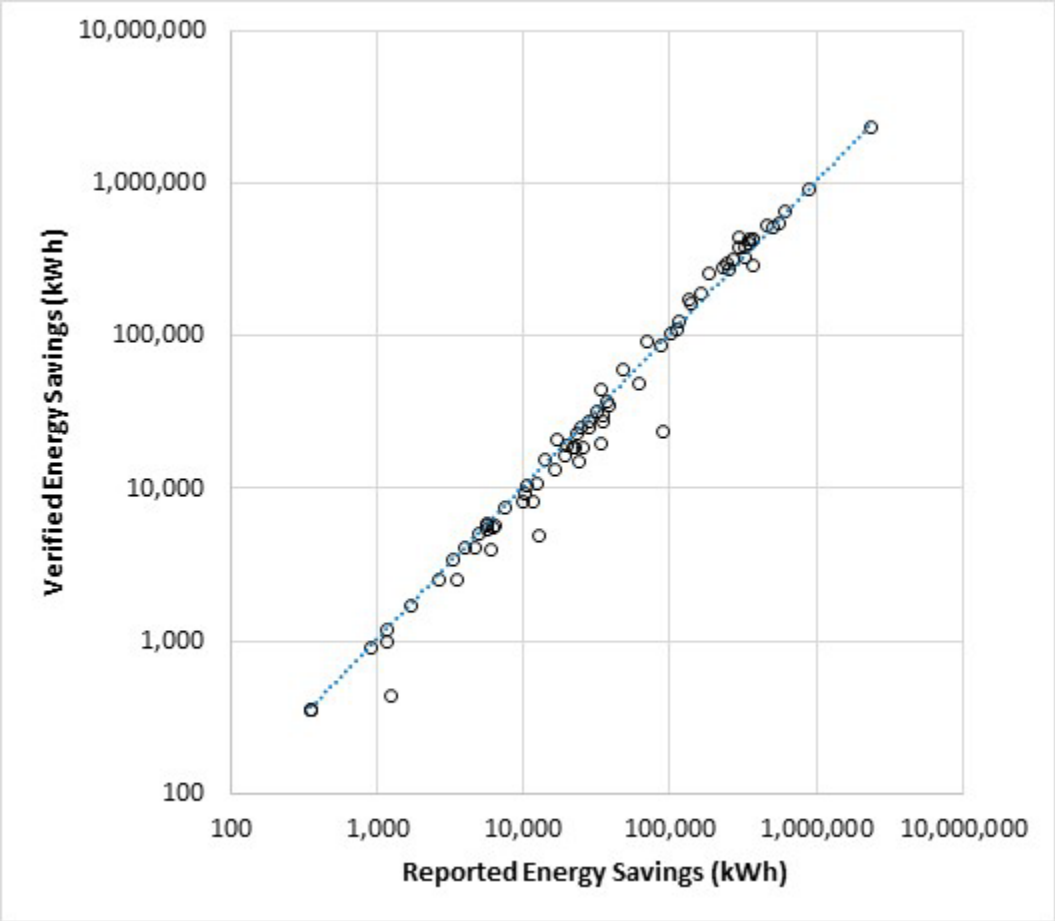


Figure 8: Verified vs. Reported Energy Savings for Sampled Prescriptive Projects.

Table 324: CI Prescriptive Initiative Energy Gross Realization Rates for Met-Ed

Stratum	MWh Threshold	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
Downstream Lighting-C	750	0	0.0%	0.4	0%
Downstream Lighting-2	120	5,467	120.9%	0.4	12%
Downstream Lighting-1	0	1,046	105.0%	0.4	14%
Downstream Nonlighting	0	3	100.0%	0.4	32%
Midstream Lighting	0	96	86.6%	0.4	37%
Midstream Nonlighting	0	0	0.0%	0.4	0%
Program Total	**n/a**	**6,612**	**117.9%**		**10.1%**

Table 325: CI Prescriptive Initiative Energy Gross Realization Rates for Penelec

Stratum	MWh Threshold	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
Downstream Lighting-C	750	0	0.0%	0.4	0%
Downstream Lighting-2	120	2,384	100.0%	0.4	21%
Downstream Lighting-1	0	1,850	90.1%	0.4	19%
Downstream Nonlighting	0	67	81.5%	0.4	37%
Midstream Lighting	0	90	90.5%	0.4	25%
Midstream Nonlighting	0	1	34.5%	0.4	0%
Program Total	**n/a**	**4,392**	**95.3%**		**14.3%**

Table 326: CI Prescriptive Initiative Energy Gross Realization Rates for Penn Power

Stratum	MWh Threshold	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
Downstream Lighting-C	750	0	0.0%	0.4	0%
Downstream Lighting-2	120	848	110.3%	0.4	0%
Downstream Lighting-1	0	769	98.3%	0.4	19%
Downstream Nonlighting	0	0	100.0%	0.4	0%
Midstream Lighting	0	0	0.0%	0.4	0%
Midstream Nonlighting	0	0	0.0%	0.4	0%
Program Total	**n/a**	**1,617**	**104.6%**		**8.6%**

Table 327: CI Prescriptive Initiative Energy Gross Realization Rates for WPP

Stratum	MWh Threshold	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
Downstream Lighting-C	750	3,773	100.4%	0.4	0%
Downstream Lighting-2	120	2,922	117.7%	0.4	28%
Downstream Lighting-1	0	1,548	71.0%	0.4	12%
Downstream Nonlighting	0	107	100.0%	0.4	55%
Midstream Lighting	0	157	106.4%	0.4	47%
Midstream Nonlighting	0	0	0.0%	0.4	0%
Program Total	**n/a**	**8,508**	**101.1%**		**11.3%**

R.1.4 Results for Demand

The gross realization rates for demand, along with relative precisions, are shown in Table 328, Table 329, Table 330, and Table 331 for Met-Ed, Penelec, Penn Power, and WPP respectively.

Table 328: CI Prescriptive Initiative Demand Gross Realization Rates for Met-Ed

Stratum	MWh Threshold	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
Downstream Lighting-C	750	0.00	0.0%	0.4	0%
Downstream Lighting-2	120	1.06	108.2%	0.4	12%
Downstream Lighting-1	0	0.20	94.8%	0.4	14%
Downstream Nonlighting	0	0.00	100.9%	0.4	32%
Midstream Lighting	0	0.03	66.6%	0.4	37%
Midstream Nonlighting	0	0.00	0.0%	0.4	0%
Program Total	**n/a**	**1.29**	**105.3%**		**10.1%**

Table 329: CI Prescriptive Initiative Demand Gross Realization Rates for Penelec

Stratum	MWh Threshold	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
Downstream Lighting-C	750	0.00	0.0%	0.4	0%
Downstream Lighting-2	120	0.47	88.1%	0.4	21%
Downstream Lighting-1	0	0.40	84.1%	0.4	19%
Downstream Nonlighting	0	0.01	99.6%	0.4	37%
Midstream Lighting	0	0.02	78.6%	0.4	25%
Midstream Nonlighting	0	0.00	34.5%	0.4	0%
Program Total	**n/a**	**0.90**	**86.2%**		**14.0%**

Table 330: CI Prescriptive Initiative Gross Realization Rates for Penn Power

Stratum	MWh Threshold	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
Downstream Lighting-C	750	0.00	0.0%	0.4	0%
Downstream Lighting-2	120	0.14	91.5%	0.4	0%
Downstream Lighting-1	0	0.12	103.6%	0.4	19%
Downstream Nonlighting	0	0.00	100.9%	0.4	0%
Midstream Lighting	0	0.00	0.0%	0.4	0%
Midstream Nonlighting	0	0.00	0.0%	0.4	0%
Program Total	**n/a**	**0.26**	**97.0%**		**9.5%**

Table 331: CI Prescriptive Initiative Demand Gross Realization Rates for WPP

Stratum	MWh Threshold	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
Downstream Lighting-C	750	0.51	100.6%	0.4	0%
Downstream Lighting-2	120	0.49	98.1%	0.4	28%
Downstream Lighting-1	0	0.32	49.7%	0.4	12%
Downstream Nonlighting	0	0.01	99.9%	0.4	55%
Midstream Lighting	0	0.04	79.4%	0.4	47%
Midstream Nonlighting	0	0.00	0.0%	0.4	0%
Program Total	**n/a**	**1.37**	**87.1%**		**11.4%**

R.2 NET IMPACT EVALUATION

R.2.1 Net Impact Evaluation Methodology

A net impact evaluation was not conducted in PY13. Net impact evaluation results from the Phase III evaluation effort will be applied to the initiative for PY13 as follows:

- The Phase IV (PY10) NTG results for downstream lighting and downstream non-lighting are respectively applied to the downstream lighting and downstream non-lighting components in PY13.
- The Phase IV (PY10) NTG results for downstream lighting and downstream non-lighting are respectively applied to the midstream lighting and midstream non-lighting components in PY13, with the modification that spillover is assumed to be zero for these midstream program components.

