

March 29, 2022

**VIA EFILE**

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

**Re: Final Annual Report to the Pennsylvania Public Utility Commission and Act 129 Statewide Evaluator; Phase III Program Period June 1, 2020 to May 31, 2021 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 amended Final 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,



Tori L. Giesler  
Supervising Counsel

TLG:dml

Enclosure

cc: Certificate of Service

# **Final Annual Report to the Pennsylvania Public Utility Commission**

**Phase III of Act 129**

**Program Year 12**

**(June 1, 2020 – May 31, 2021)**

For Pennsylvania Act 129 of 2008

Energy Efficiency and Conservation Plan

Prepared by ADM Associates and Tetra Tech

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

March 29, 2022

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## Acronyms

BDR	Behavioral Demand Response
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
DR	Demand Response
EDC	Electric Distribution Company
EDT	Eastern Daylight Time
EE&C	Energy Efficiency and Conservation
EM&V	Evaluation, Measurement, and Verification
EUL	Effective Useful Life
GNI	Government, Non-Profit, Institutional
HER	Home Energy Report
HERS	Home Energy Rating System
HIM	High-Impact Measure
HVAC	Heating, Ventilating, and Air Conditioning
ICSP	Implementation Conservation Service Provider
kW	Kilowatt
kWh	Kilowatt-hour
LED	Light-Emitting Diode
LIURP	Low-Income Usage Reduction Program
M&V	Measurement and Verification
MW	Megawatt
MWh	Megawatt-hour
NPV	Net Present Value
NTG	Net-to-Gross
P3TD	Phase III to Date
PA PUC	Pennsylvania Public Utility Commission
PSA	Phase III to Date Preliminary Savings Achieved; equal to VTD + PYRTD
PSA+CO	PSA savings plus Carryover from Phase II
PY	Program Year: e.g. PY8, from June 1, 2016, to May 31, 2017
PYRTD	Program Year Reported to Date
PYVTD	Program Year Verified to Date
RTD	Phase III to Date Reported Gross Savings
SWE	Statewide Evaluator
TRC	Total Resource Cost
TRM	Technical Reference Manual
VTD	Phase III to Date Verified Gross Savings

## 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 III 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 III to Date (P3TD):** The energy and peak demand savings achieved by an EE&C program or portfolio within Phase III of Act 129. Reported in several permutations described below.

**Phase III to Date Reported (RTD):** The sum of the reported gross savings recorded to date in Phase III of Act 129 for an EE&C program or portfolio.

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

**Phase III to Date Preliminary Savings Achieved (PSA):** The sum of the verified gross savings (VTD) from previous program years in Phase III where the impact evaluation is complete plus the reported gross savings from the current program year (PYTD). For PY8, the PSA savings will always equal the PYTD savings because PY8 is the first program year of the phase (no savings will be verified until the PY8 final annual report).

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

**Phase III to Date Verified + Carryover (VTD + CO):** The sum of the verified gross savings recorded to date in Phase III plus any verified gross carryover savings from Phase II 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 Phase I (2008 through 2013). Phase II of Act 129 began in June 2013 and concluded in May 2016. In late 2015, 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 III. These plans were updated based on stakeholder input and subsequently approved by the PUC in 2016.

Implementation of Phase III of the Act 129 programs began on June 1, 2016. This report documents the progress and effectiveness of the Phase III EE&C accomplishments in Program Year 12 (PY12) 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 III programs since inception. This report additionally documents the energy savings carried over from Phase II. The Phase II carryover savings count towards EDC savings compliance targets for Phase III.

This report details the participation, spending, reported gross, verified gross, and verified net impacts of the energy efficiency programs in PY12. 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).<sup>1</sup> The Companies have retained ADM Associates, Inc. and Tetra Tech, Inc. (the ADM team, or ADM) as an independent evaluation contractor for Phase III 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.

Phase III of Act 129 includes a demand response goal for Met-Ed, Penn Power, and WPP. Demand response events are limited to the months of June through September, which are the first four months of the Act 129 program year. Because the demand response season is completed early in the program year, it is possible to complete the independent evaluation of verified gross savings for demand response sooner than is possible for energy efficiency programs. The Companies reported the verified gross impacts for the demand response programs which the Companies operated on a voluntary basis in PY12, as well as the cumulative demand response performance of the EE&C program to date for Phase III of Act 129 in the Preliminary Annual Report filed July 15, 2021.

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<sup>1</sup> 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.

## 2 Summary of Achievements

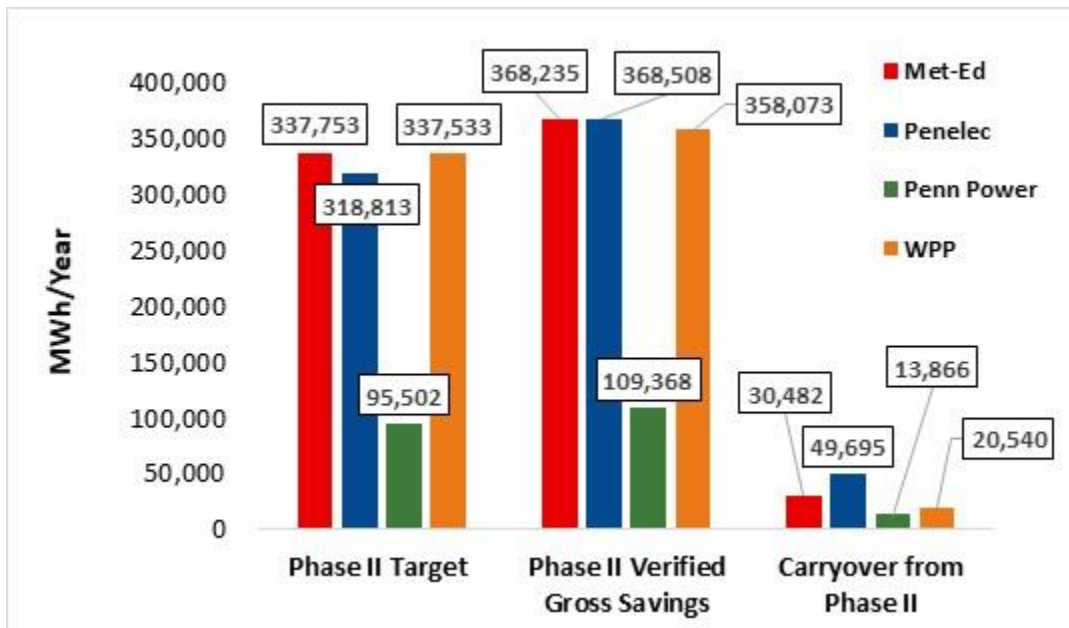
### 2.1 CARRYOVER SAVINGS FROM PHASE II OF ACT 129

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

**Table 1: Carryover Savings from Phase II**

FirstEnergy EDC	Phase II Carryover Savings (MWh/Year)
Met-Ed	30,482
Penelec	49,695
Penn Power	13,866
West Penn Power	20,540

**Figure 1: Carryover Savings from Phase II of Act 129**



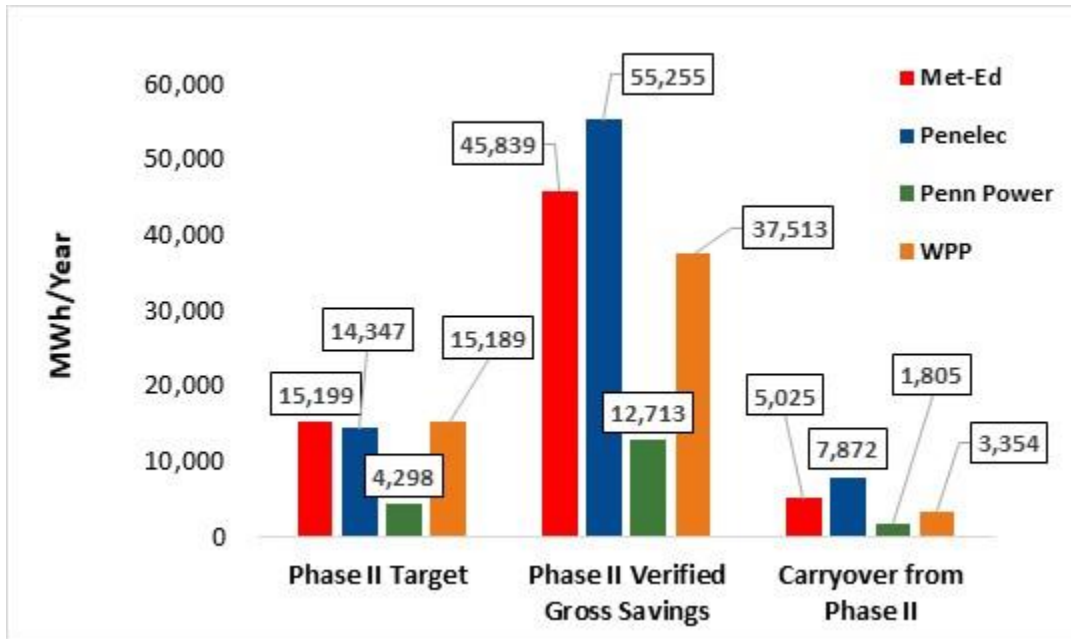
The Commission's Phase III Implementation Order<sup>2</sup> also allowed EDCs to carry over savings in excess of the Phase II Government, Non-Profit, and Institutional (GNI) savings goal and excess savings from the Low-Income (LI) customer segment.<sup>3</sup> Figure 2 shows the calculation of

<sup>2</sup> Pennsylvania Public Utility Commission, *Energy Efficiency and Conservation Program Implementation Order*, at Docket No. M-2014-2424864, (*Phase III Implementation Order*), entered June 11, 2015.

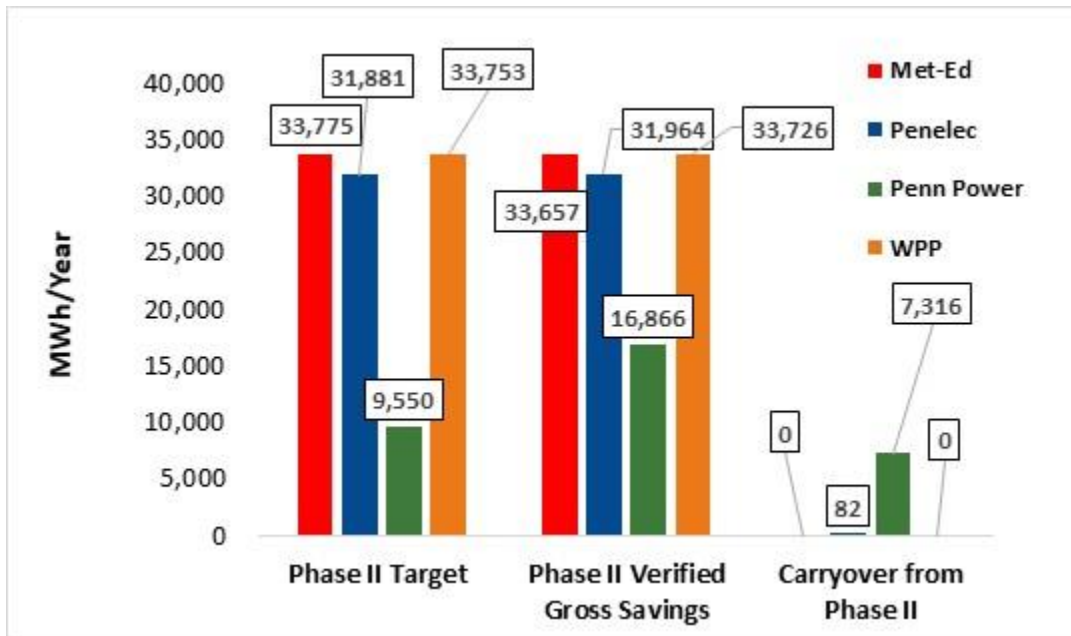
<sup>3</sup> Proportionate to those savings achieved by dedicated low-income programs in Phase III.

carryover savings for the low-income targets, and Figure 3 shows the calculation of carryover savings for the GNI targets.

**Figure 2: Low-Income Carryover from Phase II**



**Figure 3: GNI Carryover from Phase II**



## 2.2 PHASE III ENERGY EFFICIENCY ACHIEVEMENTS TO DATE

Since the beginning of Program Year 12 on June 1, 2020, the four FirstEnergy PA EDCs reported and verified gross electric energy savings and gross peak demand savings are shown in Table 2 below.

**Table 2: Gross Reported and Verified Electric and Demand Savings for PY12**

EDC	PYRTD MWh	PYRTD MW	PYVTD MWh	PYVTD MW
<b>Met-Ed</b>	101,591	16	102,958	14
<b>Penelec</b>	81,808	12	81,623	12
<b>Penn Power</b>	22,607	3	23,599	3
<b>West Penn Power</b>	106,330	17	104,990	15

Since the beginning of Program Year 8 on June 1, 2016, the four FirstEnergy PA EDCs reported and verified gross electric energy savings and gross peak demand savings are shown in Table 3 below.

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

EDC	RTD MWh	RTD MW	VTD MWh	VTD MW
<b>Met-Ed</b>	681,682	95	746,655	99
<b>Penelec</b>	640,214	82	696,193	85
<b>Penn Power</b>	196,276	27	223,948	30
<b>West Penn Power</b>	657,746	93	709,466	92

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

**Table 4: Phase III Electric Savings including Phase II Carryover**

EDC	VTD +CO MWh	Compliance Target	Percent of Target to Date
<b>Met-Ed</b>	777,137	599,352	130%
<b>Penelec</b>	745,888	566,168	132%
<b>Penn Power</b>	237,814	157,371	151%
<b>West Penn Power</b>	730,006	540,986	135%

Looking ahead to Phase IV:

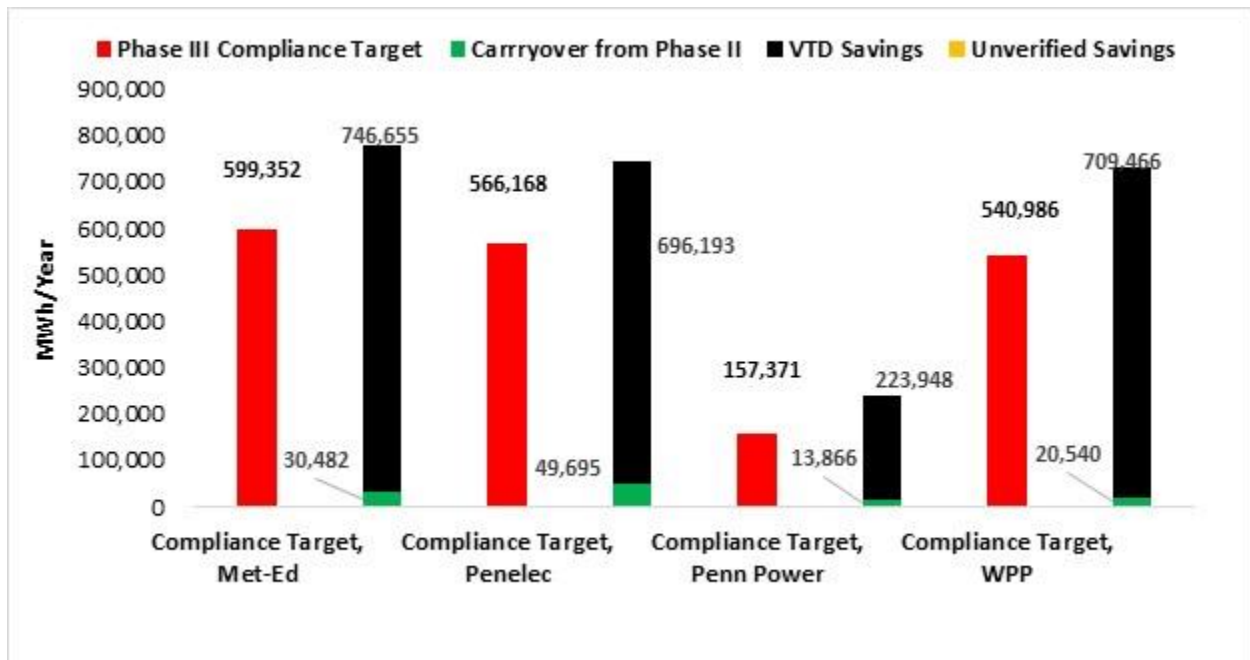
The VTD energy savings achieved during Phase III and the estimated carryover energy savings to Phase IV are shown for each EDC in Table 5. The last column of Table 5 shows the carryover as a % of Phase IV portfolio savings targets.

**Table 5: Estimated Phase IV Carryover**

EDC	VTD MWh	Compliance Target	Phase IV Carryover	% of Phase IV Target
<b>Met-Ed</b>	746,655	599,352	147,303	32%
<b>Penelec</b>	696,193	566,168	130,025	30%
<b>Penn Power</b>	223,948	157,371	66,577	52%
<b>West Penn Power</b>	709,466	540,986	168,480	33%

Figure 4 summarizes progress towards the Phase III portfolio compliance targets for each of the four EDCs.

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



The Phase III 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 6. The 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 6: 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
<b>Met-Ed</b>	9%	158	59	37%
<b>Penelec</b>	10%	158	59	37%
<b>Penn Power</b>	11%	158	59	37%
<b>West Penn Power</b>	9%	158	59	37%

The PA PUC also established a low-income energy savings target of 5.5% of the portfolio savings goal. The second column of Table 7 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 II carryover. The percentages of the Phase III low-income energy savings targets achieved to date are shown in the last column of the table.