The following sections provide information related to the historical net impact evaluation effort that informs the initiative's NTG values for PY13.

R.2.2 Sampling

The sample designs for the four EDCs are shown in Table 332, Table 333, Table 334, and Table 335 for Met-Ed, Penelec, Penn Power, and WPP respectively. Please note that the population counts shown are from PY10, when the NTG study was conducted.

Table 332: CI Prescriptive Initiative Net-to-Gross Sampling for Met-Ed

Stratum	Population Size	Achieved Sample Size	Response Rate
Downstream Lighting	682	146	21%
Downstream Nonlighting	43	15	35%
Midstream Lighting	682	146	21%
Midstream Nonlighting	43	15	35%
Program Total	**1,450**	**322**	**22.2%**

Table 333: CI Prescriptive Initiative Net-to-Gross Sampling for Penelec

Stratum	Population Size	Achieved Sample Size	Response Rate
Downstream Lighting	1,053	180	17%
Downstream Nonlighting	61	40	66%
Midstream Lighting	1,053	180	17%
Midstream Nonlighting	61	40	66%
Program Total	**2,228**	**440**	**19.7%**

Table 334: CI Prescriptive Initiative Net-to-Gross Sampling for Penn Power

Stratum	Population Size	Achieved Sample Size	Response Rate
Downstream Lighting	320	86	27%
Downstream Nonlighting	15	10	67%
Midstream Lighting	320	86	27%
Midstream Nonlighting	15	10	67%
Program Total	**670**	**192**	**28.7%**

Table 335: CI Prescriptive Initiative Net-to-Gross Sampling for WPP

Stratum	Population Size	Achieved Sample Size	Response Rate
Downstream Lighting	987	152	15%
Downstream Nonlighting	57	30	53%
Midstream Lighting	987	152	15%
Midstream Nonlighting	57	30	53%
Program Total	**2,088**	**364**	**17.4%**

R.2.3 Net Impact Evaluation Results

The PYTD verified gross energy impacts, free ridership, spillover, net-to-gross ratios, and relative precisions for net-to-gross are shown in Table 336, Table 337, Table 338, and Table 339 for Met-Ed, Penelec, Penn Power, and WPP respectively.

Table 336: CI Prescriptive Initiative Net-to-Gross Results for Met-Ed

Stratum	PYVTD MWh	Free Ridership (%)	Spillover (%)	NTG Ratio	Relative Precision (@ 85% CL)
Downstream Lighting	7,709	37.5%	0.8%	63.3%	5.3%
Downstream Nonlighting	3	47.3%	0.0%	52.7%	15.0%
Midstream Lighting	83	37.5%	0.0%	62.5%	5.3%
Midstream Nonlighting	0	47.3%	0.0%	52.7%	15.0%
Program Total	**7,795**	**37.5%**	**0.8%**	**63.3%**	**5.2%**

Table 337: CI Prescriptive Initiative Net-to-Gross Results for Penelec

Stratum	PYVTD MWh	Free Ridership (%)	Spillover (%)	NTG Ratio	Relative Precision (@ 85% CL)
Downstream Lighting	4,051	24.6%	3.4%	78.8%	4.9%
Downstream Nonlighting	54	46.3%	0.0%	53.7%	6.7%
Midstream Lighting	81	24.6%	0.0%	75.4%	4.9%
Midstream Nonlighting	0	46.3%	0.0%	53.7%	6.7%
Program Total	**4,188**	**24.8%**	**3.3%**	**78.4%**	**4.8%**

Table 338 CI Prescriptive Initiative Net-to-Gross Results for Penn Power

Stratum	PYVTD MWh	Free Ridership (%)	Spillover (%)	NTG Ratio	Relative Precision (@ 85% CL)
Downstream Lighting	1,691	20.3%	0.7%	80.4%	6.6%
Downstream Nonlighting	0	56.1%	0.0%	43.9%	13.1%
Midstream Lighting	0	20.3%	0.0%	79.7%	6.6%
Midstream Nonlighting	0	56.1%	0.0%	43.9%	13.1%
Program Total	**1,691**	**20.3%**	**0.7%**	**80.4%**	**6.6%**

Table 339 CI Prescriptive Initiative Net-to-Gross Results for WPP

Stratum	PYVTD MWh	Free Ridership (%)	Spillover (%)	NTG Ratio	Relative Precision (@ 85% CL)
Downstream Lighting	8,327	34.3%	0.5%	66.2%	5.4%
Downstream Nonlighting	107	53.0%	0.0%	47.0%	9.0%
Midstream Lighting	168	34.3%	0.0%	65.7%	5.4%
Midstream Nonlighting	0	53.0%	0.0%	47.0%	9.0%
Program Total	**8,602**	**34.6%**	**0.5%**	**65.9%**	**5.2%**

Appendix S Evaluation Detail – Commercial and Industrial Custom Initiative

S.1 Gross Impact Evaluation

Gross impact evaluation for the Commercial and Industrial Custom (C&I Custom) Initiative involved stratified sampling, on-site verifications, and project-specific data collection and calculations.

S.1.1 Gross Impact Evaluation Methodology

As a first step, projects are placed into one of three sampling strata as described in the next section. As with lighting projects, each sampled custom project undergoes a desk review prior to M&V plan construction. The desk review includes a full documentation review and if needed, additional topical research. Evaluation of most projects requires an M&V plan. The first step in the M&V planning process is to check that the project is sufficiently documented, and that the evaluation engineer can articulate the mechanism or process that will yield the expected energy savings. ADM engineers are encouraged to contact the applicant early on in the M&V planning process to ask for additional documentation, clarification, or even to seek feedback on the feasibility of the proposed data acquisition and analysis methodology. The desk review and M&V plan will depend on the opportunities and constraints posed by each project. However, some defaults or "modes" are discussed for certain categories of projects below:

Air Compressor Projects: In many cases, vendors perform a baseline metering study prior to air compressor upgrades. The data collected from such studies are very useful, provided that they appear to be consistent with the overall project documentation. In many cases it is possible to use metered flow data or power data along with compressor curves to establish the facility's compressed air load profile. The energy usage of the proposed air compressor may then be derived from application of compressor curves to the compressed air load profile. Additional activities such as post-installation metering or a billing analysis may be recommended, depending on project specifics. In some cases, baseline meter data are not available. In these cases, ADM will meter the new air compressor and use compressor curves to establish the underlying compressed air load profile, and then determine the baseline usage through application of the baseline compressor curves and (if needed) compressor staging practices.

Water Pumping Projects: Pumping projects are typically evaluated through billing analysis, using water throughput as the normalizing variable.

Combined Heat and Power (CHP): CHP projects are typically evaluated through trending data analysis. The generator output is typically modeled as a function of explanatory variables that may include weather-related information, calendar day types (especially for universities), and availability of biofuels, if applicable. Parasitic loads are estimated through inspection of trending data, monitoring, or an inspection equipment specifications and operating schedules.

General Process Improvements: For general process improvements, the evaluation determines the change in the energy usage intensity associated with the creation or maintenance of one production unit. Production data are typically provided by the applicant upon ADM's request. Energy usage is measured either through power monitoring, energy management system trending, or billing analysis.

General Space and Process Cooling Improvements: Data acquisition for such projects involves the determination of independent variables that predict the cooling load (units produced, degree-days, etc.) along with utility bills, EMS trending data, or sub-metering. The data analysis may involve regressions or energy simulation models.