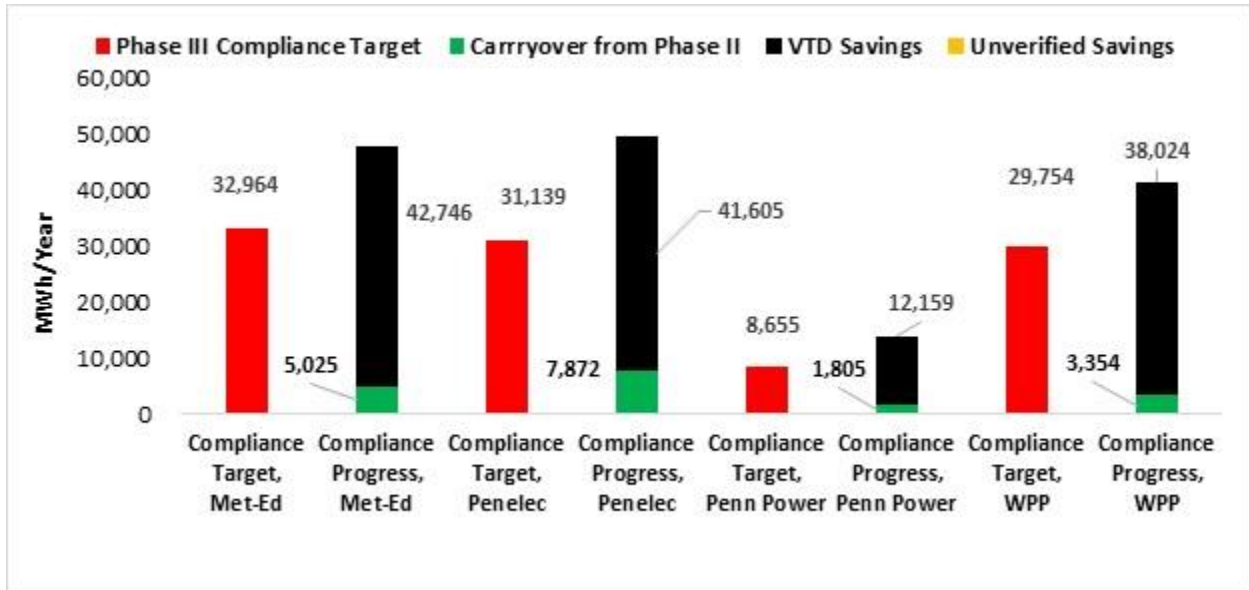
**Table 7: Low-Income Program Energy Savings and Targets<sup>4</sup>**

EDC	Compliance Target	LI VTD +CO MWh	Percent of Target to Date
<b>Met-Ed</b>	32,964	47,771	145%
<b>Penelec</b>	31,139	49,477	159%
<b>Penn Power</b>	8,655	13,965	161%
<b>West Penn Power</b>	29,754	41,378	139%

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

<sup>4</sup> The sum of the LI VTD + CO in Table 7 (13,965) is different from the sum of the VTD and CO reported in Figure 5 (13,964) due to rounding. To one decimal place the sum is 12,159.2+1,805.4=13,964.7.

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



Looking ahead to Phase IV, the energy savings achieved in the low-income sector during Phase III and the estimated carryover energy savings toward Phase IV low-income savings targets are shown for each EDC in Table 8. The last column of Table 8 shows the carryover as a % of Phase IV low-income savings targets.

**Table 8: Estimated Phase IV Low-Income Carryover**

EDC	VTD MWh	Compliance Target	Phase IV Carryover	% of Phase IV Target
<b>Met-Ed</b>	42,746	32,964	9,782	36%
<b>Penelec</b>	41,605	31,139	10,466	41%
<b>Penn Power</b>	12,159	8,655	3,504	47%
<b>West Penn Power</b>	38,024	29,754	8,269	28%

The Phase III Implementation Order established a GNI energy savings target of 3.5% of the portfolio savings goal. The second column of Table 9 shows the GNI savings targets, based on verified gross savings, for each EDC. The third column of the table shows the verified GNI impacts, inclusive of Phase II carryover. The percentages of the Phase III GNI energy savings targets achieved to date are shown in the last column of the table.

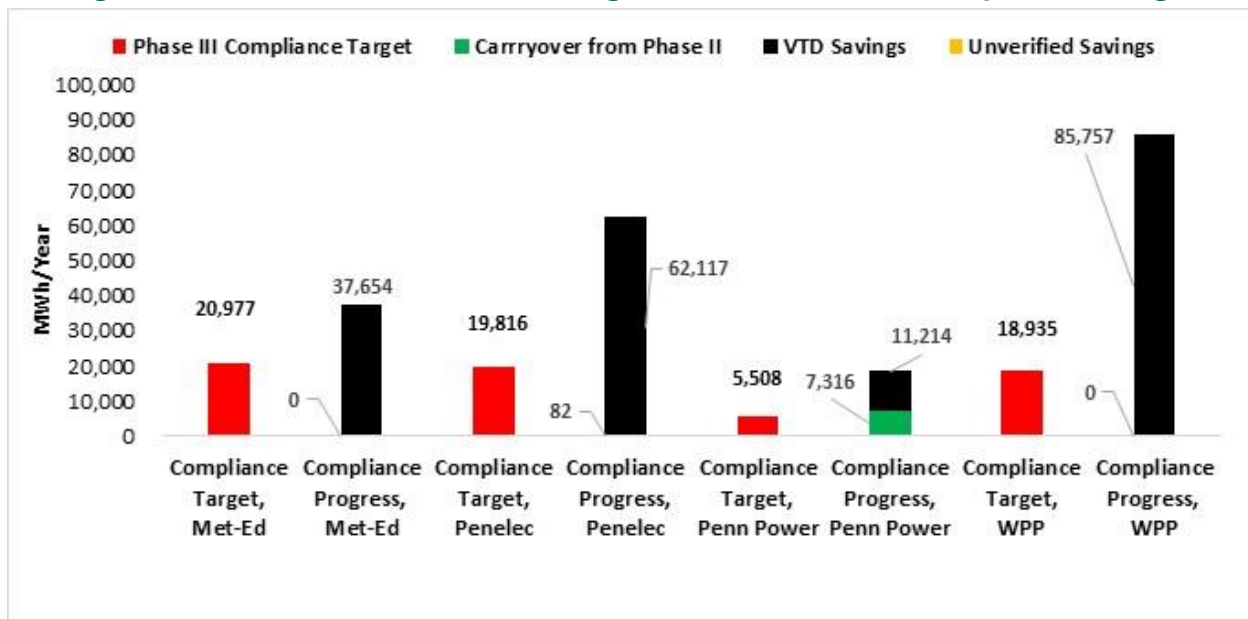


**Table 9: GNI Savings and Targets**

EDC	Compliance Target	GNI VTD +CO MWh	Percent of Target to Date
Met-Ed	20,977	37,654	179%
Penelec	19,816	62,200	314%
Penn Power	5,508	18,530	336%
West Penn Power	18,935	85,757	453%

Figure 6 compares the VTD performance for the GNI customer segment to the Phase III savings target.

**Figure 6: EE&C Plan Performance against Phase III GNI Compliance Target**



### 2.3 PHASE III DEMAND RESPONSE ACHIEVEMENTS TO DATE

The Phase III demand response performance targets are 49 MW for Met-Ed, 17 MW for Penn Power, and 64 MW for West Penn Power. Penelec does not have DR targets in Phase III. Compliance targets for demand response programs were established at the system level, which means the load reductions measured at the customer meter must be escalated to reflect transmission and distribution losses.

It is important to note that the EDCs were not required to obtain peak demand reductions in the first program year of Phase III (PY8) and demand response programs were deemed voluntary by the Commission in PY12 due to the COVID-19 pandemic.<sup>5</sup>

As a result of the Commission's Order reclassifying the DR target compliance period, the Companies' VTD results through PY11 can be considered final Phase III DR results for the SWE to recognize the Companies have exceeded the required DR MW program targets. Also, PY12 DR final results reported herein reflect lower results than in previous years, which is likely a result of COVID-19 impacts to participating DR customers.

Act 129 demand response events are triggered by PJM's day-ahead load forecast. When the day-ahead forecast is above 96% of the peak load forecast for the year, a demand response event is initiated for the following day. In PY12, there were 4 demand response events called. Table 10 lists the days that DR events were called, along with verified gross demand reductions achieved by each EDC and program for PY12. Table 10 also lists the average DR performance for PY12 and for Phase III to date. The FirstEnergy EDCs' DR performance to date, with consideration of the measurement confidence intervals reflecting the uncertainty of average values, is 12% above, 182% above, and 99% above the Phase III compliance reduction targets for Met-Ed, Penn Power and West Penn Power respectively. Without consideration of measurement confidence intervals around the average values, the EDC's average DR performance is 8% above, 134% above, and 76% above the Phase III compliance reduction target for Met-Ed, Penn Power and West Penn Power respectively.

Met-Ed's demand response achievement to date demonstrates compliance with Act 129 target, as the confidence interval associated with measurements exceeds the Act 129 target value. The 51.4 – 54.7 MW confidence interval of the measurement for events in PY9-PY11 exceeds the 49.0 MW target.

Penn Power's demand response achievement to date demonstrates compliance with Act 129 target, as the confidence interval associated with measurements exceeds the Act 129 target value. The 31.7 – 48.0 MW confidence interval of the measurement for events in PY9-PY11 exceeds the 17.0 MW target.

West Penn Power's demand response achievement to date demonstrates compliance with Act 129 target, as the confidence interval associated with measurements exceeds the Act 129 target value. The 97.2 – 127.6 MW confidence interval of the measurement for events in PY9-PY11 exceeds the 64.0 MW target.

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<sup>5</sup> The Commission granted the EAP's petition to modify compliance with peak demand reduction (DR) targets because of the COVID-19 pandemic. The EAP requested that the Commission modify the Phase III Implementation Order to measure compliance with peak DR targets based on electric distribution company (EDC) performance during the second, third, and fourth program years of Phase III (June 1, 2017 through May 31, 2020), and permit EDCs to implement approved DR programs on a voluntary basis for the fifth and final program year (June 1, 2020 through May 31, 2021). EAP sought expedited consideration of this Petition.

See *Petition to Amend the Commission's June 19, 2015 Implementation Order* at Docket No. M-2014-2424864, (Phase III Implementation Order) Phase III Modification Order entered June 3, 2020.

<http://www.puc.pa.gov/pcdocs/1665150.docx>

**Table 10: PY12 Demand Response VTD<sup>6</sup> and PYVTD Performance by Event**

EDC	Event Date	Start Hour	End Hour	Small C&I Load Curtailment	Large C&I Load Curtailment	BDR	Average Portfolio MW Impact	
Met-Ed	7/20/2020	15	18	1.7 ± 0.3	37.0 ± 5.2	9.9 ± 4.5	48.5 ± 6.9	
	7/27/2020	15	18	2.1 ± 0.3	41.5 ± 4.8	10.7 ± 4.5	54.4 ± 6.6	
	7/29/2020	16	19	2.2 ± 0.3	32.9 ± 5.5	7.3 ± 4.3	42.4 ± 7.0	
	8/25/2020	15	18	1.8 ± 0.3	35.9 ± 4.9	9.0 ± 4.1	46.7 ± 6.4	
	8/27/2020	16	19	1.1 ± 0.3	29.2 ± 5.5	7.8 ± 4.3	38.1 ± 7.0	
	<b>PYVTD - Average PY12 DR Event Performance</b>							46.0 ± 4.3
	<b>VTD - Average Phase III DR Event Performance</b>							<b>51.1 ± 1.7</b>
	<b>Compliance Value (PY9-PY11) - Average Performance</b>							<b>53.0 ± 1.6</b>
Penn Power	7/20/2020	15	18	0.0 ± 0.0	4.5 ± 4.8	1.6 ± 1.1	6.1 ± 4.9	
	7/27/2020	15	18	0.0 ± 0.0	7.3 ± 5.7	1.7 ± 1.2	9.0 ± 5.8	
	7/29/2020	16	19	0.0 ± 0.0	7.5 ± 6.0	1.6 ± 1.2	9.1 ± 6.1	
	8/25/2020	15	18	0.0 ± 0.0	14.3 ± 11.7	1.4 ± 1.1	15.7 ± 11.8	
	8/27/2020	16	19	0.0 ± 0.0	16.8 ± 12.8	1.5 ± 1.1	18.2 ± 12.8	
	<b>PYVTD - Average PY12 DR Event Performance</b>							11.6 ± 6.5
	<b>VTD - Average Phase III DR Event Performance</b>							<b>32.0 ± 6.1</b>
	<b>Compliance Value (PY9-PY11) - Average Performance</b>							<b>39.9 ± 8.1</b>
West Penn Power	7/20/2020	15	18	1.6 ± 0.3	105.5 ± 49.5	2.8 ± 2.2	109.9 ± 49.6	
	7/27/2020	15	18	0.9 ± 0.3	116.2 ± 52.8	3.2 ± 2.2	120.2 ± 52.8	
	7/29/2020	16	19	1.1 ± 0.3	85.4 ± 40.2	2.8 ± 2.1	89.4 ± 40.3	
	8/25/2020	15	18	1.3 ± 0.3	66.6 ± 48.9	2.9 ± 2.0	70.8 ± 49.0	
	8/27/2020	16	19	0.9 ± 0.3	62.9 ± 32.5	2.6 ± 2.1	66.3 ± 32.6	
	<b>PYVTD - Average PY12 DR Event Performance</b>							91.3 ± 33.4
	<b>VTD - Average Phase III DR Event Performance</b>							<b>106.5 ± 14.4</b>
	<b>Compliance Value (PY9-PY11) - Average Performance</b>							<b>112.4 ± 15.2</b>

The Commission's Phase III Implementation Order also established a requirement that EDCs achieve at least 85% of the Phase III demand reduction target in each DR event. For each DR event, this translates to a 41.7 MW minimum for Met-Ed, a 14.5 MW minimum for Penn Power, and a 54.4 MW minimum for West Penn Power. Penelec does not have DR targets in Phase III. Figure 7, Figure 8, and Figure 9 compare the performances of each of the DR events in PY12 to the event-specific minimum and average targets for Met-Ed, Penn Power, and West Penn Power respectively. Figure 10, Figure 11, and Figure 12 compare the performances of each of the DR events in Phase III to the event-specific minimum and average targets for Met-Ed, Penn Power, and West Penn Power respectively. PY12 DR programs were voluntary so the comparison of per-event performance to the 85% target is strictly informational.

<sup>6</sup> VTD demand response impacts are the average performance across all Phase III demand response event hours. This is inclusive of PY12, which was voluntary and did not count towards Phase III compliance.

Figure 7: Met-Ed Event Performance Compared to 85% Per-Event Target

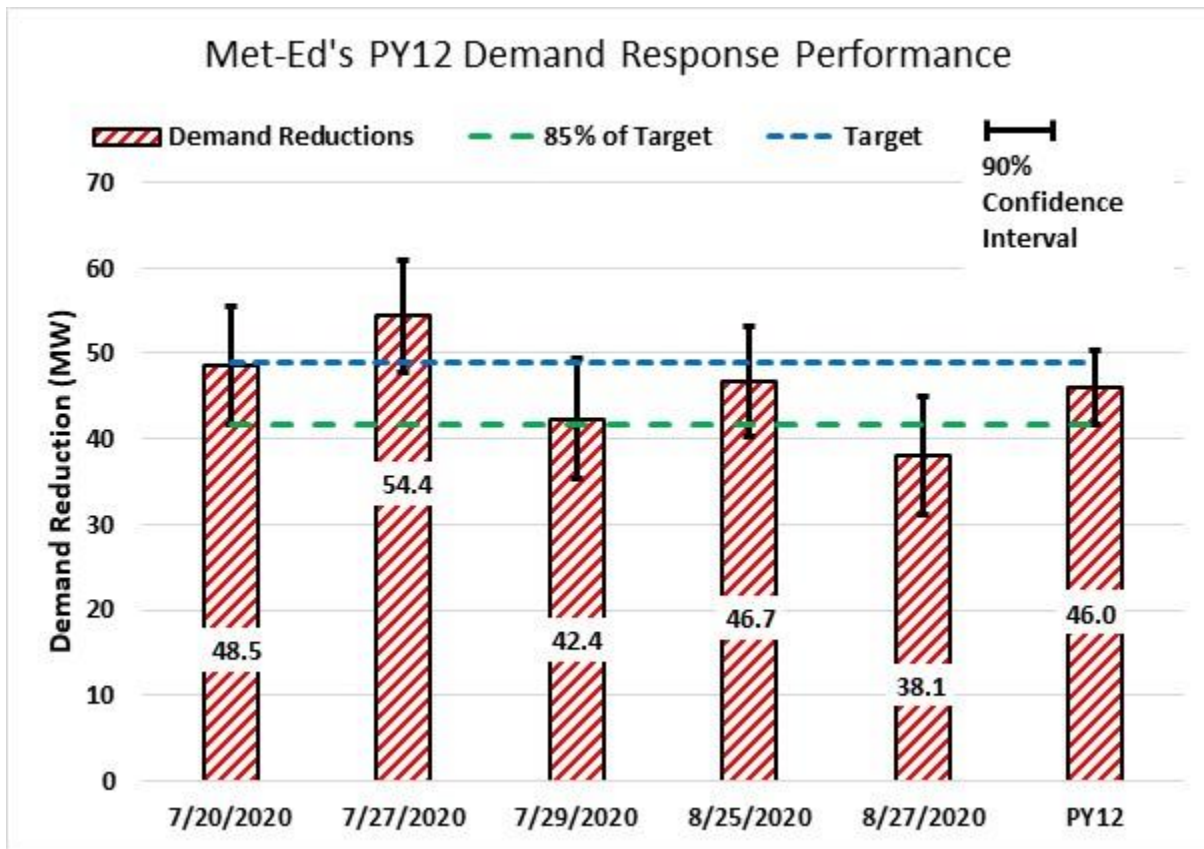


Figure 8: Penn Power Event Performance Compared to 85% Per-Event Target

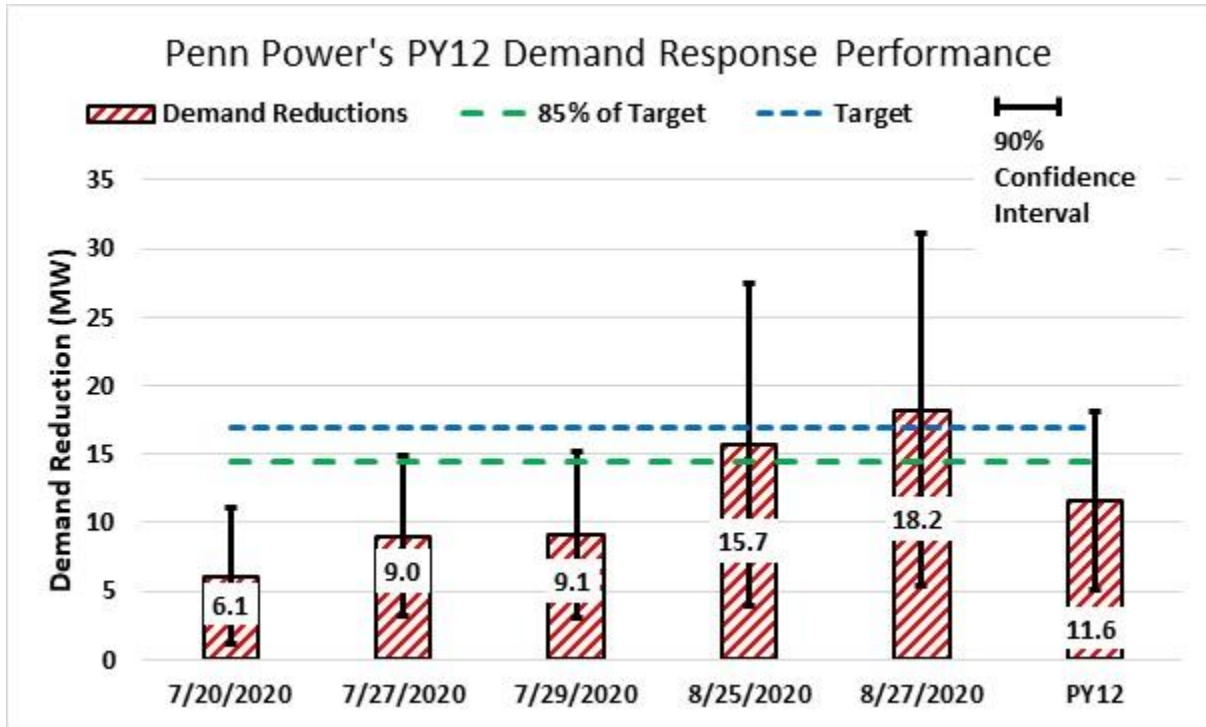


Figure 9: WPP Event Performance Compared to 85% Per-Event Target

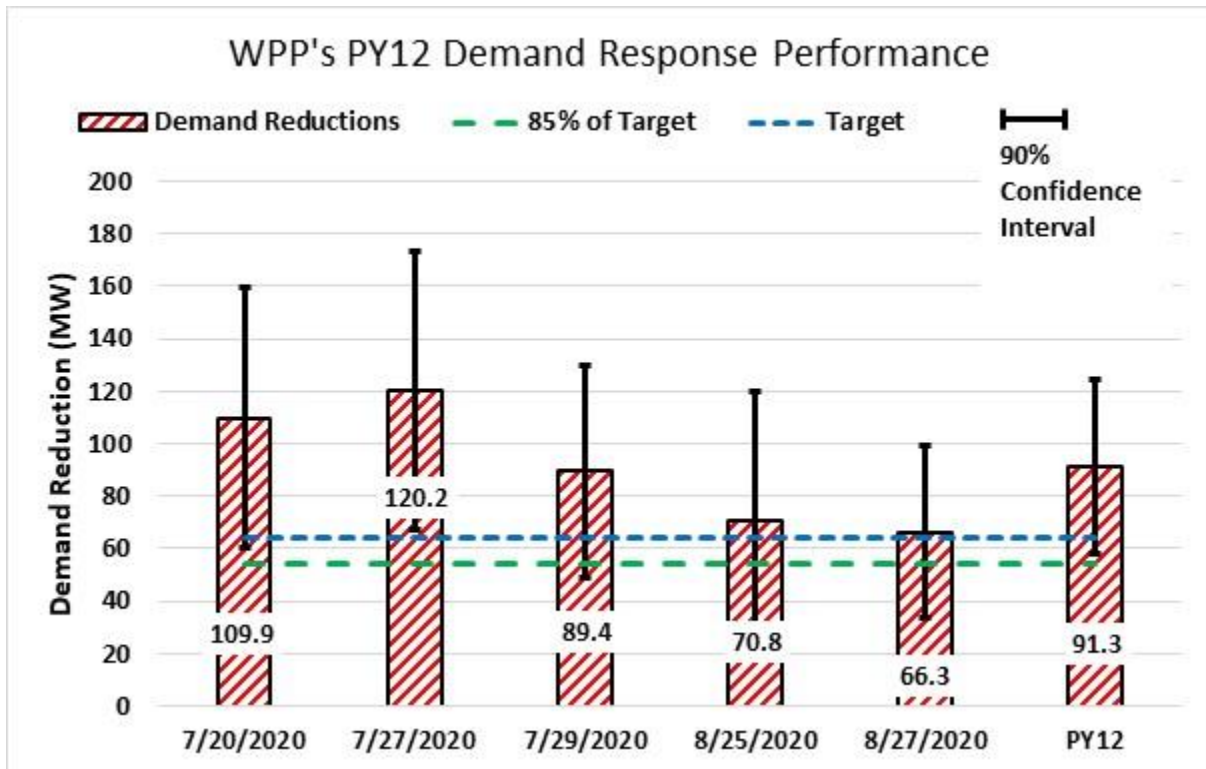


Figure 10: Met-Ed Phase III Performance Compared to 85% Per-Event Target

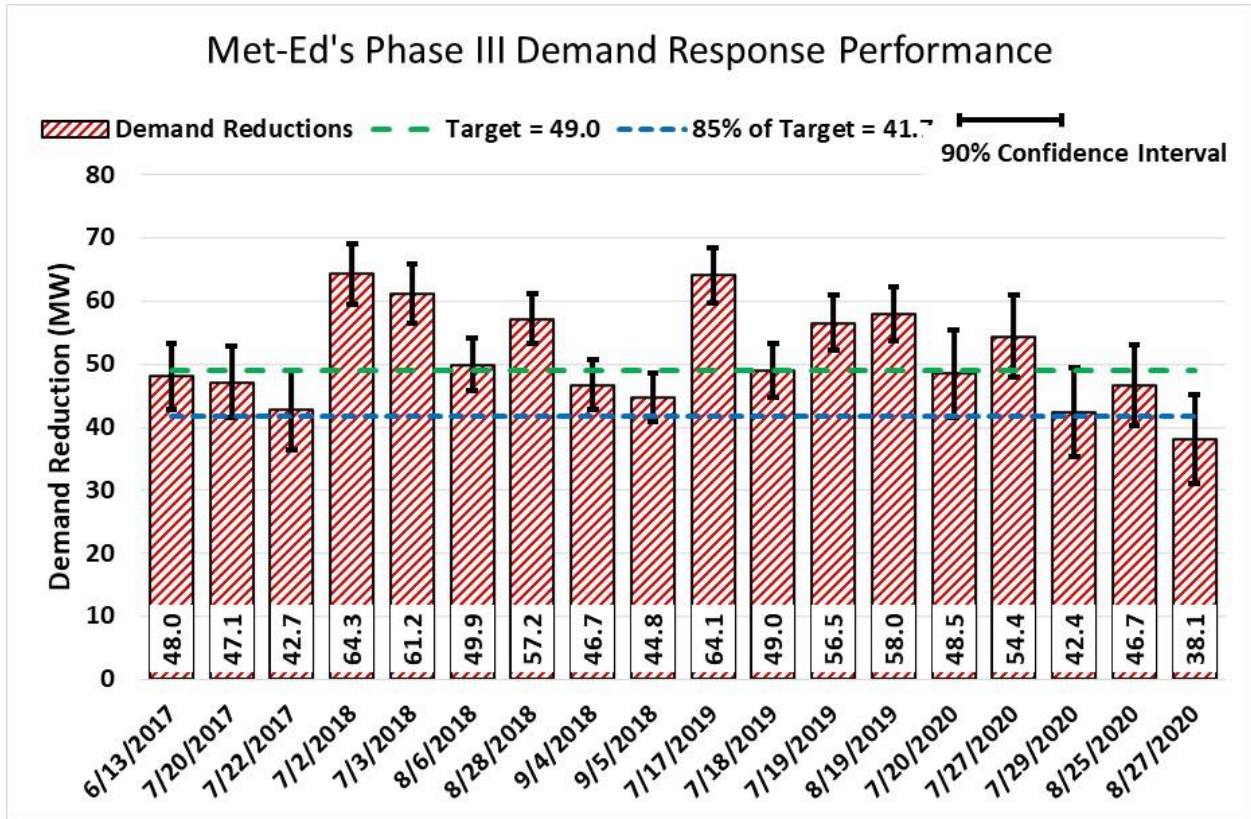
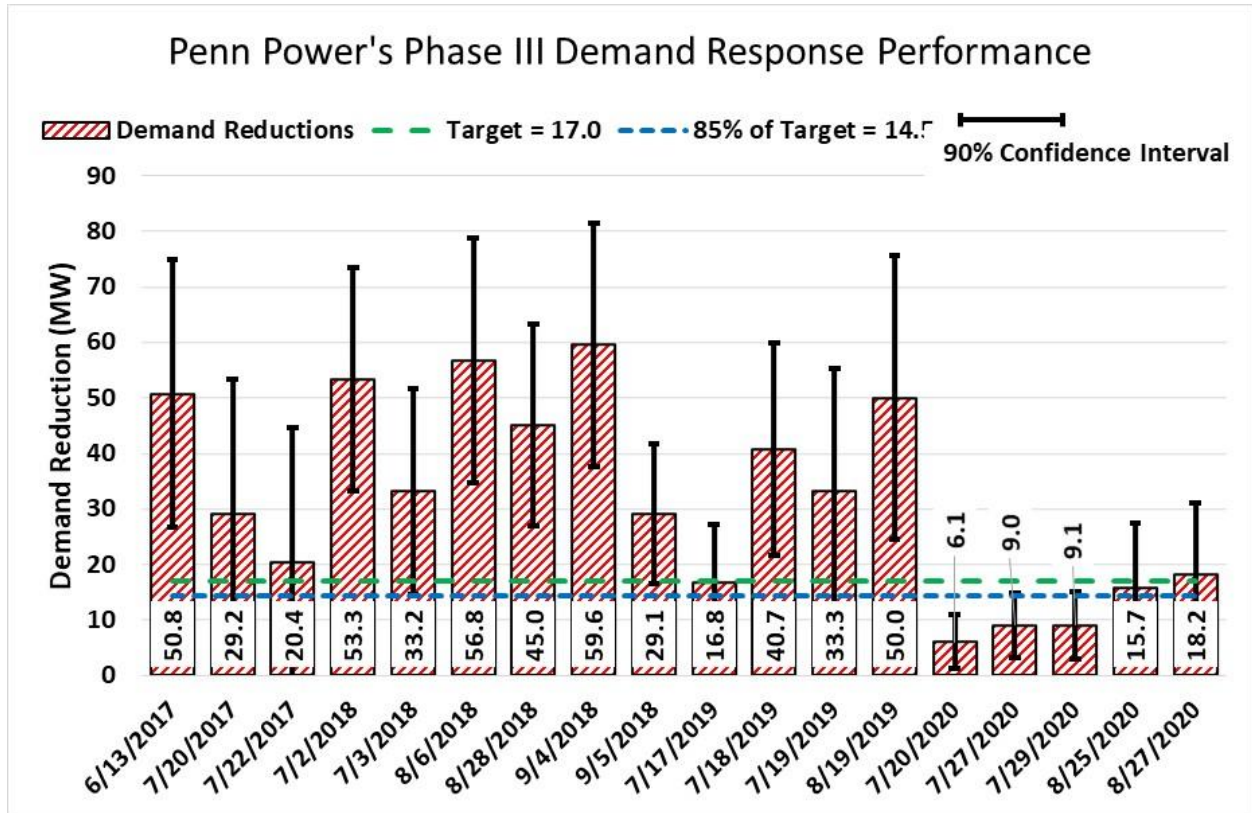
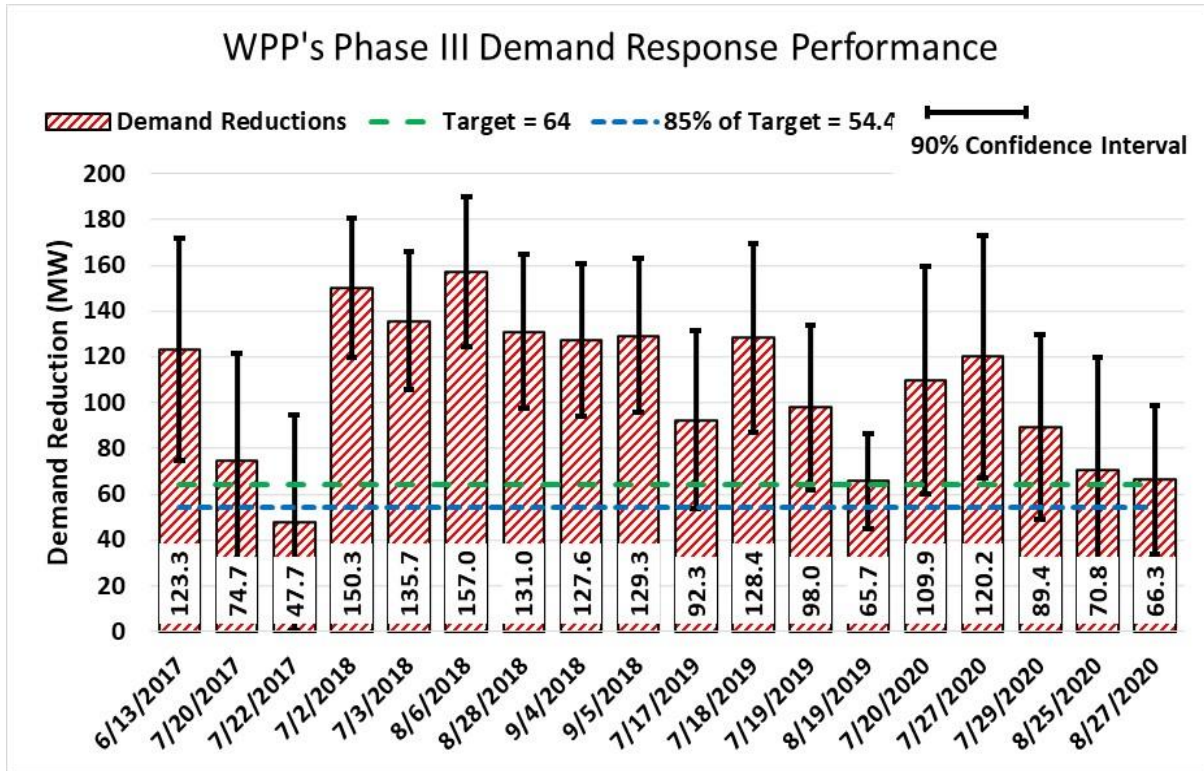


Figure 11: Penn Power Phase III Performance Compared to 85% Per-Event Target



**Figure 12: WPP Phase III Performance Compared to 85% Per-Event Target**



## 2.4 PHASE III PERFORMANCE BY CUSTOMER SEGMENT

Table 11 presents the participation, savings, and spending by customer sector for PY12. 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 classes. The savings, spending, and participation values for the LI and GNI segments have been removed from the parent sectors in Table 11. The values in Table 11 and Table 12 below also reflect adjustments related to cross sector sales of upstream lighting. Participant counts, incentive amounts, and reported impacts were removed from the parent (residential) sector, and allocated to Small C&I and GNI sectors, to reflect cross-sector sales adjustments to reported data for the Energy Efficient Products Program in Table 89, Table 90, Table 91, and Table 92 of Section 3.3.1.

As the Companies' anticipated, the acquisition costs increase through the end of Phase III as participation among higher cost programs and measures increased to offset the reduction in residential lighting that occurred in PY12.



**Table 11: Program Year 12 Summary Statistics by Customer Segment**

EDC	Parameter	Residential (Non-LI)	Residential LI	Small C&I (Non-GNI)	Large C&I (Non-GNI)	GNI
Met-Ed	# participants	429,902	12,061	4,868	149	2,899
	PY12 Energy Realization Rate	106%	113%	101%	96%	102%
	PYVTD MWh/yr	40,911	3,688	14,719	34,799	8,840
	PY12 Demand Realization Rate	84%	86%	99%	91%	97%
	PYVTD MW (Energy Efficiency)	5.69	0.42	2.14	4.36	1.53
	PYVTD MW (Demand Response)	8.94	0.00	1.73	32.89	2.44
	Incentives (\$1000)	\$1,780.60	\$59.30	\$823.73	\$2,015.01	\$414.16
Penelec	# participants	240,262	15,580	5,146	67	2,996
	PY12 Energy Realization Rate	106%	90%	98%	94%	99%
	PYVTD MWh/yr	33,288	2,520	14,963	22,360	8,493
	PY12 Demand Realization Rate	92%	79%	113%	105%	111%
	PYVTD MW (Energy Efficiency)	3.99	0.29	2.41	3.61	1.53
	PYVTD MW (Demand Response)	0.00	0.00	0.00	0.00	0.00
	Incentives (\$1000)	\$979.41	\$60.79	\$729.78	\$790.83	\$358.53
Penn Power	# participants	78,740	2,857	1,021	14	588
	PY12 Energy Realization Rate	114%	109%	98%	96%	105%
	PYVTD MWh/yr	9,752	755	10,505	1,594	994
	PY12 Demand Realization Rate	91%	80%	99%	97%	111%
	PYVTD MW (Energy Efficiency)	1.54	0.09	1.28	0.25	0.15
	PYVTD MW (Demand Response)	1.55	0.00	0.00	10.17	-0.08
	Incentives (\$1000)	\$536.13	\$5.92	\$438.91	\$120.44	\$37.28
West Penn Power	# participants	341,316	14,151	5,780	109	3,324
	PY12 Energy Realization Rate	95%	76%	102%	100%	111%
	PYVTD MWh/yr	41,421	2,405	21,651	27,890	11,623
	PY12 Demand Realization Rate	78%	54%	104%	99%	111%
	PYVTD MW (Energy Efficiency)	6.11	0.26	3.25	3.77	1.87
	PYVTD MW (Demand Response)	2.83	0.00	1.19	87.38	-0.07
	Incentives (\$1000)	\$1,990.33	\$46.20	\$955.96	\$1,876.95	\$379.75

Table 12 summarizes plan performance by sector since the beginning of Phase III.