Rooftop Unit Optimization: In PY13, 16 of the sampled custom projects involved rooftop unit air handler optimization at various sites operated by a large retail chain. ADM applied results from a billing analysis performed on 31 similar projects in Phase III. Starting in PY13, the Advanced Rooftop Control IMP can be used to evaluate similar projects. However, because these projects were extremely homogeneous and represented the tail end of a major implementation and evaluation effort from Phase III, the billing analysis was seen as a more specific and consistent evaluation approach for these projects.

In some cases, the desk review process may indicate that an on-site visit would not add sufficient value to the evaluation effort. For example, billing analysis or trending data analysis is a viable option for certain projects. Figure 9 shows the fraction of verified energy savings, as averaged over the four PA Companies, by primary evaluation activities.

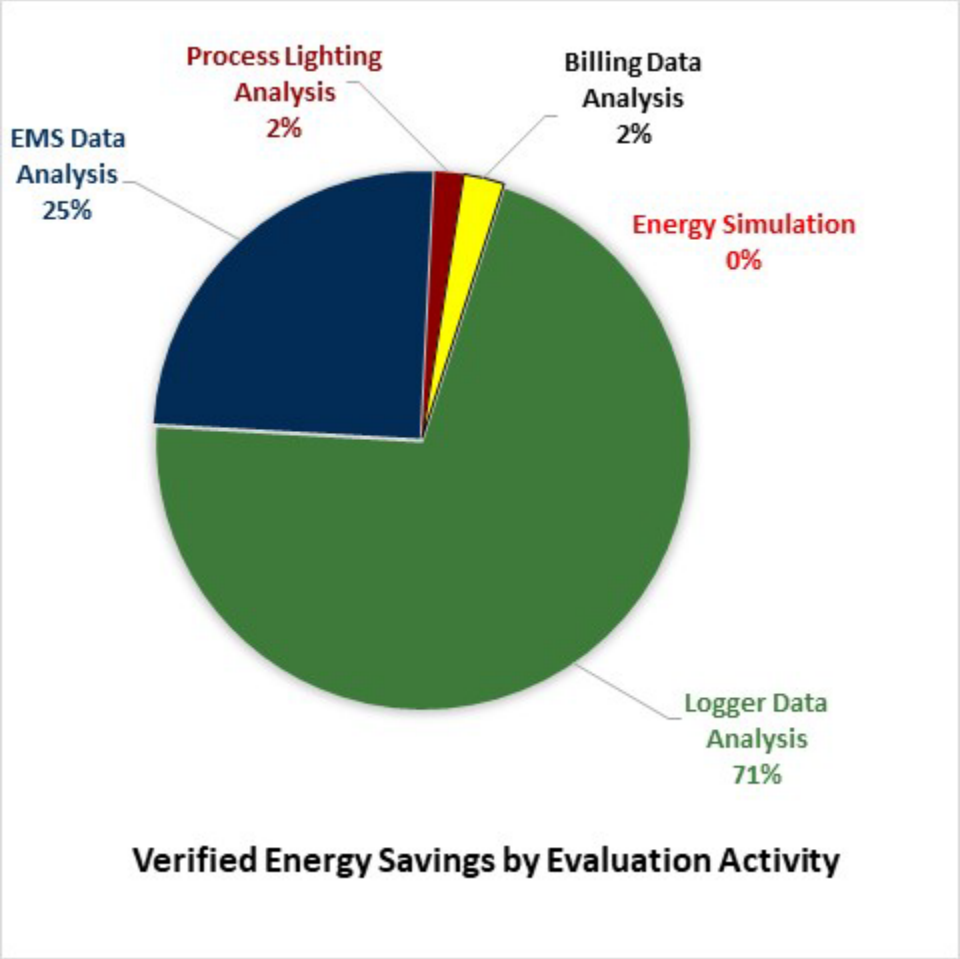


Figure 9: Fraction of verified energy savings by evaluation activity.

As a final step in custom project analysis, ADM analysts determine the incremental material and labor costs. In estimating the material and labor costs, preference is given first to invoices, then to the SWE incremental cost database, and then to the cost values from the CA DEER database, then to the costs used in the EDCs' EE&C plans.

S.1.2 Sampling

Projects are placed into two strata. The first stratum or "certainty" stratum consists of projects that are expected to result in energy savings in excess of 500 MWh. All of these projects are sampled for evaluation, and nearly all of them are evaluated prior to rebate approval. Therefore, the gross realization rate for the certainty stratum is essentially 100% by design, although reported impacts may at times be lower than the 500 MWh threshold, as the threshold is on ex ante MWh, while ex post MWh are reported for these projects. The remaining projects are placed into one sampling stratum. The sample designs for the four EDCs are shown in Table 340, Table 341, Table 342, and Table 343.

Table 340: CI Custom Initiative Gross Impact Sample Design for Met-Ed

Stratum	MWh Threshold	Population Size	Achieved Sample Size	Evaluation Activity
Custom-C	500	2	2	On-Site
Custom-1	0	6	6	Verification,
Program Total	**n/a**	**8**	**8**	Metering

Table 341: CI Custom Initiative Gross Impact Sample Design for Penelec

Stratum	MWh Threshold	Population Size	Achieved Sample Size	Evaluation Activity
Custom-C	500	1	1	On-Site
Custom-1	0	11	10	Verification,
Program Total	**n/a**	**12**	**11**	Metering

Table 342: CI Custom Initiative Gross Impact Sample Design for Penn Power

Stratum	MWh Threshold	Population Size	Achieved Sample Size	Evaluation Activity
Custom-C	500	1	1	On-Site
Custom-1	0	2	1	Verification,
Program Total	**n/a**	**3**	**2**	Metering

Table 343: CI Custom Initiative Gross Impact Sample Design for WPP

Stratum	MWh Threshold	Population Size	Achieved Sample Size	Evaluation Activity
Custom-C	500	3	3	On-Site
Custom-1	0	4	1	Verification,
Program Total	**n/a**	**7**	**4**	Metering

S.1.3 Results for Energy

The gross realization rates for energy, along with relative precisions, are shown in Table 344, Table 345, Table 346, and Table 347 for Met-Ed, Penelec, Penn Power, and WPP respectively. Figure 10 plots the verified energy savings against the reported energy savings for all evaluated custom projects for the program year. The figure includes data points from all four EDCs and is designed to show the reader the correspondence between reported and verified impacts. The relative precision values in the following tables are calculated with a coefficient of variation of 0.5.

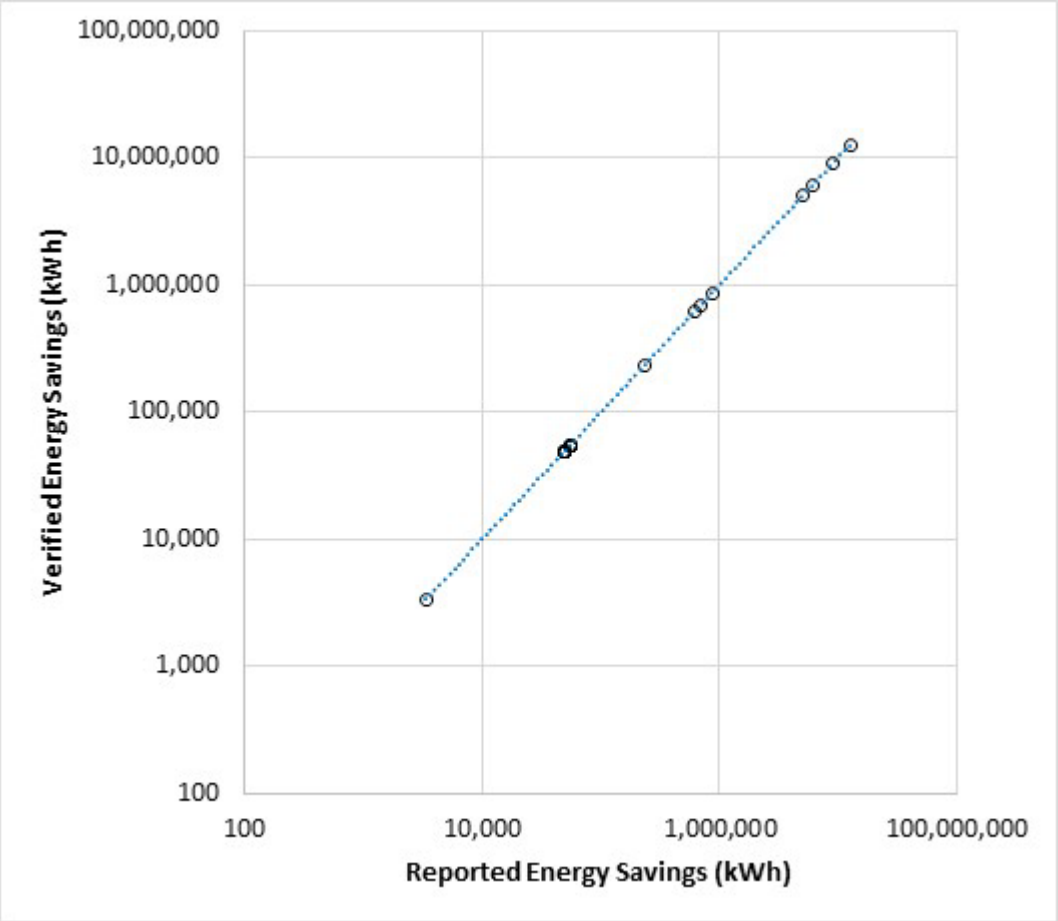


Figure 10: Verified vs. Reported Energy Savings for Sampled Custom Projects.