**Table 12: Phase III Summary Statistics by Customer Segment**

EDC	Parameter	Residential (Non-LI)	Residential LI	Small C&I (Non-GNI)	Large C&I (Non-GNI)	GNI
Met-Ed	# participants	1,658,553	49,528	76,077	846	20,831
	P3TD Energy Realization Rate	116%	114%	106%	97%	108%
	VTD MWh/yr	390,952	42,746	117,660	157,644	37,654
	P3TD Demand Realization Rate	104%	104%	111%	96%	109%
	VTD MW (Energy Efficiency)	48.94	4.95	18.40	20.57	6.01
	VTD MW (Demand Response)	6.68	0.00	0.83	35.55	8.02
	Incentives (\$1000)	\$22,653.74	\$486.56	\$5,833.06	\$8,506.33	\$1,806.33
Penelec	# participants	1,426,751	55,426	77,815	543	20,983
	P3TD Energy Realization Rate	117%	110%	106%	96%	101%
	VTD MWh/yr	343,830	41,605	112,720	135,921	62,117
	P3TD Demand Realization Rate	105%	100%	112%	95%	102%
	VTD MW (Energy Efficiency)	38.33	4.47	17.27	17.02	8.22
	VTD MW (Demand Response)	0.00	0.00	0.00	0.00	0.00
	Incentives (\$1000)	\$18,945.37	\$479.19	\$5,781.53	\$7,577.61	\$3,055.57
Penn Power	# participants	350,390	15,830	19,767	149	5,692
	P3TD Energy Realization Rate	129%	104%	103%	98%	112%
	VTD MWh/yr	110,704	12,159	61,269	28,603	11,214
	P3TD Demand Realization Rate	115%	95%	107%	95%	127%
	VTD MW (Energy Efficiency)	14.98	1.41	8.79	3.33	1.43
	VTD MW (Demand Response)	1.90	0.00	-0.02	29.89	0.24
	Incentives (\$1000)	\$6,697.71	\$154.66	\$3,081.49	\$2,577.59	\$540.90
West Penn Power	# participants	1,627,374	44,733	84,401	541	26,554
	P3TD Energy Realization Rate	111%	103%	108%	99%	107%
	VTD MWh/yr	357,165	38,024	128,800	99,721	85,757
	P3TD Demand Realization Rate	94%	89%	113%	97%	106%
	VTD MW (Energy Efficiency)	47.38	4.46	18.98	12.60	8.94
	VTD MW (Demand Response)	2.50	0.00	1.35	102.67	0.02
	Incentives (\$1000)	\$19,337.86	\$390.74	\$6,658.29	\$9,037.74	\$4,164.88

## 2.5 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 13 provides the current participation totals for PY12 and Phase III.

- For the Appliance Turn-In Program and the low-income Appliance Turn-In components of the 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 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 Upstream Lighting component of the Energy Efficient Products Program, the participant count is equal to the number of packs sold. This is approximately equal to number of bulbs divided by three.
- 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 Appliances rebated by the program. If a customer purchases multiple Appliances, then the customer counts as multiple participants. The majority of rebate applications, however, are for a single appliance.
- 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 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.
- For the Commercial and Industrial Demand Response Programs, each unique utility premise is taken to be a unique participant.
- For the Behavioral Demand Response program component, the number of participants is taken as the maximum number of participants in the treatment group during the year.

**Table 13: EE&C Portfolio Participation by Program**

Utility	Program	PYTD Participation	P3TD Participation
Met-Ed	Appliance Turn-in	2,852	19,940
	Energy Efficient Homes	312,347	413,634
	Energy Efficient Products	122,092	1,319,176
	Low Income Energy Efficiency	12,061	49,528
	C&I Energy Solutions for Business - Small	260	2,038
	C&I Demand Response - Small	62	201
	C&I Energy Solutions for Business - Large	91	810
	C&I Demand Response - Large	94	341
	Governmental & Institutional Tariff	20	168
	Portfolio Total	449,879	1,805,836
Penelec	Appliance Turn-in	2,297	17,301
	Energy Efficient Homes	124,189	221,605
	Energy Efficient Products	121,498	1,282,262
	Low Income Energy Efficiency	15,580	55,426
	C&I Energy Solutions for Business - Small	375	3,378
	C&I Demand Response - Small	0	0
	C&I Energy Solutions for Business - Large	78	720
	C&I Demand Response - Large	0	0
	Governmental & Institutional Tariff	34	826
	Portfolio Total	264,051	1,581,518
Penn Power	Appliance Turn-in	0	5,081
	Energy Efficient Homes	52,659	23,972
	Energy Efficient Products	27,601	345,213
	Low Income Energy Efficiency	2,857	15,830
	C&I Energy Solutions for Business - Small	85	1,281
	C&I Demand Response - Small	0	3
	C&I Energy Solutions for Business - Large	9	146
	C&I Demand Response - Large	9	33
	Governmental & Institutional Tariff	0	269
	Portfolio Total	83,220	391,828
West Penn Power	Appliance Turn-in	2,697	22,074
	Energy Efficient Homes	202,754	174,287
	Energy Efficient Products	144,522	1,537,670
	Low Income Energy Efficiency	14,151	44,733
	C&I Energy Solutions for Business - Small	379	3,236
	C&I Demand Response - Small	50	98
	C&I Energy Solutions for Business - Large	97	560
	C&I Demand Response - Large	29	108
	Governmental & Institutional Tariff	1	837
	Portfolio Total	364,680	1,783,603

## 2.6 SUMMARY OF IMPACT EVALUATION RESULTS

During PY12 the ADM Tetra Tech team completed gross impact evaluations for all the energy efficiency programs in the portfolio except for several small program components which together account for less than 1% of portfolio savings. Table 14 and Table 15 summarize the realization rates and net-to-gross ratios by program. Initiative-level evaluation detail is available in the Appendices to this report.

**Table 14: Impact Evaluation Results Summary for Met-Ed and Penelec**

Program/ Initiative	Met-Ed			Penelec		
	Energy Realization Rate	Demand Realization Rate	Net to Gross Ratio	Energy Realization Rate	Demand Realization Rate	Net to Gross Ratio
Appliance Turn-In	99.8%	93.0%	45.0%	89.2%	87.0%	47.0%
Energy Efficient Homes	96.5%	68.6%	98.2%	95.9%	80.0%	99.5%
Energy Efficient Products	128.9%	129.7%	35.4%	126.7%	121.4%	36.9%
Low Income Program	112.6%	85.8%	100.0%	90.3%	79.2%	100.0%
C&I Solutions for Business Program - Small	96.2%	91.0%	60.4%	93.8%	105.6%	80.8%
C&I Solutions for Business Program - Large	96.2%	90.9%	60.0%	94.2%	104.7%	81.3%
Government and Insitutional Tariff Program	94.7%	100.0%	62.0%	92.5%	74.7%	81.4%

**Table 15: Impact Evaluation Results Summary for Penn Power and WPP**

Program/ Initiative	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
Appliance Turn-In	100.0%	100.0%	51.0%	89.5%	88.9%	48.0%
Energy Efficient Homes	102.0%	76.6%	97.1%	79.6%	57.1%	97.6%
Energy Efficient Products	138.5%	139.6%	37.1%	125.9%	128.6%	32.1%
Low Income Program	109.2%	80.1%	100.0%	76.0%	54.3%	100.0%
C&I Solutions for Business Program - Small	96.6%	96.1%	73.0%	99.2%	99.4%	61.4%
C&I Solutions for Business Program - Large	96.2%	97.1%	75.9%	101.7%	100.2%	60.3%
Government and Insitutional Tariff Program	100.0%	100.0%	100.0%	95.7%	85.0%	48.0%

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. Most programs, and particularly high impact measures (HIMs), were evaluated for net-to-gross in PY8 and PY10. No HIMs were evaluated for net-to-gross in PY12. Table 16 and Table 17 present net-to-gross findings for HIMs studied in PY8 and PY10, as applied to the PY12 program populations.

**Table 16: 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	55.0%	0.0%	45.0%	53.0%	0.0%	47.0%
Res Upstream Lighting	71.0%	0.0%	29.0%	69.0%	0.0%	31.0%
Res EE Kits	21.0%	3.0%	82.0%	20.0%	3.0%	83.0%
C&I Lighting	38.9%	0.9%	62.0%	22.0%	3.4%	81.4%
C&I Custom	44.5%	0.0%	55.5%	19.2%	0.3%	81.1%

**Table 17: 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	49.0%	0.0%	51.0%	52.0%	0.0%	48.0%
Res Upstream Lighting	74.0%	0.0%	26.0%	77.0%	0.0%	23.0%
Res EE Kits	20.0%	2.0%	82.0%	20.0%	2.0%	82.0%
C&I Lighting	19.9%	0.7%	80.8%	34.6%	0.3%	65.7%
C&I Custom	38.8%	0.0%	61.2%	47.0%	0.0%	53.0%

## 2.7 SUMMARY OF ENERGY IMPACTS BY PROGRAM

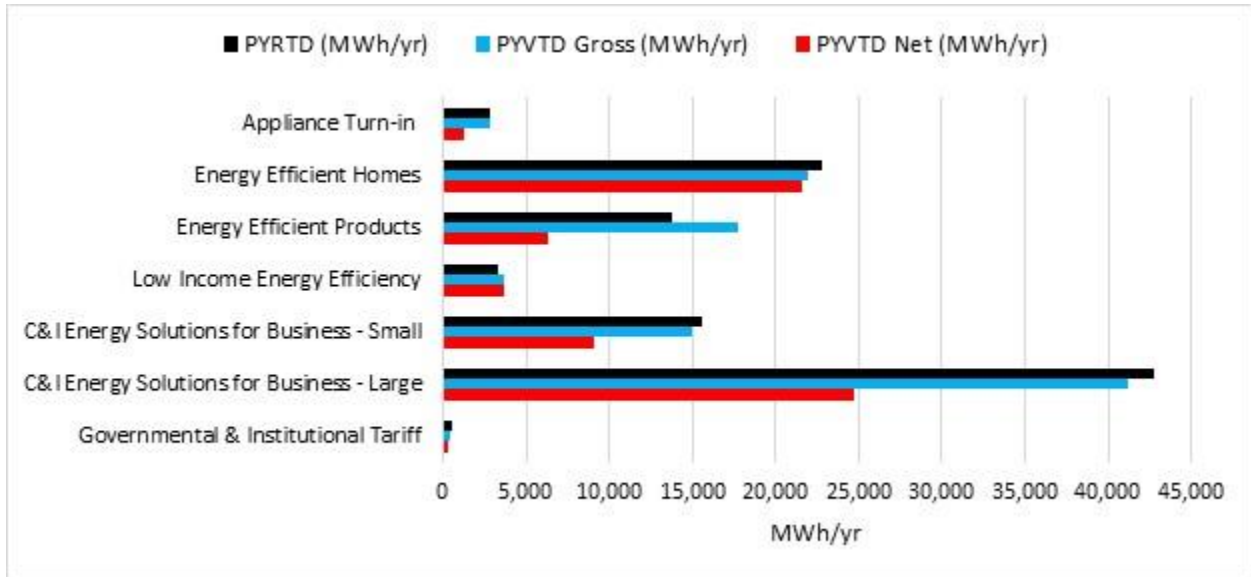
Act 129 compliance targets are based on annualized savings estimates (MWh/year). Each program year, the annual savings achieved by EE&C program activity are recorded as incremental annual, or “first-year”, savings and added to an EDC’s progress toward compliance. Incremental annual savings estimates are presented in Section 2.7.1. 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 2.7.2 presents the lifetime energy savings by program.

### 2.7.1 Incremental Annual Energy Savings by Program

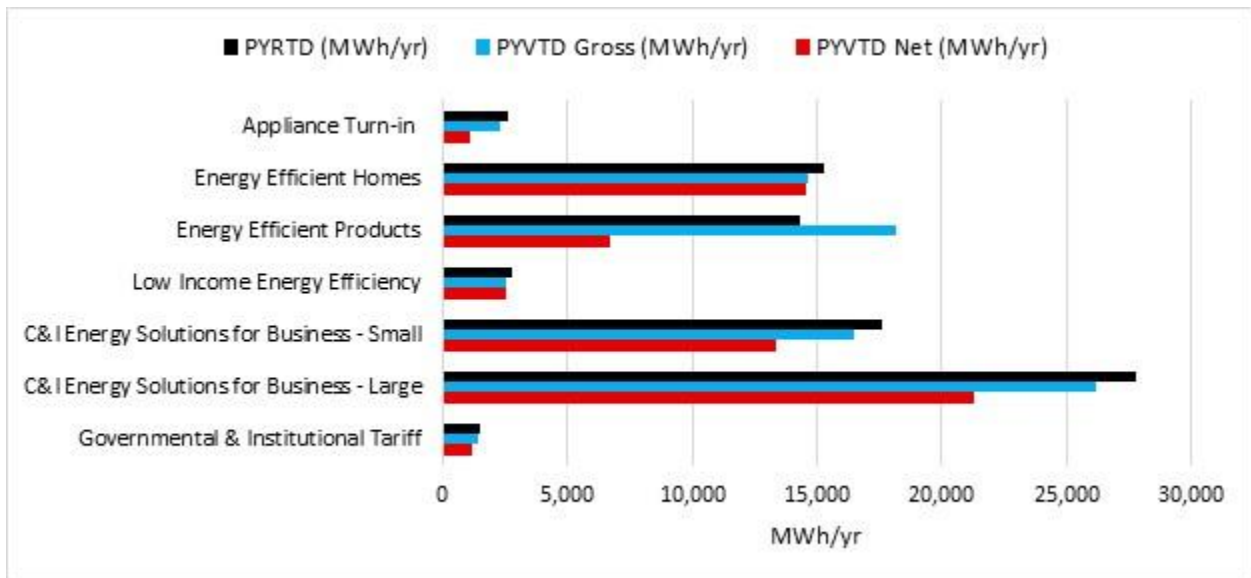
Figure 13, Figure 14, Figure 15, and Figure 16 present summaries of the PYTD energy savings by program respectively for Met-Ed, Penelec, Penn Power, and WPP for Program Year 12. The energy impacts in this report are presented at the meter level and do not reflect adjustments for transmission and distribution losses. The verified gross savings are adjusted by energy realization rates and the verified net savings are adjustments by both the gross realization rates and the net-to-gross ratios.



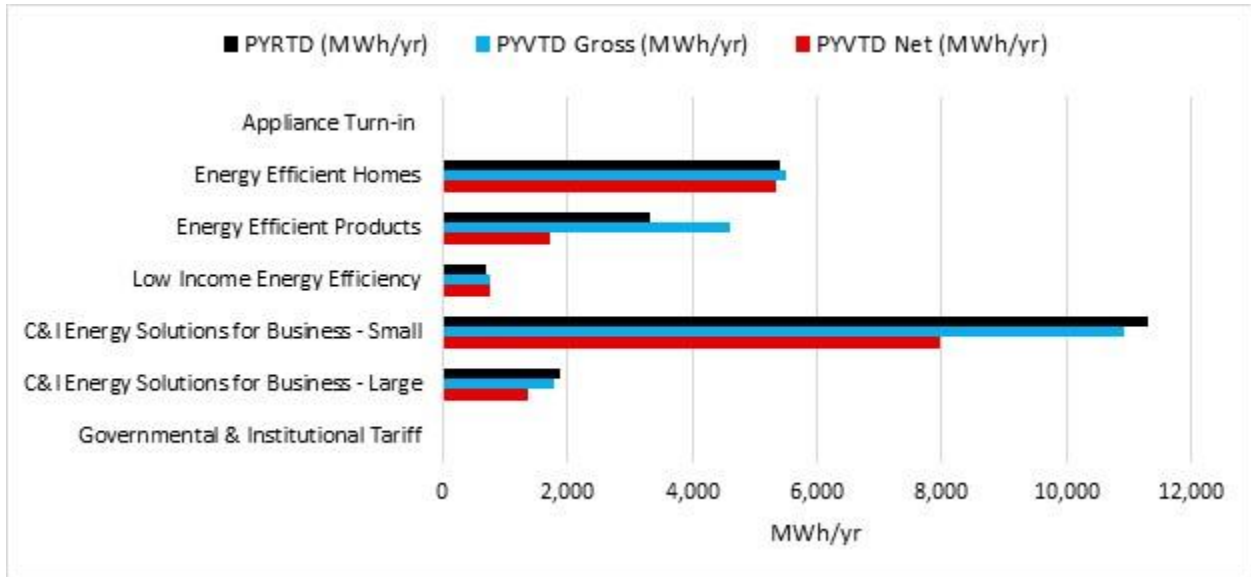
**Figure 13: PYTD Energy Savings by Program for Met-Ed**



**Figure 14: PYTD Energy Savings by Program for Penelec**



**Figure 15: PYTD Energy Savings by Program for Penn Power**



**Figure 16: PYTD Energy Savings by Program for WPP**

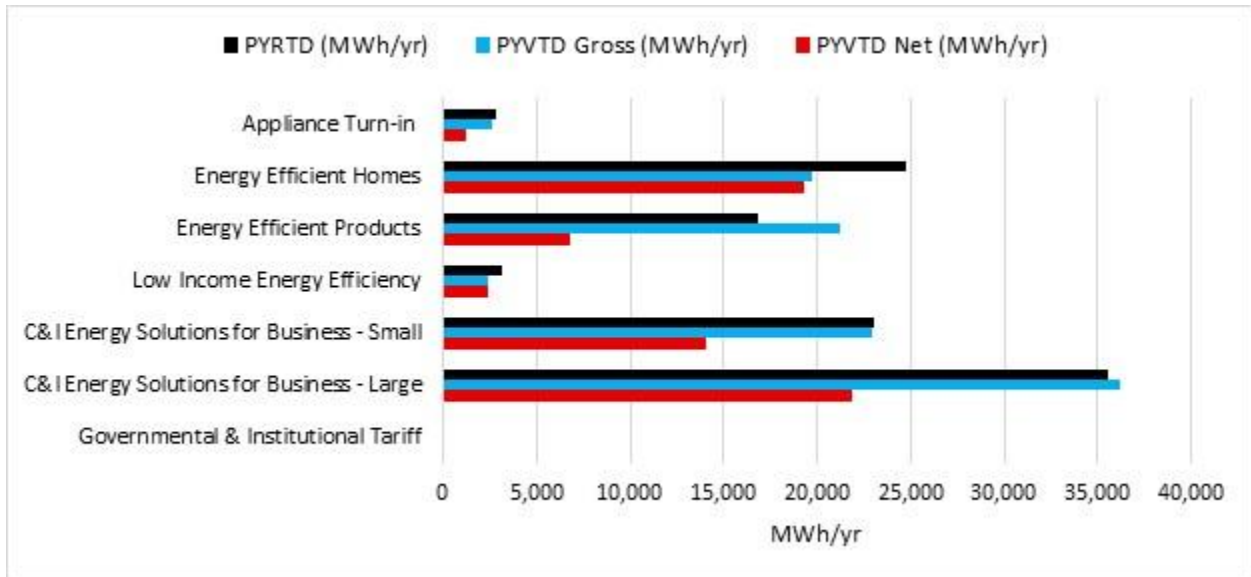
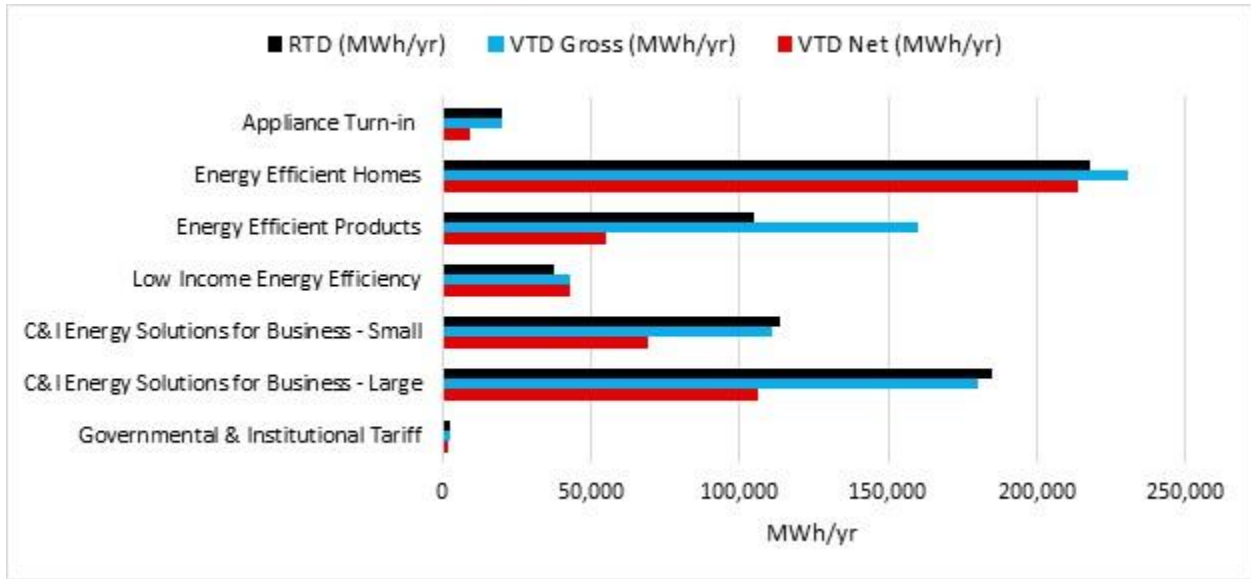
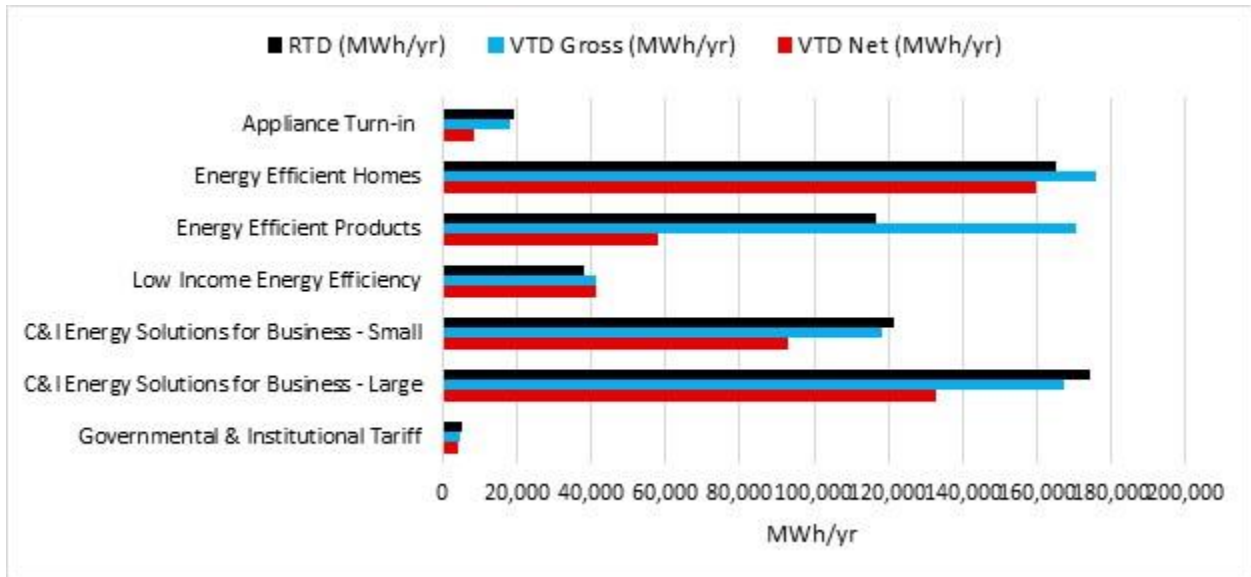


Figure 17, Figure 18, Figure 19, and Figure 20 present summaries of the energy savings by program respectively for Met-Ed, Penelec, Penn Power, and WPP for Phase III of Act 129.

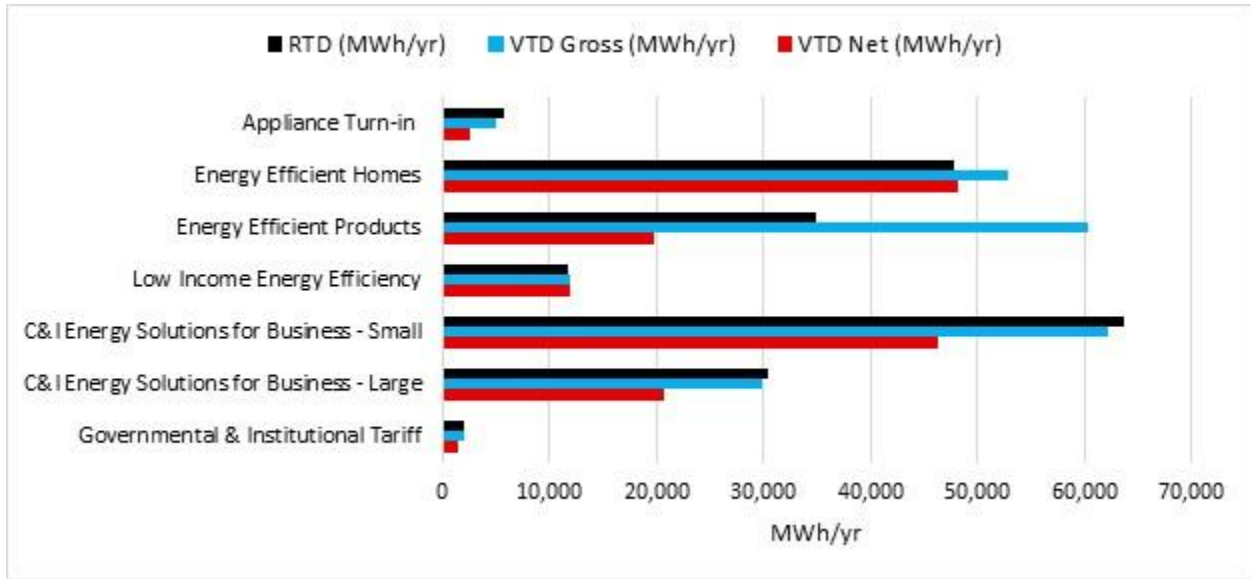
**Figure 17: P3TD Energy Savings by Program for Met-Ed**



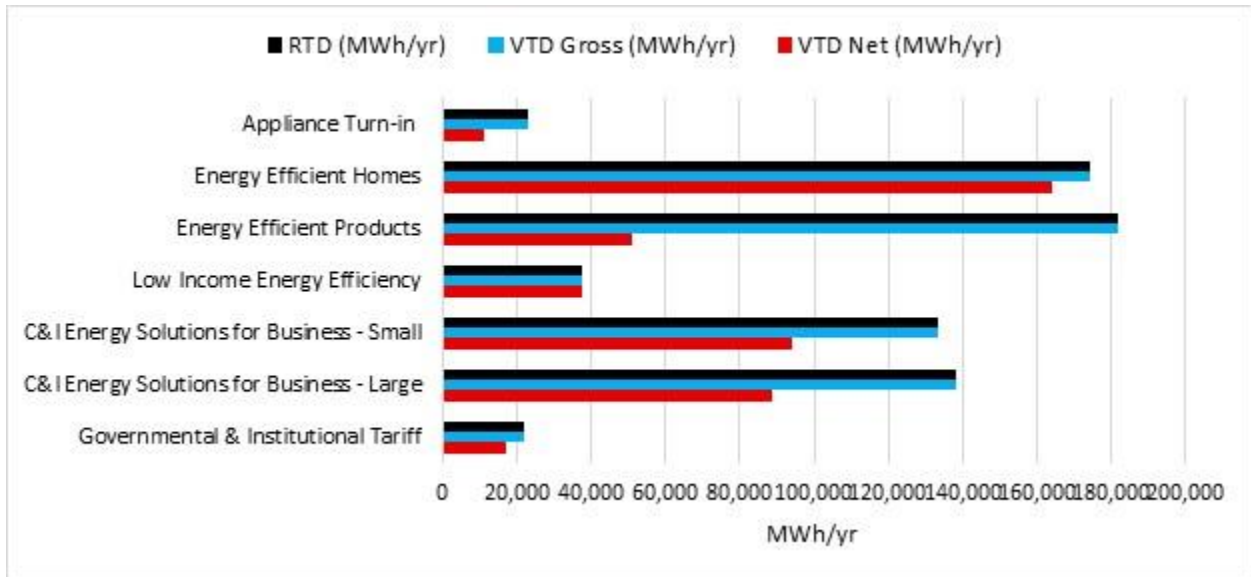
**Figure 18: P3TD Energy Savings by Program for Penelec**



**Figure 19: P3TD Energy Savings by Program for Penn Power**



**Figure 20: P3TD Energy Savings by Program for WPP**



Summaries of energy impacts by program through PY12 are presented in Table 18, Table 19, Table 20, and Table 21 for Met-Ed, Penelec, Penn Power, and WPP respectively.

**Table 18: 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)
Appliance Turn-in	2,883	2,877	1,295	20,092	19,786	9,288
Energy Efficient Homes	22,781	21,991	21,599	218,193	231,070	213,762
Energy Efficient Products	13,797	17,784	6,293	104,730	159,814	54,972
Low Income Energy Efficiency	3,275	3,688	3,688	37,394	42,563	42,563
C&I Energy Solutions for Business - Small	15,540	14,952	9,026	113,671	110,788	69,135
C&I Energy Solutions for Business - Large	42,809	41,186	24,722	185,036	180,135	106,420
Governmental & Institutional Tariff	506	478	297	2,567	2,498	1,589
<b>Portfolio Total</b>	<b>101,591</b>	<b>102,958</b>	<b>66,919</b>	<b>681,682</b>	<b>746,655</b>	<b>497,728</b>

**Table 19: 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)
Appliance Turn-in	2,573	2,295	1,078	19,087	17,792	8,140
Energy Efficient Homes	15,286	14,653	14,578	165,406	175,945	159,827
Energy Efficient Products	14,303	18,128	6,692	116,910	170,517	58,149
Low Income Energy Efficiency	2,792	2,520	2,520	37,935	41,250	41,250
C&I Energy Solutions for Business - Small	17,588	16,490	13,322	121,689	118,519	93,011
C&I Energy Solutions for Business - Large	27,757	26,142	21,258	174,250	167,484	133,083
Governmental & Institutional Tariff	1,509	1,396	1,136	4,936	4,687	3,784
<b>Portfolio Total</b>	<b>81,808</b>	<b>81,623</b>	<b>60,584</b>	<b>640,214</b>	<b>696,193</b>	<b>497,244</b>

**Table 20: 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)
Appliance Turn-in	0	0	0	5,635	4,890	2,583
Energy Efficient Homes	5,404	5,509	5,349	47,755	52,788	48,139
Energy Efficient Products	3,334	4,618	1,713	34,954	60,345	19,808
Low Income Energy Efficiency	691	755	755	11,692	11,953	11,953
C&I Energy Solutions for Business - Small	11,315	10,925	7,974	63,767	62,185	46,276
C&I Energy Solutions for Business - Large	1,863	1,792	1,361	30,439	29,838	20,712
Governmental & Institutional Tariff	0	0	0	2,034	1,948	1,464
<b>Portfolio Total</b>	<b>22,607</b>	<b>23,599</b>	<b>17,151</b>	<b>196,276</b>	<b>223,948</b>	<b>150,936</b>

**Table 21: 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)
Appliance Turn-in	2,883	2,581	1,239	23,620	22,769	10,967
Energy Efficient Homes	24,797	19,734	19,270	183,818	174,136	164,243
Energy Efficient Products	16,823	21,173	6,791	121,924	181,896	51,010
Low Income Energy Efficiency	3,164	2,405	2,405	36,883	37,447	37,447
C&I Energy Solutions for Business - Small	23,063	22,885	14,043	131,811	133,184	93,852
C&I Energy Solutions for Business - Large	35,600	36,212	21,829	139,222	138,410	88,676
Governmental & Institutional Tariff	1	1	0	20,468	21,624	17,131
<b>Portfolio Total</b>	<b>106,330</b>	<b>104,990</b>	<b>65,577</b>	<b>657,746</b>	<b>709,466</b>	<b>463,324</b>

The previously reported VTD savings from prior years have not changed since the prior final annual report was submitted:

### 2.7.2 Lifetime Energy Savings by Program

Table 22, Table 23, Table 24, and Table 25 present the PYTD and P3TD 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<sup>7</sup>, and in part to maintain consistency between verified impacts, measure lives, and incremental costs for all sampled projects. For the residential upstream lighting program, the measure life is reduced to replicate the effect of a dual-baseline benefits stream<sup>8</sup>. To develop the modified measured lives, we used the adjusted EUL calculator provided by SWE along with the related guidance memo issued August 11, 2020. The modified measure life is the product of the original measure life and the ratio of the net-present value of delta-Watt-years for the dual-baseline stream to a single-baseline stream.

<sup>7</sup> For example, a project may consist of various measures with different lifetimes can have different realization rates by measure.

<sup>8</sup> See also comments in Section 2.10.

**Table 22: 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)
Appliance Turn-in	22,425	10,091	123,102	56,830
Energy Efficient Homes	42,698	36,850	613,428	513,975
Energy Efficient Products	99,486	42,036	758,673	276,840
Low Income Energy Efficiency	12,034	12,034	164,125	164,125
C&I Energy Solutions for Business - Small	215,077	129,950	1,605,479	1,003,501
C&I Energy Solutions for Business - Large	595,018	357,453	2,607,383	1,543,288
Governmental & Institutional Tariff	6,988	4,332	36,518	23,224
<b>Portfolio Total</b>	<b>993,725</b>	<b>592,746</b>	<b>5,908,706</b>	<b>3,581,782</b>

**Table 23: Lifetime Energy Savings by Program for Penelec**

Program	PYVTD Gross Lifetime (MWh)	PYVTD Net Lifetime (MWh)	VTD Gross Lifetime (MWh)	VTD Net Lifetime (MWh)
Appliance Turn-in	17,878	8,403	112,661	52,272
Energy Efficient Homes	19,501	18,330	524,821	445,074
Energy Efficient Products	95,319	42,656	759,527	278,911
Low Income Energy Efficiency	10,617	10,617	177,929	177,929
C&I Energy Solutions for Business - Small	237,929	192,419	1,728,136	1,360,851
C&I Energy Solutions for Business - Large	372,823	303,196	2,429,902	1,936,375
Governmental & Institutional Tariff	20,638	16,801	69,287	55,963
<b>Portfolio Total</b>	<b>774,706</b>	<b>592,421</b>	<b>5,802,263</b>	<b>4,307,376</b>

**Table 24: 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)
Appliance Turn-in	0	0	30,423	16,286
Energy Efficient Homes	13,909	11,503	163,274	132,891
Energy Efficient Products	29,252	13,635	301,540	105,735
Low Income Energy Efficiency	1,454	1,454	52,145	52,145
C&I Energy Solutions for Business - Small	149,225	110,501	905,270	677,282
C&I Energy Solutions for Business - Large	25,305	19,427	434,100	303,327
Governmental & Institutional Tariff	0	0	29,025	21,823
<b>Portfolio Total</b>	<b>219,145</b>	<b>156,520</b>	<b>1,915,777</b>	<b>1,309,491</b>

**Table 25: Lifetime Energy Savings by Program for WPP**

Program	PYVTD Gross Lifetime (MWh)	PYVTD Net Lifetime (MWh)	VTD Gross Lifetime (MWh)	VTD Net Lifetime (MWh)
Appliance Turn-in	20,154	9,674	142,942	69,986
Energy Efficient Homes	44,844	37,820	412,609	346,868
Energy Efficient Products	112,179	47,950	799,132	259,418
Low Income Energy Efficiency	9,408	9,408	149,968	149,968
C&I Energy Solutions for Business - Small	336,384	206,457	1,964,904	1,387,455
C&I Energy Solutions for Business - Large	538,140	324,573	2,041,982	1,310,791
Governmental & Institutional Tariff	5	3	322,387	255,359
<b>Portfolio Total</b>	<b>1,061,114</b>	<b>635,885</b>	<b>5,833,924</b>	<b>3,779,846</b>

The previously reported VTD lifetime savings from prior years have not changed since the prior final annual report was submitted.

## 2.8 SUMMARY OF DEMAND IMPACTS BY PROGRAM

Phase III EE&C programs achieve peak demand reductions in two primary ways. The first is through coincident reductions from energy efficiency measures and the second is through dedicated demand response offerings that exclusively target temporary demand reductions on peak days. Energy efficiency reductions coincident with system peak hours are reported and used in the calculation of benefits in the TRC Test, but do not contribute to Phase III peak demand reduction compliance goals. Phase III peak demand reduction targets are exclusive to demand response programs.