Table 344: CI Custom Initiative Energy Gross Realization Rates for Met-Ed

Stratum	MWh Threshold	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
Custom-C	500	13,327	100.0%	0.5	0%
Custom-1	0	312	100.0%	0.5	0%
Program Total	**n/a**	**13,639**	**100.0%**		**0.0%**

Table 345: CI Custom Initiative Energy Gross Realization Rates for Penelec

Stratum	MWh Threshold	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
Custom-C	500	8,969	100.4%	0.5	0%
Custom-1	0	579	100.0%	0.5	7%
Program Total	**n/a**	**9,548**	**100.3%**		**0.4%**

Table 346: CI Custom Initiative Energy Gross Realization Rates for Penn Power

Stratum	MWh Threshold	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
Custom-C	500	6,089	100.0%	0.5	0%
Custom-1	0	235	101.2%	0.5	51%
Program Total	**n/a**	**6,325**	**100.0%**		**1.9%**

Table 347: CI Custom Initiative Energy Gross Realization Rates for WPP

Stratum	MWh Threshold	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
Custom-C	500	6,532	100.1%	0.5	0%
Custom-1	0	679	100.0%	0.5	62%
Program Total	**n/a**	**7,211**	**100.1%**		**5.9%**

S.1.4 Results for Demand

The gross realization rates for demand, along with relative precisions, are shown in Table 348, Table 349, Table 350, and Table 351 for Met-Ed, Penelec, Penn Power, and WPP respectively.

Table 348: CI Custom Initiative Demand Gross Realization Rates for Met-Ed

Stratum	MWh Threshold	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
Custom-C	500	1.68	100.0%	0.5	0%
Custom-1	0	0.04	100.0%	0.5	0%
Program Total	**n/a**	**1.71**	**100.0%**		**0.0%**

Table 349: CI Custom Initiative Demand Gross Realization Rates for Penelec

Stratum	MWh Threshold	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
Custom-C	500	3.03	100.0%	0.5	0%
Custom-1	0	0.07	100.0%	0.5	7%
Program Total	**n/a**	**3.10**	**100.0%**		**0.2%**

Table 350: CI Custom Initiative Gross Realization Rates for Penn Power

Stratum	MWh Threshold	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
Custom-C	500	0.65	100.0%	0.5	0%
Custom-1	0	0.03	99.3%	0.5	51%
Program Total	**n/a**	**0.69**	**100.0%**		**2.3%**

Table 351: CI Custom Initiative Demand Gross Realization Rates for WPP

Stratum	MWh Threshold	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
Custom-C	500	0.58	100.2%	0.5	0%
Custom-1	0	0.15	100.0%	0.5	62%
Program Total	**n/a**	**0.72**	**100.2%**		**12.6%**

S.2 NET IMPACT EVALUATION

S.2.1 Net Impact Evaluation Methodology

A net impact evaluation was not conducted in PY13. Net impact evaluation results from the Phase III evaluation effort will be applied to the initiative for PY13. Tetra Tech conducted a net-to-gross (NTG) evaluation in PY10. The evaluation assessed free ridership and spillover through participant customer and vendor surveys following the Pennsylvania Evaluation Framework. NTG was assessed for each EDC at the major measure category level (i.e., custom, lighting, and other prescriptive), as custom and lighting qualified as high-impact measures in PY10. The following sections provide information related to the historical net impact evaluation effort that informs the initiative's NTG values for PY13.

S.2.2 Sampling

Net impact evaluation used a similar sampling scheme as gross impact evaluation. Due to the high skew in the impact distribution (the largest custom projects continue to account for the majority of impacts for the initiative), the Phase III NTG is essentially determined by the large projects. As such, each EDC's initiative-level NTG for custom projects from Phase III is applied to the custom initiative for that EDC in Phase IV. The following sample tables reflect this strategy by removing the previous size-based stratification in the original Phase III study.

The sample designs for the four EDCs are shown in Table 352, Table 353, Table 354, and Table 355 for Met-Ed, Penelec, Penn Power, and WPP respectively. Please note that the population counts shown are from PY10, when the NTG study was conducted.

Table 352: CI Custom Initiative Net-to-Gross Sampling for Met-Ed

Stratum	Population Size	Achieved Sample Size	Response Rate
Custom	50	26	52%
Program Total	**50**	**26**	**52%**

Table 353: CI Custom Initiative Net-to-Gross Sampling for Penelec

Stratum	Population Size	Achieved Sample Size	Response Rate
Custom	119	34	29%
Program Total	**119**	**34**	**29%**

Table 354: CI Custom Initiative Net-to-Gross Sampling for Penn Power

Stratum	Population Size	Achieved Sample Size	Response Rate
Custom	22	11	50%
Program Total	**22**	**11**	**50%**

Table 355: CI Custom Initiative Net-to-Gross Sampling for WPP

Stratum	Population Size	Achieved Sample Size	Response Rate
Custom	52	21	40%
Program Total	**52**	**21**	**40%**

S.2.3 Net Impact Evaluation Results

The PYTD verified gross energy impacts, free ridership, spillover, net-to-gross ratios, and relative precisions for net-to-gross are shown in Table 356, Table 357, Table 358, and Table 359 for Met-Ed, Penelec, Penn Power, and WPP respectively. Inspection of stratum-level NTG ratios for all four EDCs suggests that NTG ratios are lower for custom projects than for lighting projects.

Table 356: CI Custom Initiative Net-to-Gross Results for Met-Ed

Stratum	PYVTD MWh	Free Ridership (%)	Spillover (%)	NTG Ratio	Relative Precision (@ 85% CL)
Custom	13,639	45.9%	0.0%	54.1%	9.8%
Program Total	**13,639**	**45.9%**	**0.0%**	**54.1%**	**9.8%**

Table 357: CI Custom Initiative Net-to-Gross Results for Penelec

Stratum	PYVTD MWh	Free Ridership (%)	Spillover (%)	NTG Ratio	Relative Precision (@ 85% CL)
Custom	9,580	11.2%	0.4%	89.3%	10.4%
Program Total	**9,580**	**11.2%**	**0.4%**	**89.3%**	**10.4%**

Table 358: CI Custom Initiative Net-to-Gross Results for Penn Power

Stratum	PYVTD MWh	Free Ridership (%)	Spillover (%)	NTG Ratio	Relative Precision (@ 85% CL)
Custom	6,327	38.5%	0.0%	61.5%	15.4%
Program Total	**6,327**	**38.5%**	**0.0%**	**61.5%**	**15.4%**

Table 359: CI Custom Initiative Net-to-Gross Results for WPP

Stratum	PYVTD MWh	Free Ridership (%)	Spillover (%)	NTG Ratio	Relative Precision (@ 85% CL)
Custom	7,217	42.3%	0.0%	57.7%	12.1%
Program Total	**7,217**	**42.3%**	**0.0%**	**57.74%**	**12.1%**

Appendix T Evaluation Detail – Commercial and Industrial Energy Management and New Construction Initiative

T.1 Gross Impact Evaluation

The Commercial and Industrial Energy Management and New Construction (CI EMNC) initiative has five subcomponents:

- The *Building Tune-Ups* subprogram is a direct-install effort targeting small and medium businesses.
- The *New Construction* subprogram provides design assistance, energy calculations, and incentives for efficient new construction methods and equipment.
- The *Commissioning* subprogram for existing buildings includes both virtual and retro-commissioning components.
- The *Building Improvements* subprogram provides incentives for envelope and equipment upgrades in existing buildings.
- The *Building Operations Certification* (BOC) subprogram provides incentives for qualified personnel to obtain BOC through a certified training program related to the efficient design, operations, and maintenance of buildings.

The Building Tune-Ups and New Construction subprograms were active in PY13.

T.1.1 Gross Impact Evaluation Methodology

As a first step, projects from the five subprograms are consolidated into three sub-initiatives by combining the BOC and New Construction components into the *EMNC* sub-initiative, and by combining the Commissioning and Building Improvements projects into the *Building Improvements* sub-initiative. Projects within those sub-initiatives may be stratified according to savings if necessary. Projects are sampled randomly from the population of projects for impact evaluation, with activities for each sub-initiative described below.

T.1.1.1 Building Tune-Up

Each sampled building tune-up project first undergoes a desk review. The desk review includes reconciliation of invoices with fixture or equipment specification sheets (cut sheets), and re-calculating reported savings using TRM algorithms and/or ex-ante assumptions, and identifying key parameters to be researched in the M&V plan. The Building Tune-Up program is new for Phase IV. Due to the lack of implementation history, ADM opted for on-site inspections of most sampled projects, despite the fact the most projects had modest scope and limited energy savings.

T.1.1.2 Building Improvements

There were no projects in this sub-initiative in PY13.

T.1.1.3 EMNC

There were five new construction projects across the four EDCs in PY13. ADM sampled each project for evaluation and reviewed all documents and calculations. The program ICSP, Willdan, has built a process to promote and rebate new construction projects in a uniform manner. The process uses Willdan's Net Energy Optimizer (NEO) building simulation tool to develop baseline, design, and as-built simulation models. The NEO tool is a web-based front-end for the DOE2 simulation engine. Willdan has developed additional features to NEO to facilitate modeling efficiency measures such as machine room-less elevators and efficient food-service equipment. Willdan staff develop the baseline model as well as several design options that feature various energy efficiency measures and design changes. Once the participant selects the desired efficiency features and completes building construction, Willdan staff perform either an on-site or virtual inspection, and gather data to develop the final as-built simulation model. Project documentation includes a final verification report which lists all efficiency measures and provides itemized energy savings for each measure. ADM also requested and received access to online NEO models and DOE2 input and output files, including 8760 hourly energy simulation outputs for all sampled projects and for several projects that are in various phases of construction. If the project includes significant energy savings from lighting, Willdan provides an itemized lighting calculation.

ADM reviewed the baseline and as-build simulation models and performed parallel calculations using TRM algorithms for sampled measures within each project. Energy savings for measures that have prescriptive counterparts in the TRM (this included most measures in PY13) are consistent with TRM calculations, within reasonable tolerances associated with the NEO calculation representing one specific instance or application of a measure, and the TRM representing a typical application of a measure within a market segment. The NEO framework assigns baseline lighting power densities (LPDs) in a manner similar to the TRM's Appendix C lighting calculator, but it assigns whole-building LPDs for a given building type to spaces within a building that have similar use cases as the whole-building descriptions in Appendix C. This appears to be a hybrid application of whole-building and space-by-space strategies. For new construction projects that are generally not dominated by savings from the lighting end-use, this is a reasonable and consistent approach. Based on the review findings, the evaluation approach taken in PY13 is to use the simulation output unless significant variances are found for certain measures, in which case ADM would modify the energy and demand impacts with extrinsic calculations. ADM developed such extrinsic adjustments for one out of five sampled projects in PY13.

Figure 11 shows the fraction of verified energy savings, as averaged over the four PA Companies, by primary evaluation activities.

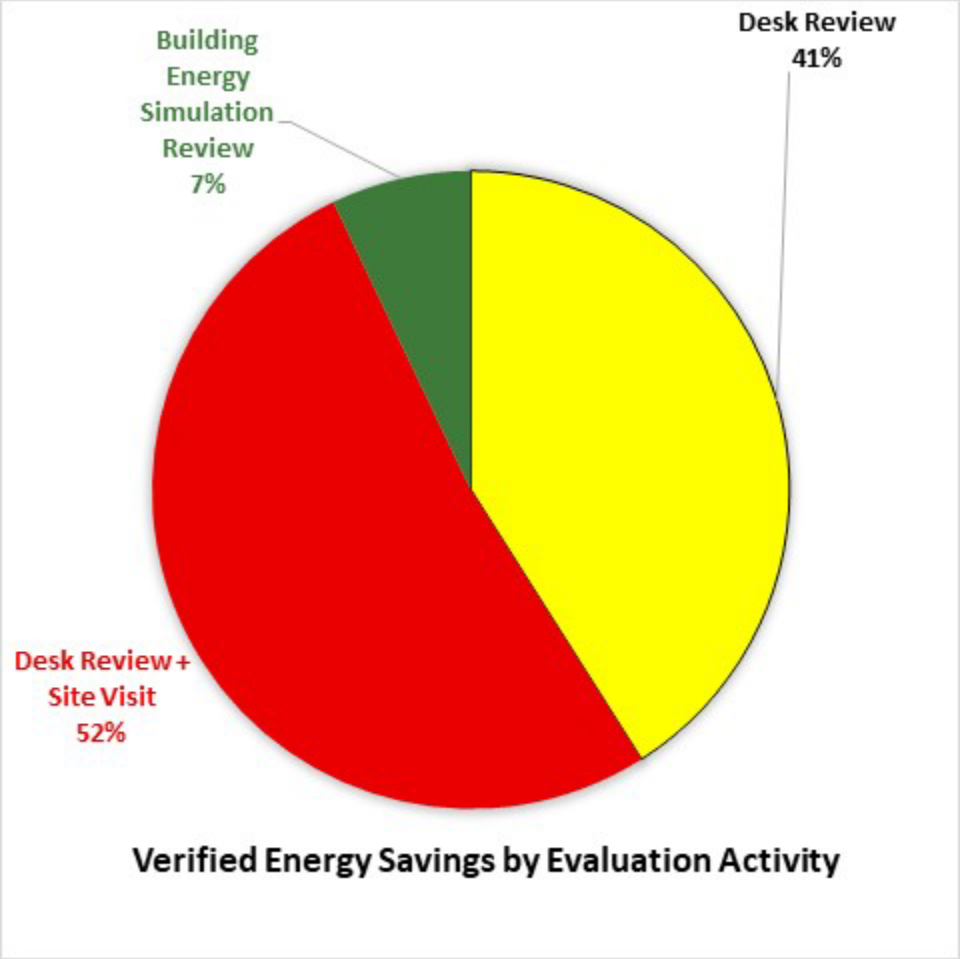


Figure 11: Fraction of verified energy savings by evaluation activity.

As a final step in lighting project analysis, ADM analysts determine the incremental material and labor costs. In estimating the material and labor costs, preference is given first to invoices, then to the SWE incremental cost database, and then to the cost values from the CA DEER database, then to the costs used in the EDCs' EE&C plans.

T.1.2 Sampling

The sample designs for the four EDCs are shown in Table 360, Table 361, Table 362, and Table 363.

Table 360: CI Lighting Initiative Gross Impact Sample Design for Met-Ed

Stratum	MWh Threshold	Population Size	Achieved Sample Size	Evaluation Activity
EMNC	0	1	1	Desk Review;
Building Tune-Ups	0	42	17	On-Site
Program Total	**n/a**	**43**	**18**	Verification

Table 361: CI EMNC Initiative Gross Impact Sample Design for Penelec

Stratum	MWh Threshold	Population Size	Achieved Sample Size	Evaluation Activity
EMNC	0	1	1	Desk Review;
Building Tune-Ups	0	31	15	On-Site
Program Total	**n/a**	**32**	**16**	Verification

Table 362: CI EMNC Initiative Gross Impact Sample Design for Penn Power

Stratum	MWh Threshold	Population Size	Achieved Sample Size	Evaluation Activity
EMNC	0	0	0	Desk Review;
Building Tune-Ups	0	15	10	On-Site
Program Total	**n/a**	**15**	**10**	Verification

Table 363: CI EMNC Initiative Gross Impact Sample Design for WPP

Stratum	MWh Threshold	Population Size	Achieved Sample Size	Evaluation Activity
EMNC	0	3	3	Desk Review;
Building Tune-Ups	0	25	12	On-Site
Program Total	**n/a**	**28**	**15**	Verification

T.1.3 Results for Energy

The gross realization rates for energy, along with relative precisions, are shown in Table 364, Table 365, Table 366, and Table 367 for Met-Ed, Penelec, Penn Power, and WPP respectively. Figure 12 plots the verified energy savings against the reported energy savings for all evaluated EMNC projects for the program year. The figure includes data points from all four EDCs and is designed to show the reader the correspondence between reported and verified impacts. The relative precision values in the following tables are calculated with a coefficient of variation of 0.4, but the actual error ratios tend to be somewhat lower than 0.4.