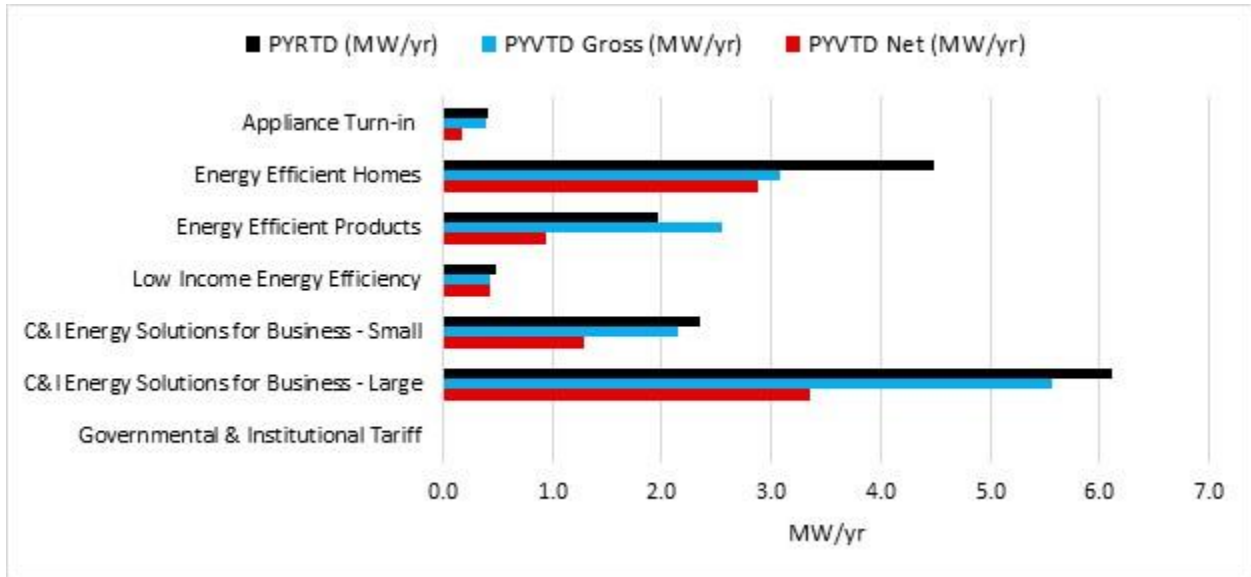
The two types of peak demand reduction savings are also treated differently for reporting purposes. Peak demand reductions from energy efficiency are generally additive across program years, meaning that the P3TD savings reflect the sum of the first-year savings in each program year. Conversely, demand response goals are based on average portfolio impacts across all events so cumulative DR performance is expressed as the *average* performance of each of the DR events called in PY9 to PY11 (with EDCs running programs in PY12 on a voluntary basis for enrolled customers). Because of these differences, demand impacts from energy efficiency and demand response are reported separately in the following sub-sections.

### 2.8.1 Energy Efficiency

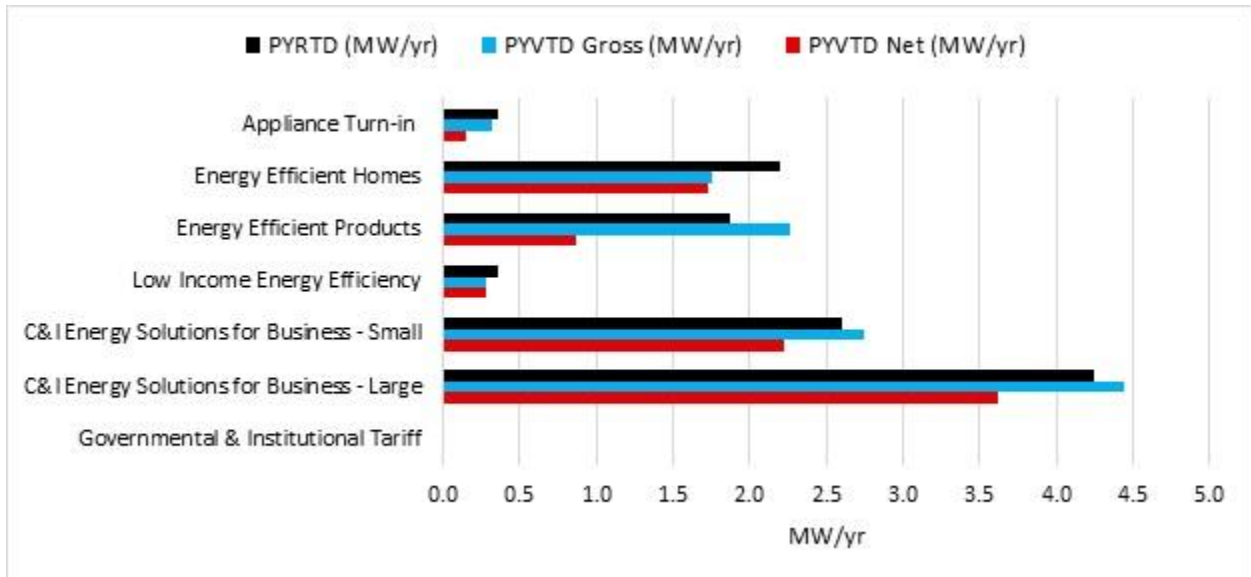
Act 129 defines peak demand savings from energy efficiency as the average expected reduction in electric demand from 2:00 p.m. to 6:00 p.m. EDT on non-holiday weekdays from June through August. Unlike Phase I and Phase II Act 129 reporting, the peak demand impacts from energy efficiency in this report are presented at the meter level and do not reflect adjustments for transmission and distribution losses. Figure 21, Figure 22, Figure 23, and Figure 24 present summaries of the PYTD demand savings by energy efficiency program for Met-Ed, Penelec, Penn Power, and WPP respectively for Program Year 12.



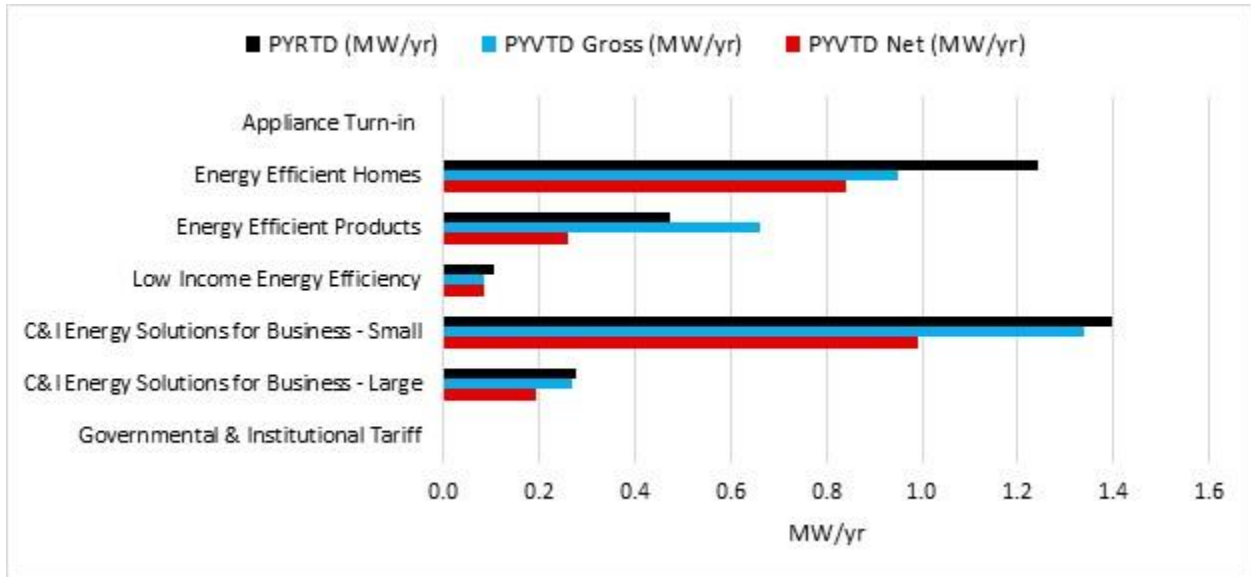
**Figure 21: PYTD Demand Savings by Energy Efficiency Program for Met-Ed**



**Figure 22: PYTD Demand Savings by Energy Efficiency Program for Penelec**



**Figure 23: PYTD Demand Savings by Energy Efficiency Program for Penn Power**



**Figure 24: PYTD Demand Savings by Energy Efficiency Program for WPP**

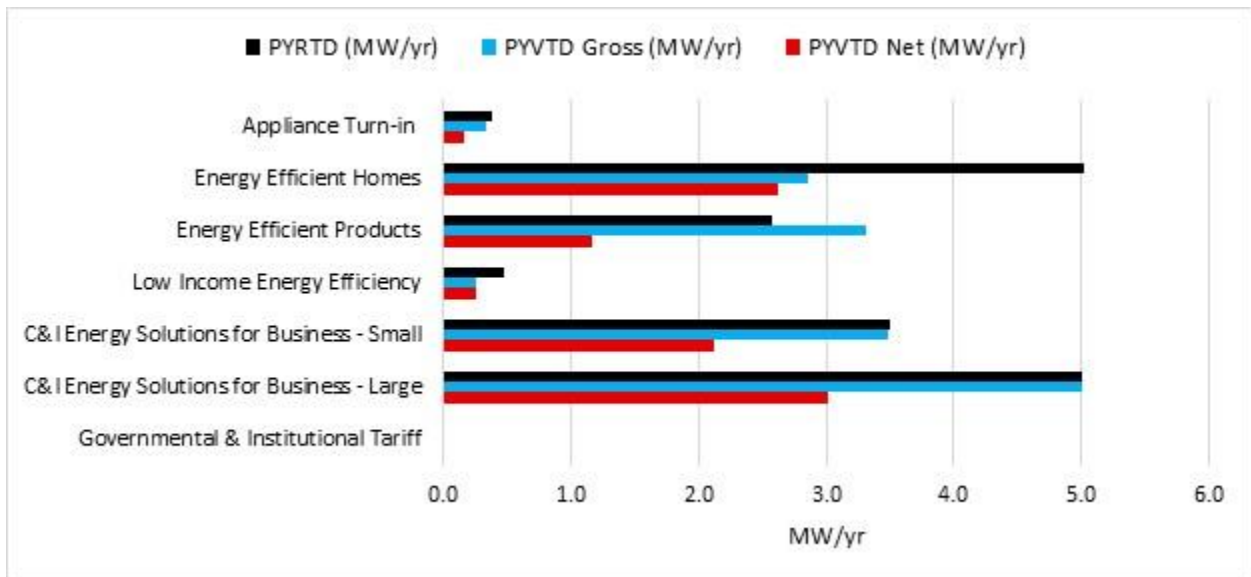
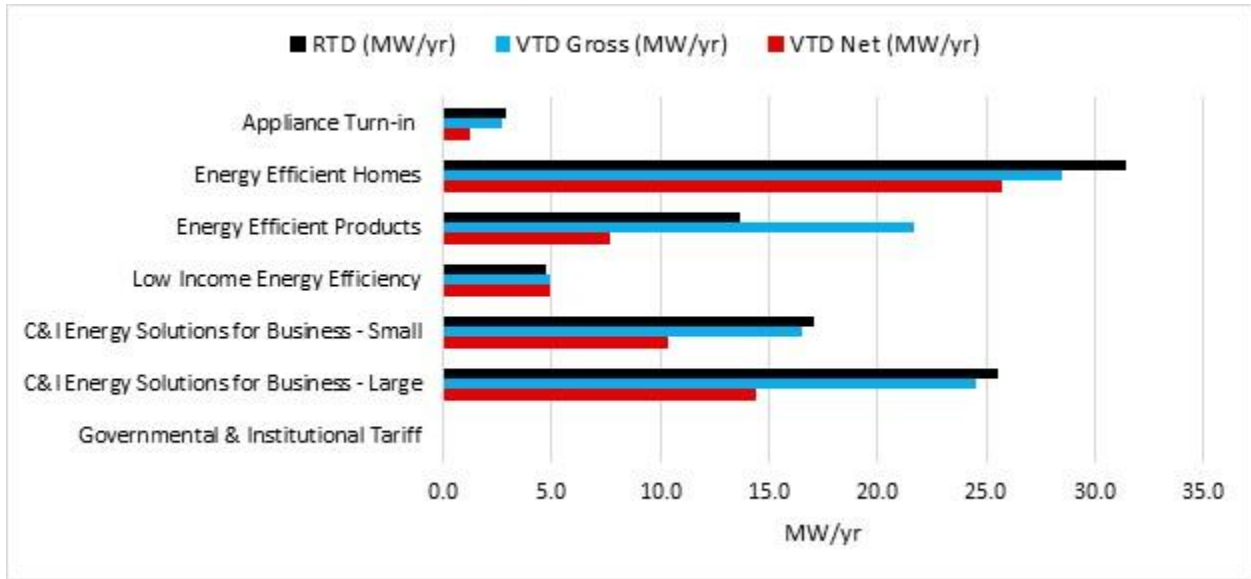
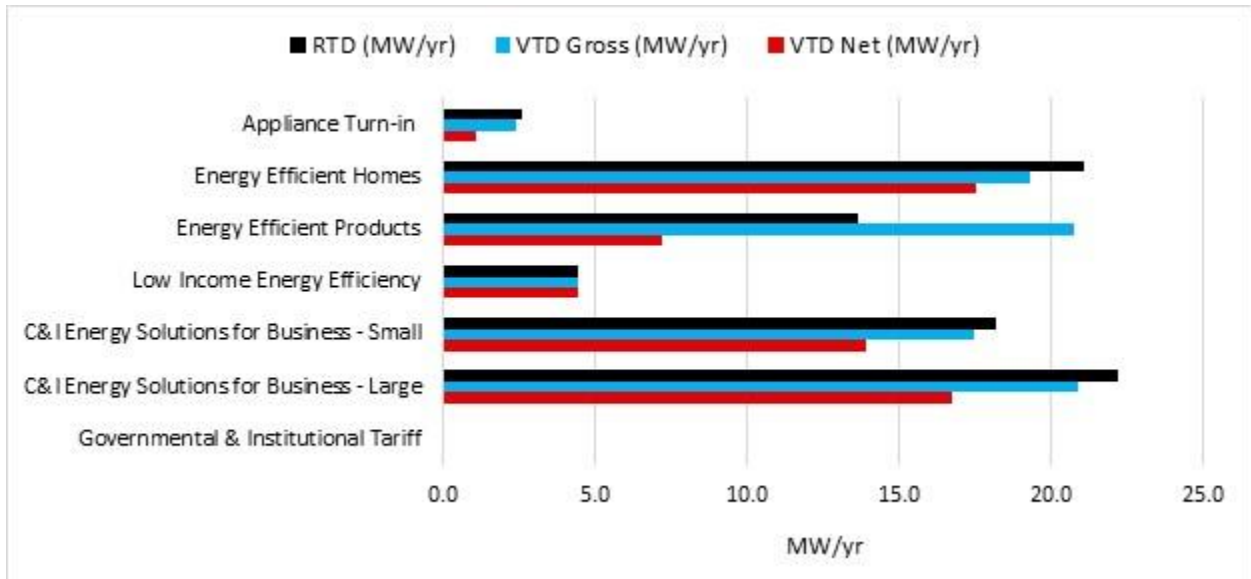


Figure 25, Figure 26, Figure 27, and Figure 28 present summaries of the P3TD demand savings by energy efficiency program for Met-Ed, Penelec, Penn Power, and WPP respectively for Phase III of Act 129.

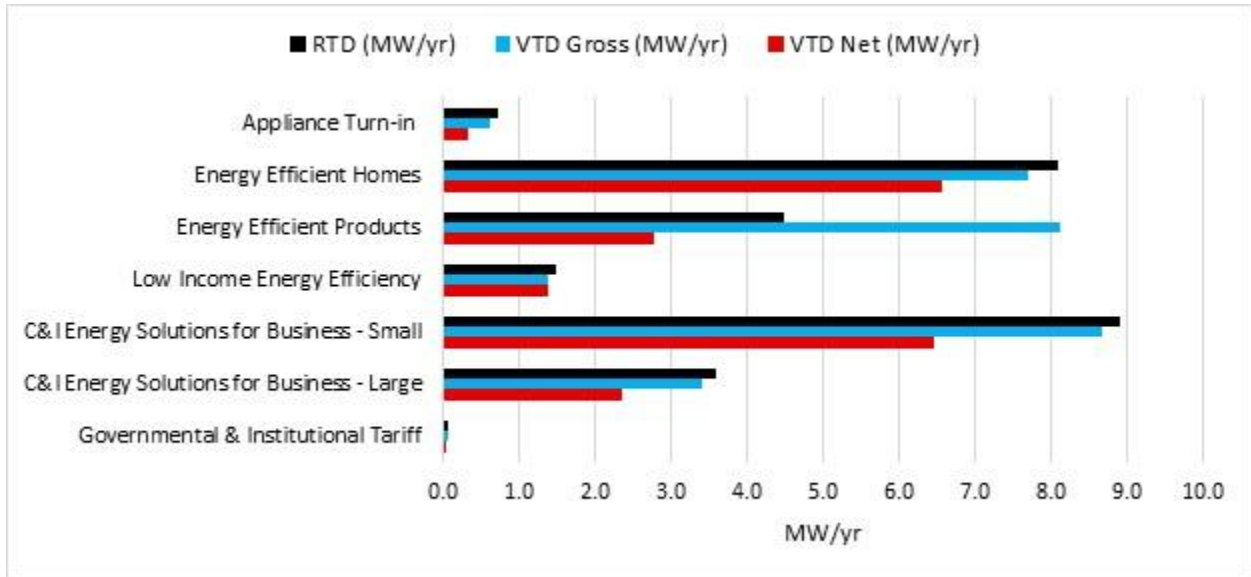
**Figure 25: P3TD Demand Savings by Energy Efficiency Program for Met-Ed**



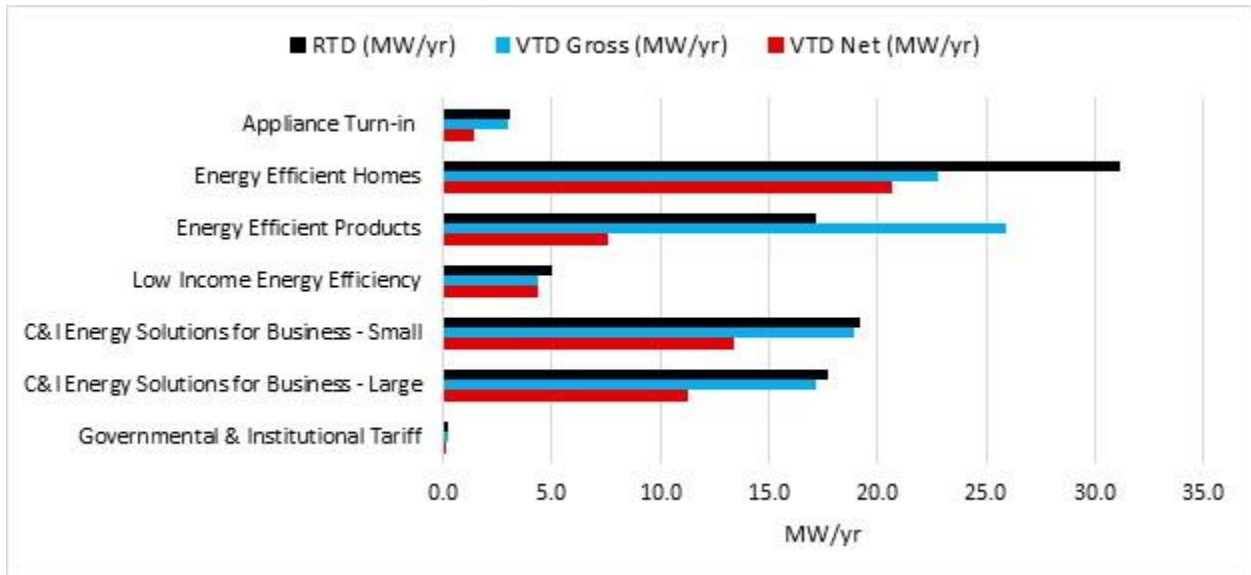
**Figure 26: P3TD Demand Savings by Energy Efficiency Program for Penelec**



**Figure 27: P3TD Demand Savings by Energy Efficiency Program for Penn Power**



**Figure 28: P3TD Demand Savings by Energy Efficiency Program for WPP**



Summaries of the peak demand impacts by energy efficiency program through the current reporting period are presented in Table 26, Table 27, Table 28, and Table 29 for Met-Ed, Penelec, Penn Power, and WPP respectively.

**Table 26: 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)
Appliance Turn-in	0.42	0.39	0.18	2.86	2.72	1.28
Energy Efficient Homes	4.49	3.08	2.88	31.45	28.47	25.74
Energy Efficient Products	1.97	2.56	0.95	13.69	21.72	7.64
Low Income Energy Efficiency	0.49	0.42	0.42	4.74	4.92	4.92
C&I Energy Solutions for Business - Small	2.35	2.14	1.29	17.09	16.52	10.36
C&I Energy Solutions for Business - Large	6.11	5.56	3.36	25.55	24.49	14.40
Governmental & Institutional Tariff	0.00	0.00	0.00	0.04	0.03	0.02
<b>Portfolio Total</b>	<b>15.84</b>	<b>14.15</b>	<b>9.07</b>	<b>95.41</b>	<b>98.88</b>	<b>64.37</b>

**Table 27: 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)
Appliance Turn-in	0.36	0.32	0.15	2.59	2.38	1.09
Energy Efficient Homes	2.20	1.76	1.72	21.05	19.31	17.52
Energy Efficient Products	1.87	2.27	0.87	13.62	20.74	7.22
Low Income Energy Efficiency	0.36	0.29	0.29	4.46	4.43	4.43
C&I Energy Solutions for Business - Small	2.61	2.75	2.23	18.21	17.49	13.89
C&I Energy Solutions for Business - Large	4.25	4.45	3.62	22.16	20.89	16.74
Governmental & Institutional Tariff	0.00	0.00	0.00	0.07	0.06	0.05
<b>Portfolio Total</b>	<b>11.64</b>	<b>11.83</b>	<b>8.87</b>	<b>82.15</b>	<b>85.31</b>	<b>60.94</b>

**Table 28: 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)
Appliance Turn-in	0.00	0.00	0.00	0.72	0.63	0.33
Energy Efficient Homes	1.24	0.95	0.84	8.08	7.70	6.57
Energy Efficient Products	0.47	0.66	0.26	4.49	8.11	2.78
Low Income Energy Efficiency	0.11	0.09	0.09	1.49	1.39	1.39
C&I Energy Solutions for Business - Small	1.39	1.34	0.99	8.91	8.66	6.46
C&I Energy Solutions for Business - Large	0.28	0.27	0.19	3.58	3.40	2.36
Governmental & Institutional Tariff	0.00	0.00	0.00	0.07	0.07	0.05
<b>Portfolio Total</b>	<b>3.49</b>	<b>3.30</b>	<b>2.37</b>	<b>27.33</b>	<b>29.95</b>	<b>19.95</b>

**Table 29: 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)
Appliance Turn-in	0.38	0.34	0.16	3.07	2.97	1.43
Energy Efficient Homes	5.01	2.86	2.62	31.18	22.82	20.62
Energy Efficient Products	2.58	3.32	1.17	17.14	25.93	7.59
Low Income Energy Efficiency	0.48	0.26	0.26	5.01	4.38	4.38
C&I Energy Solutions for Business - Small	3.50	3.48	2.12	19.15	18.93	13.39
C&I Energy Solutions for Business - Large	5.00	5.00	3.02	17.73	17.13	11.28
Governmental & Institutional Tariff	0.00	0.00	0.00	0.20	0.21	0.17
<b>Portfolio Total</b>	<b>16.95</b>	<b>15.26</b>	<b>9.36</b>	<b>93.49</b>	<b>92.36</b>	<b>58.86</b>

The previously reported VTD demand reductions from prior years have not changed since the prior final annual report was submitted:

### 2.8.2 Demand Response

Act 129 defines peak demand savings from demand response as the average reduction in electric demand during the hours when a demand response event is initiated. Phase III DR events are initiated according to the following guidelines:

- 1) Curtailment events shall be limited to the months of June through September.
- 2) Curtailment events shall be called for the first six days of each program year (starting in PY9) in which the peak hour of PJM’s day-ahead forecast for the PJM RTO is greater than 96% of the PJM RTO summer peak demand forecast for the months of June through September.
- 3) Each curtailment event shall last four hours.
- 4) Each curtailment event shall be called such that it will occur during the day’s forecasted peak hour(s) above 96% of the PJM RTO summer peak demand forecast.
- 5) Once six curtailment events have been called in a program year, the peak demand reduction program shall be suspended for that program year.

The peak demand impacts from demand response in this report are presented at the system level and reflect adjustments to account for transmission and distribution losses. Table 30 lists the line loss multipliers by EDC and by sector. These values are taken from Table 1-4 of the 2016 PA TRM.

**Table 30: 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

Table 31 summarizes the PYVTD and VTD demand reductions for each of the demand response programs in the EE&C plan and for the demand response portfolio as a whole. VTD demand reductions are the average performance across all Phase III demand response events independent of how many events occurred in a given program year. The relative precision columns in Table 31 indicate the margin of error (at the 90% confidence interval) around the PYVTD and VTD demand reductions. It is important to note that the EDCs were not required to obtain peak demand reductions in the first program year of Phase III (PY8) and demand response programs were deemed voluntary by the Commission in PY12 due to the COVID-19 pandemic.

**Table 31: Verified Gross Demand Response Impacts by Program**

EDC	Program	PYVTD Gross MW	Relative Precision	VTD Gross MW	Relative Precision
Met-Ed	Residential Behavioral Demand Response	8.9	22%	6.7	10%
Met-Ed	C&I Demand Response Program – Small	1.8	13%	3.0	6%
Met-Ed	C&I Demand Response Program – Large	35.3	11%	41.4	4%
Penn Power	Residential Behavioral Demand Response	1.5	33%	1.9	10%
Penn Power	C&I Demand Response Program – Small	0.00	0%	0.03	58%
Penn Power	C&I Demand Response Program – Large	10.1	65%	30.1	20%
WPP	Residential Behavioral Demand Response	2.8	33%	2.5	13%
WPP	C&I Demand Response Program – Small	1.2	20%	1.4	14%
WPP	C&I Demand Response Program – Large	87.3	38%	102.7	14%

## 2.9 SUMMARY OF FUEL SWITCHING IMPACTS

Act 129 allows EDCs to achieve electric savings by converting electric equipment to non-electric equipment. Table 32 summarizes for each EDC, key fuel switching metrics to date in Phase III. Combined Heat and Power (CHP) and solar water heating are the only fuel switching measures offered by the Companies in Phase III. There was one rebate approved by Met-Ed for a CHP project in PY12.

**Table 32: Phase III to Date Fuel Switching Summary**

	Met-Ed	Penelec	Penn Power	WPP
Fuel Switching Measures Offered	CHP, Solar Water Heater			
Fuel Switching Measures Implemented in PY12	CHP	None	None	None
Fuel Switching Measures Implemented in Phase III	CHP	CHP	None	CHP
PY12 Energy Savings Achieved via Fuel Switching (MWh/yr)	0	0	0	3,298
PY12 Increased Fossil Fuel Consumption Due to Fuel Switching Measures (MMBTU/yr)	0	0	0	34,098
PY12 Incentive Payments for Fuel Switching Measures (\$1000)	0	0	0	99
VTD Energy Savings Achieved via Fuel Switching (MWh/yr)	10,033	15,024	0	17,301
P3TD Increased Fossil Fuel Consumption Due to Fuel Switching Measures (MMBTU/yr)	51,088	55,178	0	38,877
P3TD Incentive Payments for Fuel Switching Measures (\$1000)	301	575	0	519

## 2.10 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 33, Table 34, Table 35, and Table 36. TRC benefits in these tables were calculated using gross verified impacts. Net present value (NPV) PY12 costs and benefits are expressed in 2020 dollars. Net present value costs and benefits for P3TD financials are expressed in 2016 dollars.



**Table 33: Summary of Program Finances – Met-Ed**

Row #	Cost Category	Gross PYTD (\$1,000)		Gross P3TD (\$1,000)	
1	EDC Incentives to Participants <sup>[1]</sup>	5,093		37,515	
2	EDC Incentives to Trade Allies	0		0	
3	Participant Costs (net of incentives/rebates paid by utilities)	21,645		105,589	
4	Incremental Measure Costs (Just row 3 for Appliance Recycling)	26,573		141,957	
		EDC	CSP	EDC	CSP
5	Design & Development <sup>[2]</sup>	112	123	162	1,744
6	Administration, Management, and Technical Assistance <sup>[3]</sup>	735	996	3,622	10,424
7	Marketing <sup>[4]</sup>	-294	346	147	4,346
8	Program Delivery <sup>[5]</sup>	178	3,772	1,115	23,069
9	EDC Evaluation Costs	761		4,231	
10	SWE Audit Costs	192		1,408	
11	Program Overhead Costs (Sum of rows 5 through 10)	6,922		50,269	
12	NPV of increases in costs of natural gas (or other fuels) for fuel switching programs	0		2,187	
13	Total NPV TRC Costs <sup>[6]</sup> (Net present value of sum of rows 4, 11, and 12)	33,495		171,815	
14	Total NPV Lifetime Electric Energy Benefits	30,918		174,363	
15	Total NPV Lifetime Electric Capacity Benefits	10,063		62,892	
16	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	1,653		20,917	
17	Total NPV Lifetime Non-Electric Benefits (Fossil Fuel, Water)	697		961	
18	Total NPV TRC Benefits <sup>[7]</sup> (Sum of rows 14 through 17)	43,330		259,133	
19	TRC Benefit-Cost Ratio <sup>[8]</sup>	1.29		1.51	

[1] Includes direct install equipment costs and costs for EE&C kits.

[2] Includes direct costs attributable to plan and advance the programs. Note: The design of the HERs program should be included here, while the actual development and mailing of HERs would be attributable to Program Delivery.

[3] Includes rebate processing, tracking system, general administration, program management, general management and legal, and technical assistance. Any common portfolio costs that are allocated across programs should be shown in this row.

[4] Includes the marketing CSP and marketing costs by program CSPs.

[5] Direct program implementation costs. Labor, fuel, and vehicle operation costs for appliance recycling and direct install programs. For behavioral programs, this includes the printing and postage of HERs.

[6] Total TRC Costs includes Total EDC Costs and Participant Costs.

[7] Total TRC Benefits equals the sum of Total Lifetime Electric and Non-Electric Benefits. Benefits include: avoided supply costs, including the reduction in costs of electric energy, generation, transmission, and distribution capacity, and natural gas valued at marginal cost for periods when there is a load reduction. Savings carried over from Phase II are not included as a part of Total TRC Benefits for Phase III.

[8] TRC Ratio equals Total NPV TRC Benefits divided by Total NPV TRC Costs.

\* Rows 1-11 are presented in nominal dollars (PY8 = 2016, PY9 = 2017, PY10 = 2018, PY11 = 2019, PY12 = 2020); P3TD = \$2016

**Table 34: Summary of Program Finances – Penelec**

Row #	Cost Category	Gross PYTD (\$1,000)		Gross P3TD (\$1,000)	
1	EDC Incentives to Participants <sup>[1]</sup>	2,919		33,843	
2	EDC Incentives to Trade Allies	0		0	
3	Participant Costs (net of incentives/rebates paid by utilities)	13,505		112,690	
4	Incremental Measure Costs (Just row 3 for Appliance Recycling)	16,291		145,548	
		EDC	CSP	EDC	CSP
5	Design & Development <sup>[2]</sup>	104	57	151	1,437
6	Administration, Management, and Technical Assistance <sup>[3]</sup>	650	778	3,125	9,495
7	Marketing <sup>[4]</sup>	-281	275	126	3,127
8	Program Delivery <sup>[5]</sup>	196	2,839	1,230	19,749
9	EDC Evaluation Costs	707		3,814	
10	SWE Audit Costs	174		1,276	
11	Program Overhead Costs (Sum of rows 5 through 10)	5,499		43,530	
12	NPV of increases in costs of natural gas (or other fuels) for fuel switching programs	0		2,143	
13	Total NPV TRC Costs <sup>[6]</sup> (Net present value of sum of rows 4, 11, and 12)	21,791		170,012	
14	Total NPV Lifetime Electric Energy Benefits	22,839		164,303	
15	Total NPV Lifetime Electric Capacity Benefits	6,304		45,548	
16	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	1,779		22,204	
17	Total NPV Lifetime Non-Electric Benefits (Fossil Fuel, Water)	-957		-2,280	
18	Total NPV TRC Benefits <sup>[7]</sup> (Sum of rows 14 through 17)	29,964		229,776	
19	TRC Benefit-Cost Ratio <sup>[8]</sup>	1.38		1.35	

[1] Includes direct install equipment costs and costs for EE&C kits.

[2] Includes direct costs attributable to plan and advance the programs. Note: The design of the HERs program should be included here, while the actual development and mailing of HERs would be attributable to Program Delivery.

[3] Includes rebate processing, tracking system, general administration, program management, general management and legal, and technical assistance. Any common portfolio costs that are allocated across programs should be shown in this row.

[4] Includes the marketing CSP and marketing costs by program CSPs.

[5] Direct program implementation costs. Labor, fuel, and vehicle operation costs for appliance recycling and direct install programs. For behavioral programs, this includes the printing and postage of HERs.

[6] Total TRC Costs includes Total EDC Costs and Participant Costs.

[7] Total TRC Benefits equals the sum of Total Lifetime Electric and Non-Electric Benefits. Benefits include: avoided supply costs, including the reduction in costs of electric energy, generation, transmission, and distribution capacity, and natural gas valued at marginal cost for periods when there is a load reduction. Savings carried over from Phase II are not included as a part of Total TRC Benefits for Phase III.

[8] TRC Ratio equals Total NPV TRC Benefits divided by Total NPV TRC Costs.

\* Rows 1-11 are presented in nominal dollars (PY8 = 2016, PY9 = 2017, PY10 = 2018, PY11 = 2019, PY12 = 2020); P3TD = \$2016

**Table 35: Summary of Program Finances – Penn Power**

Row #	Cost Category	Gross PYTD (\$1,000)		Gross P3TD (\$1,000)	
1	EDC Incentives to Participants <sup>[1]</sup>	1,139		12,098	
2	EDC Incentives to Trade Allies	0		0	
3	Participant Costs (net of incentives/rebates paid by utilities)	5,620		36,452	
4	Incremental Measure Costs (Just row 3 for Appliance Recycling)	6,759		48,268	
		EDC	CSP	EDC	CSP
5	Design & Development <sup>[2]</sup>	31	39	45	475
6	Administration, Management, and Technical Assistance <sup>[3]</sup>	255	311	1,223	2,942
7	Marketing <sup>[4]</sup>	-80	145	39	1,123
8	Program Delivery <sup>[5]</sup>	95	887	490	6,634
9	EDC Evaluation Costs	182		1,097	
10	SWE Audit Costs	54		396	
11	Program Overhead Costs (Sum of rows 5 through 10)	1,919		14,464	
12	NPV of increases in costs of natural gas (or other fuels) for fuel switching programs	0		0	
13	Total NPV TRC Costs <sup>[6]</sup> (Net present value of sum of rows 4, 11, and 12)	8,677		55,241	
14	Total NPV Lifetime Electric Energy Benefits	6,472		52,817	
15	Total NPV Lifetime Electric Capacity Benefits	2,236		22,235	
16	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	366		7,161	
17	Total NPV Lifetime Non-Electric Benefits (Fossil Fuel, Water)	551		-632	
18	Total NPV TRC Benefits <sup>[7]</sup> (Sum of rows 14 through 17)	9,625		81,581	
19	TRC Benefit-Cost Ratio <sup>[8]</sup>	1.11		1.48	

[1] Includes direct install equipment costs and costs for EE&C kits.  
 [2] Includes direct costs attributable to plan and advance the programs. Note: The design of the HERs program should be included here, while the actual development and mailing of HERs would be attributable to Program Delivery.  
 [3] Includes rebate processing, tracking system, general administration, program management, general management and legal, and technical assistance. Any common portfolio costs that are allocated across programs should be shown in this row.  
 [4] Includes the marketing CSP and marketing costs by program CSPs.  
 [5] Direct program implementation costs. Labor, fuel, and vehicle operation costs for appliance recycling and direct install programs. For behavioral programs, this includes the printing and postage of HERs.  
 [6] Total TRC Costs includes Total EDC Costs and Participant Costs.  
 [7] Total TRC Benefits equals the sum of Total Lifetime Electric and Non-Electric Benefits. Benefits include: avoided supply costs, including the reduction in costs of electric energy, generation, transmission, and distribution capacity, and natural gas valued at marginal cost for periods when there is a load reduction. Savings carried over from Phase II are not included as a part of Total TRC Benefits for Phase III.  
 [8] TRC Ratio equals Total NPV TRC Benefits divided by Total NPV TRC Costs.  
 \* Rows 1-11 are presented in nominal dollars (PY8 = 2016, PY9 = 2017, PY10 = 2018, PY11 = 2019, PY12 = 2020); P3TD = \$2016

**Table 36: Summary of Program Finances – WPP**

Row #	Cost Category	Gross PYTD (\$1,000)		Gross P3TD (\$1,000)	
1	EDC Incentives to Participants <sup>[1]</sup>	5,249		35,654	
2	EDC Incentives to Trade Allies	0		0	
3	Participant Costs (net of incentives/rebates paid by utilities)	22,880		123,907	
4	Incremental Measure Costs (Just row 3 for Appliance Recycling)	27,977		158,323	
		EDC	CSP	EDC	CSP
5	Design & Development <sup>[2]</sup>	117	162	170	1,934
6	Administration, Management, and Technical Assistance <sup>[3]</sup>	741	1,230	3,948	11,671
7	Marketing <sup>[4]</sup>	-304	691	124	4,985
8	Program Delivery <sup>[5]</sup>	164	4,902	1,137	25,883
9	EDC Evaluation Costs	783		4,294	
10	SWE Audit Costs	180		1,320	
11	Program Overhead Costs (Sum of rows 5 through 10)	8,666		55,467	
12	NPV of increases in costs of natural gas (or other fuels) for fuel switching programs	1,635		1,442	
13	Total NPV TRC Costs <sup>[6]</sup> (Net present value of sum of rows 4, 11, and 12)	38,277		190,546	
14	Total NPV Lifetime Electric Energy Benefits	31,274		162,013	
15	Total NPV Lifetime Electric Capacity Benefits	12,403		67,714	
16	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	2,000		20,126	
17	Total NPV Lifetime Non-Electric Benefits (Fossil Fuel, Water)	1,511		-2,015	
18	Total NPV TRC Benefits <sup>[7]</sup> (Sum of rows 14 through 17)	47,188		247,837	
19	TRC Benefit-Cost Ratio <sup>[8]</sup>	1.23		1.30	

[1] Includes direct install equipment costs and costs for EE&C kits.  
 [2] Includes direct costs attributable to plan and advance the programs. Note: The design of the HERs program should be included here, while the actual development and mailing of HERs would be attributable to Program Delivery.  
 [3] Includes rebate processing, tracking system, general administration, program management, general management and legal, and technical assistance. Any common portfolio costs that are allocated across programs should be shown in this row.  
 [4] Includes the marketing CSP and marketing costs by program CSPs.  
 [5] Direct program implementation costs. Labor, fuel, and vehicle operation costs for appliance recycling and direct install programs. For behavioral programs, this includes the printing and postage of HERs.  
 [6] Total TRC Costs includes Total EDC Costs and Participant Costs.  
 [7] Total TRC Benefits equals the sum of Total Lifetime Electric and Non-Electric Benefits. Benefits include: avoided supply costs, including the reduction in costs of electric energy, generation, transmission, and distribution capacity, and natural gas valued at marginal cost for periods when there is a load reduction. Savings carried over from Phase II are not included as a part of Total TRC Benefits for Phase III.  
 [8] TRC Ratio equals Total NPV TRC Benefits divided by Total NPV TRC Costs.  
 \* Rows 1-11 are presented in nominal dollars (PY8 = 2016, PY9 = 2017, PY10 = 2018, PY11 = 2019, PY12 = 2020); P3TD = \$2016

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. Table 38, Table 39, Table 40, and Table 41 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 PY12, cost and benefits are expressed in 2020 dollars.