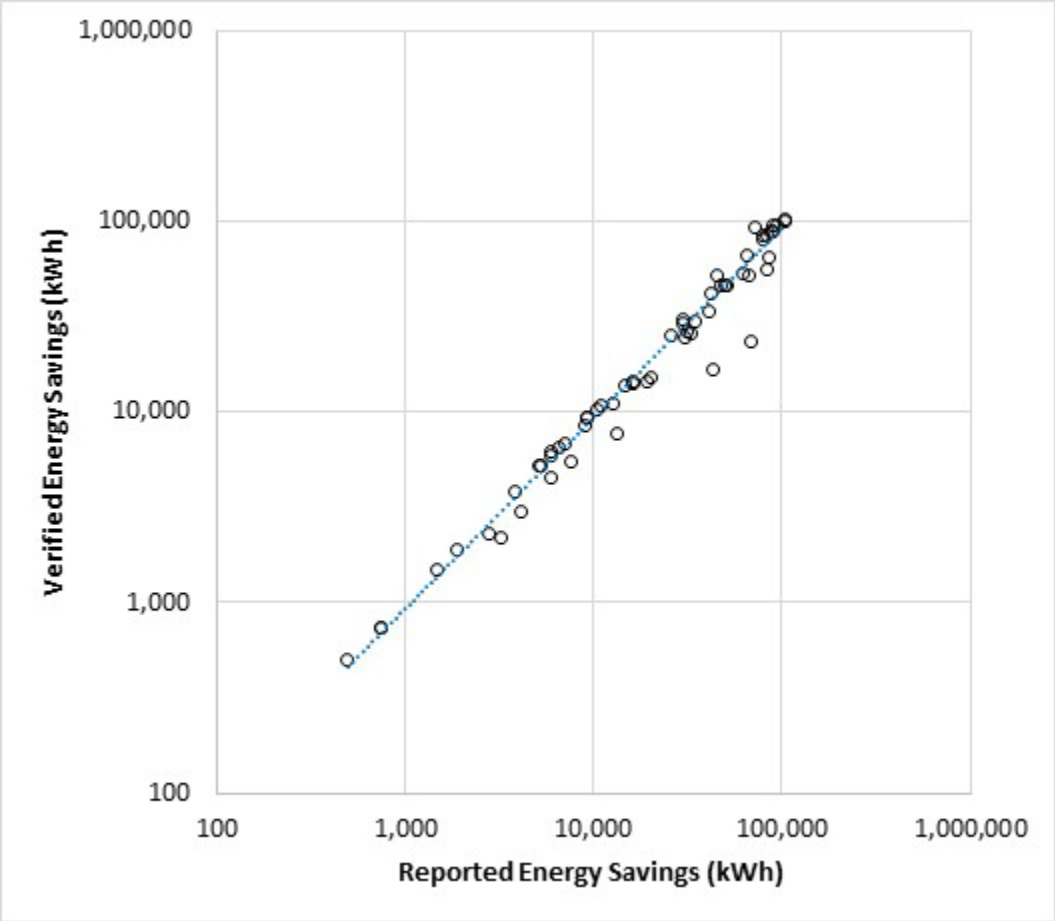


Figure 12: Verified vs. Reported Energy Savings for Sampled EMNC Projects.

Table 364: CI EMNC Initiative Energy Gross Realization Rates for Met-Ed

Stratum	MWh Threshold	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
EMNC	0	63	85.2%	0.4	0%
Building Tune-Ups	0	1,335	84.1%	0.4	11%
Program Total	**n/a**	**1,398**	**84.1%**	**0.4**	**10.3%**

Table 365: CI EMNC Initiative Energy Gross Realization Rates for Penelec

Stratum	MWh Threshold	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
EMNC	0	42	100.0%	0.4	0%
Building Tune-Ups	0	1,329	85.5%	0.4	11%
Program Total	**n/a**	**1,371**	**85.9%**	**0.4**	**10.3%**

Table 366: CI EMNC Initiative Energy Gross Realization Rates for Penn Power

Stratum	MWh Threshold	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
EMNC	0	0	0.0%	0.4	0%
Building Tune-Ups	0	361	98.6%	0.4	11%
Program Total	**n/a**	**361**	**98.6%**	**0.4**	**10.5%**

Table 367: CI EMNC Initiative Energy Gross Realization Rates for WPP

Stratum	MWh Threshold	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
EMNC	0	259	100.0%	0.4	0%
Building Tune-Ups	0	964	93.7%	0.4	12%
Program Total	**n/a**	**1,223**	**95.0%**	**0.4**	**9.3%**

T.1.4 Results for Demand

The gross realization rates for demand, along with relative precisions, are shown in Table 368, Table 369, Table 370, and Table 371 for Met-Ed, Penelec, Penn Power, and WPP respectively.

Table 368: CI EMNC Initiative Demand Gross Realization Rates for Met-Ed

Stratum	MWh Threshold	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
EMNC	0	0.01	43.5%	0.4	0%
Building Tune-Ups	0	0.23	83.4%	0.4	11%
Program Total	**n/a**	**0.25**	**81.7%**	**0.4**	**10.5%**

Table 369: CI EMNC Initiative Demand Gross Realization Rates for Penelec

Stratum	MWh Threshold	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
EMNC	0	0.01	100.0%	0.4	0%
Building Tune-Ups	0	0.13	73.6%	0.4	11%
Program Total	**n/a**	**0.13**	**74.9%**	**0.4**	**100.0%**

Table 370: CI EMNC Initiative Gross Realization Rates for Penn Power

Stratum	MWh Threshold	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
EMNC	0	0.00	0.0%	0.4	0%
Building Tune-Ups	0	0.05	63.1%	0.4	11%
Program Total	**n/a**	**0.05**	**63.1%**	**0.4**	**100.0%**

Table 371: CI EMNC Initiative Demand Gross Realization Rates for WPP

Stratum	MWh Threshold	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
EMNC	0	0.04	100.0%	0.4	0%
Building Tune-Ups	0	0.19	93.9%	0.4	12%
Program Total	**n/a**	**0.23**	**94.9%**	**0.4**	**100.0%**

T.2 NET IMPACT EVALUATION

T.2.1 Net Impact Evaluation Methodology

A net impact evaluation was not conducted in PY13. Since the dominant energy efficiency measure in the EMNC initiative was lighting in PY13, the Phase IV (PY10) NTG results for downstream lighting are applied to the EMNC Initiative with the exception that spillover is taken to be zero for the EMNC program in PY13. Most of the impacts are from the direct-install component which is not anticipated to generate much spillover. The following sections provide information related to the historical net impact evaluation effort that informs the initiative's NTG values for PY13.

T.2.2 Sampling

The sample designs for the four EDCs are shown in Table 372, Table 373, Table 374, and Table 375 for Met-Ed, Penelec, Penn Power, and WPP respectively. Please note that the population counts shown are from PY10, when the NTG study was conducted.

Table 372: CI EMNC Initiative Net-to-Gross Sampling for Met-Ed

Stratum	Population Size	Achieved Sample Size	Response Rate
EMNC	682	146	21%
Program Total	**682**	**146**	**21%**

Table 373: CI EMNC Initiative Net-to-Gross Sampling for Penelec

Stratum	Population Size	Achieved Sample Size	Response Rate
EMNC	1,053	180	17%
Program Total	**1,053**	**180**	**17%**

Table 374: CI EMNC Initiative Net-to-Gross Sampling for Penn Power

Stratum	Population Size	Achieved Sample Size	Response Rate
EMNC	320	86	27%
Program Total	**320**	**86**	**27%**

Table 375: CI EMNC Initiative Net-to-Gross Sampling for WPP

Stratum	Population Size	Achieved Sample Size	Response Rate
EMNC	987	152	15%
Program Total	**987**	**152**	**15%**

T.2.3 Net Impact Evaluation Results

The PYTD verified gross energy impacts, free ridership, spillover, net-to-gross ratios, and relative precisions for net-to-gross are shown in Table 376, Table 377, Table 378, and Table 379 for Met-Ed, Penelec, Penn Power, and WPP respectively.

Table 376: CI EMNC Initiative Net-to-Gross Results for Met-Ed

Stratum	PYVTD MWh	Free Ridership (%)	Spillover (%)	NTG Ratio	Relative Precision (@ 85% CL)
EMNC	1,176	37.5%	0.0%	100.0%	5.3%
Program Total	**1,176**	**37.5%**	**0.0%**	**62.5%**	**5.3%**

Table 377: CI EMNC Initiative Net-to-Gross Results for Penelec

Stratum	PYVTD MWh	Free Ridership (%)	Spillover (%)	NTG Ratio	Relative Precision (@ 85% CL)
EMNC	1,179	24.6%	0.0%	100.0%	4.9%
Program Total	**1,179**	**24.6%**	**0.0%**	**75.4%**	**4.9%**

Table 378 CI EMNC Initiative Net-to-Gross Results for Penn Power

Stratum	PYVTD MWh	Free Ridership (%)	Spillover (%)	NTG Ratio	Relative Precision (@ 85% CL)
EMNC	356	20.3%	0.0%	100.0%	6.6%
Program Total	**356**	**20.3%**	**0.0%**	**79.7%**	**6.6%**

Table 379 CI EMNC Initiative Net-to-Gross Results for WPP

Stratum	PYVTD MWh	Free Ridership (%)	Spillover (%)	NTG Ratio	Relative Precision (@ 85% CL)
EMNC	1,162	34.3%	0.0%	100.0%	5.4%
Program Total	**1,162**	**34.3%**	**0.0%**	**65.7%**	**5.4%**

Appendix U Evaluation Detail – Commercial and Master-Metered Multifamily Direct Install Initiative

The Commercial Master-Metered Multifamily Direct Install (CI MF) Initiative targets master-metered communities that house income-qualified tenants. A participant in this program is defined as a unique address in the program, multiple projects can be installed at one address. This program consists of brief energy audits performed by CLEAResult along with energy efficiency measures directly installed in customers' dwelling units and in common areas. The audit is used to identify low-cost energy savings opportunities, with associated energy savings measures directly installed in the unit during the audit. Low-cost measures installed in PY13 included light bulbs, refrigerator replacement, nightlights, smart power strips, energy saving showerheads and aerators, LED exit signs, and common area lighting. Refrigerator replacement and lighting upgrades were the two most significant measures, together accounting for over 75% of program impacts.

U.1 Gross Impact Evaluation

Each sampled project first undergoes a desk review. The desk review includes reconciliation of invoices with fixture or equipment specification sheets (cut sheets), re-calculating reported savings using TRM algorithms and/or ex-ante assumptions, and identifying key parameters to be researched in the M&V plan. ADM opted for on-site inspections for about one-third of sampled projects.

U.1.1 Sampling

Table 380, Table 381, Table 382, and Table 383 show sample sizes for Met-Ed, Penelec, Penn Power, and WPP respectively.

Table 380: CI MF Initiative Gross Impact Sample Design for Met-Ed

Stratum	MWh Threshold	Population Size	Achieved Sample Size	Evaluation Activity
Multifamily-1	750	3	3	Desk Review, On-Site Verification, Logging HOU
Program Total	**n/a**	**3**	**3**	

Table 381: CI MF Initiative Gross Impact Sample Design for Penelec

Stratum	MWh Threshold	Population Size	Achieved Sample Size	Evaluation Activity
Multifamily-1	750	12	9	Desk Review, On-Site Verification, Logging HOU
Program Total	**n/a**	**12**	**9**	

Table 382: CI MF Initiative Gross Impact Sample Design for Penn Power

Stratum	MWh Threshold	Population Size	Achieved Sample Size	Evaluation Activity
Multifamily-1	750	7	6	Desk Review, On-Site Verification, Logging HOU
Program Total	**n/a**	**7**	**6**	

Table 383: CI MF Initiative Gross Impact Sample Design for WPP

Stratum	MWh Threshold	Population Size	Achieved Sample Size	Evaluation Activity
Multifamily-1	750	30	17	Desk Review, On-Site Verification, Logging HOU
Program Total	**n/a**	**30**	**17**	

U.1.2 Results for Energy

The gross realization rates for energy, along with relative precisions, are shown in Table 384, Table 385, Table 386, and Table 387 for Met-Ed, Penelec, Penn Power, and WPP respectively. Figure 13 plots the verified energy savings against the reported energy savings for all projects evaluated in the program year. The figure includes data points from all four EDCs and is designed to show the reader the correspondence between reported and verified impacts.

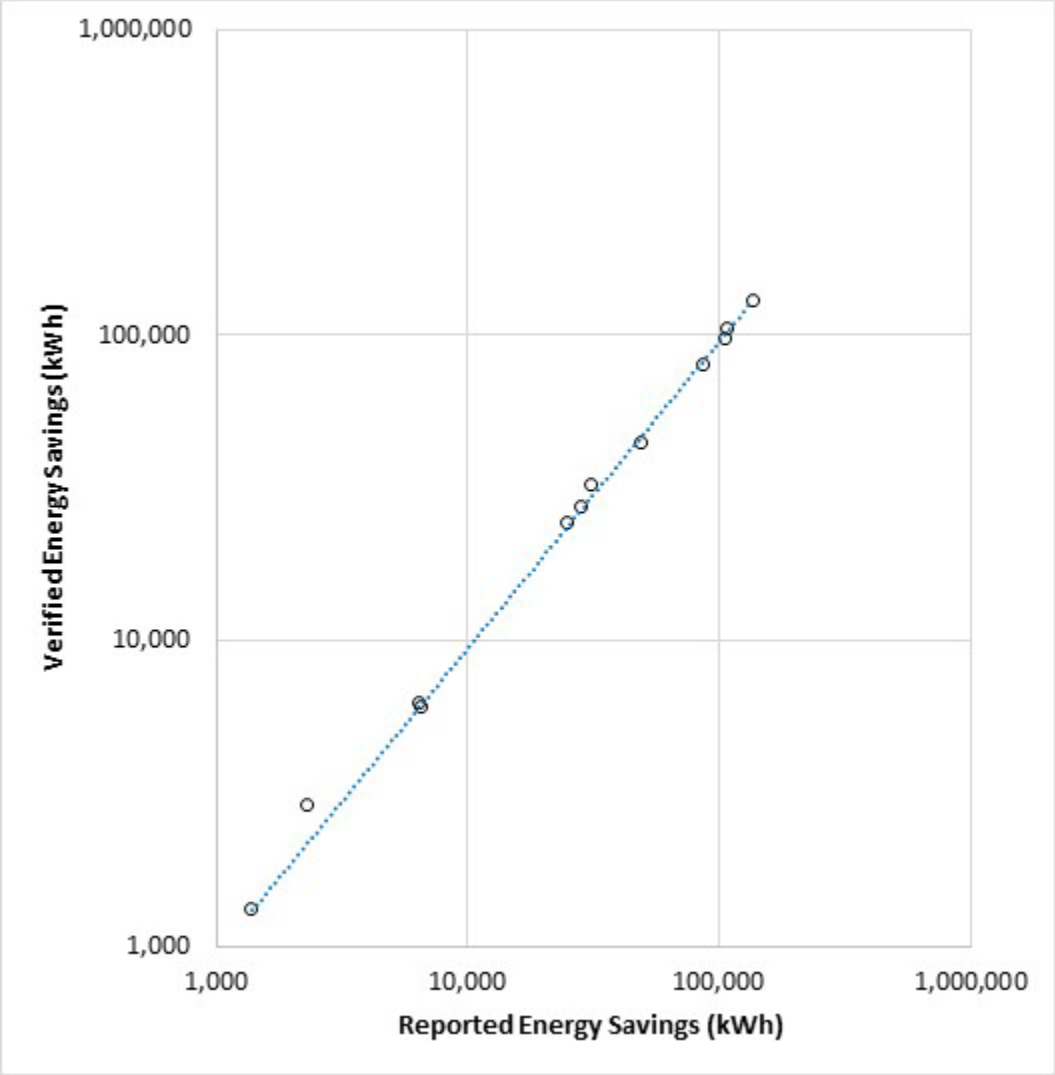


Figure 13: Verified vs. Reported Energy Savings for Sampled Multifamily Projects.

Table 384: CI MF Initiative Energy Gross Realization Rates for Met-Ed

Stratum	MWh Threshold	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
Multifamily-1	750	122	49.0%	0.5	0%
Program Total	**n/a**	**122**	**49.0%**	**0.5**	**0.0%**

Table 385: CI MF Initiative Energy Gross Realization Rates for Penelec

Stratum	MWh Threshold	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
Multifamily-1	750	619	71.9%	0.5	12%
Program Total	**n/a**	**619**	**71.9%**	**0.5**	**8.6%**

Table 386: CI MF Initiative Energy Gross Realization Rates for Penn Power

Stratum	MWh Threshold	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
Multifamily-1	750	132	90.3%	0.5	11%
Program Total	**n/a**	**132**	**90.3%**	**0.5**	**10.0%**

Table 387: CI MF Initiative Energy Gross Realization Rates for WPP

Stratum	MWh Threshold	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
Multifamily-1	750	1,482	78.1%	0.5	11%
Program Total	**n/a**	**1,482**	**78.1%**	**0.5**	**9.0%**

U.1.3 Results for Demand

The gross realization rates for demand, along with relative precisions, are shown in Table 388, Table 389, Table 390, and Table 391 for Met-Ed, Penelec, Penn Power, and WPP respectively.

Table 388: CI MF Initiative Demand Gross Realization Rates for Met-Ed

Stratum	MWh Threshold	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
Multifamily-1	750	0.02	43.2%	0.5	0%
Program Total	**n/a**	**0.02**	**43.2%**	**0.5**	**0.0%**

Table 389: CI MF Initiative Demand Gross Realization Rates for Penelec

Stratum	MWh Threshold	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
Multifamily-1	750	0.09	70.0%	0.5	12%
Program Total	**n/a**	**0.09**	**70.0%**	**0.5**	**8.4%**

Table 390: CI MF Initiative Gross Realization Rates for Penn Power

Stratum	MWh Threshold	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
Multifamily-1	750	0.02	94.6%	0.5	11%
Program Total	**n/a**	**0.02**	**94.6%**	**0.5**	**10.5%**

Table 391: CI MF Initiative Demand Gross Realization Rates for WPP

Stratum	MWh Threshold	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
Multifamily-1	750	0.21	78.7%	0.5	11%
Program Total	**n/a**	**0.21**	**78.7%**	**0.5**	**9.0%**

U.2 Net Impact Evaluation

A net impact evaluation was not conducted for the CI MF Initiative. NTG is deemed at 1.0 since this initiative exclusively serves low-income customers.

Appendix V Evaluation Detail – C&I Appliance Recycling Sub-Initiative

V.1 Gross Impact Evaluation

Gross impact evaluation for the C&I Appliance Recycling sub-initiative consisted of applying realization rates from the broader initiative-level evaluation which includes the dominant residential and low-income residential components.

V.1.1 Sampling

Table 392, Table 393, Table 394, and Table 395 show sample sizes for Met-Ed, Penelec, Penn Power, and WPP respectively. A census of sites was not selected for customer surveys. Rather, tracking and reporting data were reviewed for consistency in formulation with the residential components so that the realization rates from the residential surveys could be applied. Note that the overall precision for the ATI initiative is the combined precision of the low income, non-low-income, and nonresidential components. The combined precisions for each EDC are shown in Table 218 in Appendix J.

Table 392: C&I ATI Initiative Gross Impact Sample Design for Met-Ed

Stratum	Population Size	Achieved Sample Size	Evaluation Activity
ApplianceRecycling-1	47	47	T&R Review, Deem RR from ATI
Program Total	**47**	**47**	

Table 393: C&I ATI Initiative Gross Impact Sample Design for Penelec

Stratum	Population Size	Achieved Sample Size	Evaluation Activity
ApplianceRecycling-1	44	44	T&R Review, Deem RR from ATI
Program Total	**44**	**44**	

Table 394: C&I ATI Initiative Gross Impact Sample Design for Penn Power

Stratum	Population Size	Achieved Sample Size	Evaluation Activity
ApplianceRecycling-1	8	8	T&R Review, Deem RR from ATI
Program Total	**8**	**8**	

Table 395: C&I ATI Initiative Gross Impact Sample Design for WPP

Stratum	Population Size	Achieved Sample Size	Evaluation Activity
ApplianceRecycling-1	33	33	T&R Review, Deem RR from ATI
Program Total	**33**	**33**	

V.1.2 Results for Energy

The gross realization rates for energy, along with relative precisions, are shown in Table 396, Table 397, Table 398, Table 399, and for Met-Ed, Penelec, Penn Power, and WPP respectively.

Table 396: C&I ATI Initiative Energy Gross Realization Rates for Met-Ed

Stratum	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
ApplianceRecycling-1	52	102.8%	0.5	0.0%
Program Total	**52**	**102.8%**	**0.5**	**0.0%**

Table 397: C&I ATI Initiative Energy Gross Realization Rates for Penelec

Stratum	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
ApplianceRecycling-1	47	108.5%	0.5	0.0%
Program Total	**47**	**108.5%**	**0.5**	**0.0%**

Table 398: C&I ATI Initiative Energy Gross Realization Rates for Penn Power

Stratum	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
ApplianceRecycling-1	9	94.8%	0.5	0.0%
Program Total	**9**	**94.8%**	**0.5**	**0.0%**

Table 399: C&I ATI Initiative Energy Gross Realization Rates for WPP

Stratum	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
ApplianceRecycling-1	37	99.8%	0.5	0.0%
Program Total	**37**	**99.8%**	**0.5**	**0.0%**

V.1.3 Results for Demand

The gross realization rates for demand, along with relative precisions, are shown in Table 400, Table 401, Table 402, and Table 403 for Met-Ed, Penelec, Penn Power, and WPP respectively.

Table 400: C&I ATI Initiative Demand Gross Realization Rates for Met-Ed

Stratum	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
ApplianceRecycling-1	0.01	98.7%	0.5	0.0%
Program Total	**0.01**	**98.7%**	**0.5**	**0.0%**

Table 401: C&I ATI Initiative Demand Gross Realization Rates for Penelec

Stratum	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
ApplianceRecycling-1	0.01	103.5%	0.5	0.0%
Program Total	**0.01**	**103.5%**	**0.5**	**0.0%**

Table 402: C&I ATI Initiative Gross Realization Rates for Penn Power

Stratum	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
ApplianceRecycling-1	0.00	92.4%	0.5	0.0%
Program Total	**0.00**	**92.4%**	**0.5**	**0.0%**

Table 403: C&I ATI Initiative Demand Gross Realization Rates for WPP

Stratum	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
ApplianceRecycling-1	0.01	95.4%	0.5	0.0%
Program Total	**0.01**	**95.4%**	**0.5**	**0.0%**

V.2 Net Impact Evaluation

V.2.1 Net Impact Evaluation Methodology

An independent net impact evaluation was not conducted for this initiative because the initiative accounts for less than 0.1% of portfolio impacts, as averaged for the four PA Companies. The Net-to-Gross ratios for the C&I Appliance Recycling program were taken to be the same as the Net-to-Gross ratios for the residential component of the Appliance Recycling program.

BEFORE THE
PENNSYLVANIA PUBLIC UTILITY COMMISSION

Semi-Annual Report to the Pennsylvania Public Utility Commission and Act 129 Statewide Evaluator; Phase IV Program Period June 1, 2021 to May 31, 2022 for Metropolitan Edison Company, Pennsylvania Electric Company, Pennsylvania Power Company and West Penn Power Company	:	**Docket No. M-2015-2514767, et. al**

CERTIFICATE OF SERVICE

I hereby certify that I have this day served a true copy of the foregoing document upon the parties via listed below by e-mail.

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