The TRCs for residential lighting presented in this report reflect a dual baseline protocol for residential lighting measures consistent with the current TRM. The TRM specifies that *“calculations for bulbs expected to be installed or remain in use past 2020. For these bulbs, [post EISA 2007 baseline wattages] should be used for the savings calculations until 2020, followed by the [post 2020 baseline wattages] for the remainder of the measure life.”* The Companies note that since the TRM was adopted in 2015, there has been uncertainty about enforcement of EISA 2020 standard changes as well as the availability of pre 2020 baseline bulbs in the market. This has resulted in some states not adopting the prospective change in standards in cost effectiveness calculations, resulting in higher lifetime savings and benefits.

If TRCs were to not use the more conservative dual baselines consistent with the current TRM, gross and net TRCs for the Energy Efficient Products program would increase by 64% and 55%, portfolio gross TRCs would increase by 16% and portfolio net TRCs would increase by 7%, as averaged over all four FirstEnergy EDCs. Gross and Net TRCs for the Portfolio with and without dual baseline treatment are presented in the following table:

**Table 37: Portfolio TRC with and without Dual Baseline Calculations**

EDC	Gross		Net	
	Dual Baseline	Without Dual Baseline	Dual Baseline	Without Dual Baseline
Met-Ed	1.29	1.55	1.17	1.28
Penelec	1.38	1.74	1.29	1.43
Penn Power	1.11	1.50	1.03	1.17
WPP	1.23	1.45	1.14	1.21
Average	1.25	1.56	1.16	1.27

The Companies believe that the TRC values for the Demand Response Programs may be overstated due to data sources and calculation methodology associated with cost effectiveness reporting of DR programs for Act 129. There are several reasons for the apparent high TRC values. One reason is that startup costs have been incurred in previous years and are not reflected in PY12. This by itself does not bias TRC results in any way, but TRC measurements in PY12 do not reflect startup costs incurred in the first two years of the Phase.

Using annual capacity prices instead of summer-only capacity prices, assuming 100% of the DR event savings equate to 100% avoided capacity, and including transmission and distribution

avoided costs in the cost effectiveness determination of DR programs for Act 129 are several other reasons for the artificially high TRC values.

As in prior reports, the Companies present rational, alternative cost-effectiveness calculations that yield more realistic TRC ratios.

First, the TRC Order specifies, for Demand Response, that *“All peak demand reduction values would be multiplied by the avoided cost of generation capacity (\$/kW-year for the Annual Product Type) for the delivery year as set by PJM’s Base Residual Auction.”* The Companies note that in 2019, PJM clearing prices are available for multiple Capacity Products: a) Base DR/EE (Summer-Only) Resources; b) Base Generation Resources; and c) Annual Resources. The Summer-Only value is approximately 20% lower than other annual product values and the “most comparable” product to the Summer-Only Act 129 DR Program. The reported TRC for the Companies’ DR programs would be similarly lower if the difference in valuation between year-round and summer-only resources were considered. Note starting delivery period 2020/21, a single Capacity Performance product was implemented eliminating this specific issue.

Second is that in 2017, 2018, 2019, and 2020 Act 129 DR events occurred on three of five critical peak days, as defined by PJM. It is reasonable to prorate DR program benefits by a factor of 3/5, given that the DR program had no impact on two of five PJM critical peak days. This would reduce the average DR TRC by 40%.

Third, Avoided Transmission and Distribution (T&D) prices comprise 30% to 54% of total avoided costs associated with demand response in PY12, depending on customer sector. The Companies have previously recommended, and continue to recommend, the exclusion of all avoided T&D costs from cost effectiveness tests for demand response because the Phase III Act 129 DR Program is solely targeting PJM’s peak load periods for Capacity or Generation and does not provide the necessary benefits needed to avoid costs on the T&D systems. If T&D benefits were to be excluded, the average TRC for Large C&I DR programs offered by the three Companies in PY12 would decrease by 30%, while the TRC for residential and Small C&I customers would decrease by 54%.

The combination of these alternative calculations would reduce TRC by 65% to 77% for Large C&I and residential/Small C&I customers respectively. In addition, there is evidence that larger customers manage loads or peak shave on high load days to reduce peak load share costs in subsequent years. While ADM has not performed an assessment of net-to-gross for the program, this would further reduce TRC. The Companies formally report the higher TRC values following Commission directives for the DR programs but continue to offer these alternative scenarios for consideration.

**Table 38: PY12 Gross TRC Ratios by Program (\$1,000) for Met-Ed<sup>1</sup>**

Program	TRC NPV Benefits	TRC NPV Costs	TRC Ratio	TRC Net Benefits (Benefits – Costs)
Appliance Turn-in	\$977	\$534	1.83	\$443
Energy Efficient Homes	\$4,635	\$2,924	1.59	\$1,711
Energy Efficient Products	\$6,494	\$7,151	0.91	-\$657
Low Income Energy Efficiency	\$527	\$1,921	0.27	-\$1,394
<b>Residential Subtotal</b>	<b>\$12,633</b>	<b>\$12,530</b>	<b>1.01</b>	<b>\$103</b>
C&I Energy Solutions for Business - Small	\$7,771	\$5,763	1.35	\$2,009
C&I Energy Solutions for Business - Large	\$21,111	\$14,215	1.49	\$6,896
Governmental & Institutional Tariff	\$184	\$195	0.94	-\$11
C&I Demand Response Program – Small	\$123	\$63	1.96	\$60
C&I Demand Response Program – Large	\$1,508	\$730	2.07	\$778
<b>Non-Residential Subtotal</b>	<b>\$30,697</b>	<b>\$20,965</b>	<b>1.46</b>	<b>\$9,732</b>
<b>Portfolio Total</b>	<b>\$43,330</b>	<b>\$33,495</b>	<b>1.29</b>	<b>\$9,835</b>

<sup>1</sup> Costs and benefits are expressed as follows: PY8 = 2016, PY9 = 2017, PY10 = 2018, PY11 = 2019, PY12 = 2020

**Table 39: PY12 Gross TRC Ratios by Program (\$1,000) for Penelec**

Program	TRC NPV Benefits	TRC NPV Costs	TRC Ratio	TRC Net Benefits (Benefits – Costs)
Appliance Turn-in	\$740	\$479	1.54	\$260
Energy Efficient Homes	\$1,823	\$993	1.84	\$830
Energy Efficient Products	\$5,743	\$5,370	1.07	\$374
Low Income Energy Efficiency	\$445	\$1,536	0.29	-\$1,091
<b>Residential Subtotal</b>	<b>\$8,751</b>	<b>\$8,379</b>	<b>1.04</b>	<b>\$373</b>
C&I Energy Solutions for Business - Small	\$8,117	\$5,641	1.44	\$2,476
C&I Energy Solutions for Business - Large	\$12,610	\$7,339	1.72	\$5,271
Governmental & Institutional Tariff	\$486	\$433	1.12	\$53
<b>Non-Residential Subtotal</b>	<b>\$21,213</b>	<b>\$13,412</b>	<b>1.58</b>	<b>\$7,801</b>
<b>Portfolio Total</b>	<b>\$29,964</b>	<b>\$21,791</b>	<b>1.38</b>	<b>\$8,173</b>

<sup>1</sup> Costs and benefits are expressed as follows: PY8 = 2016, PY9 = 2017, PY10 = 2018, PY11 = 2019, PY12 = 2020

**Table 40: PY12 Gross TRC Ratios by Program (\$1,000) for Penn Power**

Program	TRC NPV Benefits	TRC NPV Costs	TRC Ratio	TRC Net Benefits (Benefits – Costs)
Appliance Turn-in	\$0	-\$3	0.00	\$3
Energy Efficient Homes	\$1,670	\$1,124	1.49	\$547
Energy Efficient Products	\$1,679	\$1,676	1.00	\$3
Low Income Energy Efficiency	\$73	\$300	0.24	-\$227
<b>Residential Subtotal</b>	<b>\$3,423</b>	<b>\$3,096</b>	<b>1.11</b>	<b>\$327</b>
C&I Energy Solutions for Business - Small	\$4,961	\$4,495	1.10	\$466
C&I Energy Solutions for Business - Large	\$810	\$814	1.00	-\$4
Governmental & Institutional Tariff	\$0	\$18	0.00	-\$18
C&I Demand Response Program – Small	\$0	\$6	0.00	-\$6
C&I Demand Response Program – Large	\$431	\$248	1.74	\$183
<b>Non-Residential Subtotal</b>	<b>\$6,202</b>	<b>\$5,581</b>	<b>1.11</b>	<b>\$621</b>
<b>Portfolio Total</b>	<b>\$9,625</b>	<b>\$8,677</b>	<b>1.11</b>	<b>\$947</b>

<sup>1</sup> Costs and benefits are expressed as follows: PY8 = 2016, PY9 = 2017, PY10 = 2018, PY11 = 2019, PY12 = 2020

**Table 41: PY12 Gross TRC Ratios by Program (\$1,000) for WPP**

Program	TRC NPV Benefits	TRC NPV Costs	TRC Ratio	TRC Net Benefits (Benefits – Costs)
Appliance Turn-in	\$830	\$506	1.64	\$324
Energy Efficient Homes	\$5,500	\$3,130	1.76	\$2,370
Energy Efficient Products	\$7,101	\$8,154	0.87	-\$1,052
Low Income Energy Efficiency	\$435	\$1,535	0.28	-\$1,101
<b>Residential Subtotal</b>	<b>\$13,866</b>	<b>\$13,325</b>	<b>1.04</b>	<b>\$541</b>
C&I Energy Solutions for Business - Small	\$11,526	\$9,863	1.17	\$1,663
C&I Energy Solutions for Business - Large	\$17,984	\$13,287	1.35	\$4,697
Governmental & Institutional Tariff	\$0	\$48	0.00	-\$48
C&I Demand Response Program – Small	\$80	\$54	1.46	\$25
C&I Demand Response Program – Large	\$3,733	\$1,700	2.20	\$2,032
<b>Non-Residential Subtotal</b>	<b>\$33,323</b>	<b>\$24,953</b>	<b>1.34</b>	<b>\$8,370</b>
<b>Portfolio Total</b>	<b>\$47,188</b>	<b>\$38,277</b>	<b>1.23</b>	<b>\$8,911</b>

<sup>1</sup> Costs and benefits are expressed as follows: PY8 = 2016, PY9 = 2017, PY10 = 2018, PY11 = 2019, PY12 = 2020



Table 42, Table 43, Table 44, and Table 45 present PY12 cost-effectiveness for Met-Ed, Penelec, Penn Power, and WPP respectively, using net verified savings to calculate benefits.

**Table 42: PY12 Net TRC Ratios by Program (\$1,000) for Met-Ed**

Program	TRC NPV Benefits	TRC NPV Costs	TRC Ratio	TRC Net Benefits (Benefits – Costs)
Appliance Turn-in	\$440	\$534	0.82	-\$94
Energy Efficient Homes	\$3,823	\$2,647	1.44	\$1,176
Energy Efficient Products	\$2,565	\$3,659	0.70	-\$1,094
Low Income Energy Efficiency	\$527	\$1,921	0.27	-\$1,394
<b>Residential Subtotal</b>	<b>\$7,354</b>	<b>\$8,760</b>	<b>0.84</b>	<b>-\$1,406</b>
C&I Energy Solutions for Business - Small	\$4,676	\$3,890	1.20	\$786
C&I Energy Solutions for Business - Large	\$12,636	\$9,042	1.40	\$3,594
Governmental & Institutional Tariff	\$114	\$136	0.84	-\$22
C&I Demand Response Program – Small	\$123	\$63	1.96	\$60
C&I Demand Response Program – Large	\$1,508	\$730	2.07	\$778
<b>Non-Residential Subtotal</b>	<b>\$19,057</b>	<b>\$13,860</b>	<b>1.37</b>	<b>\$5,197</b>
<b>Portfolio Total</b>	<b>\$26,411</b>	<b>\$22,620</b>	<b>1.17</b>	<b>\$3,791</b>

<sup>1</sup> Costs and benefits are expressed as follows: PY8 = 2016, PY9 = 2017, PY10 = 2018, PY11 = 2019, PY12 = 2020

**Table 43: PY12 Net TRC Ratios by Program (\$1,000) for Penelec**

Program	TRC NPV Benefits	TRC NPV Costs	TRC Ratio	TRC Net Benefits (Benefits – Costs)
Appliance Turn-in	\$348	\$479	0.73	-\$132
Energy Efficient Homes	\$1,698	\$946	1.80	\$752
Energy Efficient Products	\$2,345	\$2,901	0.81	-\$556
Low Income Energy Efficiency	\$445	\$1,536	0.29	-\$1,091
<b>Residential Subtotal</b>	<b>\$4,835</b>	<b>\$5,862</b>	<b>0.82</b>	<b>-\$1,027</b>
C&I Energy Solutions for Business - Small	\$6,563	\$4,793	1.37	\$1,770
C&I Energy Solutions for Business - Large	\$10,253	\$6,128	1.67	\$4,125
Governmental & Institutional Tariff	\$396	\$364	1.09	\$31
<b>Non-Residential Subtotal</b>	<b>\$17,212</b>	<b>\$11,285</b>	<b>1.53</b>	<b>\$5,927</b>
<b>Portfolio Total</b>	<b>\$22,048</b>	<b>\$17,147</b>	<b>1.29</b>	<b>\$4,900</b>

<sup>1</sup> Costs and benefits are expressed as follows: PY8 = 2016, PY9 = 2017, PY10 = 2018, PY11 = 2019, PY12 = 2020

**Table 44: PY12 Net TRC Ratios by Program (\$1,000) for Penn Power**

Program	TRC NPV Benefits	TRC NPV Costs	TRC Ratio	TRC Net Benefits (Benefits – Costs)
Appliance Turn-in	\$0	-\$3	0.00	\$3
Energy Efficient Homes	\$1,313	\$988	1.33	\$325
Energy Efficient Products	\$718	\$926	0.78	-\$208
Low Income Energy Efficiency	\$73	\$300	0.24	-\$227
<b>Residential Subtotal</b>	<b>\$2,104</b>	<b>\$2,211</b>	<b>0.95</b>	<b>-\$107</b>
C&I Energy Solutions for Business - Small	\$3,651	\$3,431	1.06	\$221
C&I Energy Solutions for Business - Large	\$609	\$664	0.92	-\$55
Governmental & Institutional Tariff	\$0	\$18	0.00	-\$18
C&I Demand Response Program – Small	\$0	\$6	0.00	-\$6
C&I Demand Response Program – Large	\$431	\$248	1.74	\$183
<b>Non-Residential Subtotal</b>	<b>\$4,692</b>	<b>\$4,367</b>	<b>1.07</b>	<b>\$325</b>
<b>Portfolio Total</b>	<b>\$6,796</b>	<b>\$6,577</b>	<b>1.03</b>	<b>\$218</b>

<sup>1</sup> Costs and benefits are expressed as follows: PY8 = 2016, PY9 = 2017, PY10 = 2018, PY11 = 2019, PY12 = 2020

**Table 45: PY12 Net TRC Ratios by Program (\$1,000) for WPP**

Program	TRC NPV Benefits	TRC NPV Costs	TRC Ratio	TRC Net Benefits (Benefits – Costs)
Appliance Turn-in	\$398	\$506	0.79	-\$108
Energy Efficient Homes	\$4,663	\$2,773	1.68	\$1,890
Energy Efficient Products	\$2,718	\$4,299	0.63	-\$1,582
Low Income Energy Efficiency	\$435	\$1,535	0.28	-\$1,101
<b>Residential Subtotal</b>	<b>\$8,213</b>	<b>\$9,113</b>	<b>0.90</b>	<b>-\$900</b>
C&I Energy Solutions for Business - Small	\$7,116	\$7,094	1.00	\$22
C&I Energy Solutions for Business - Large	\$10,738	\$8,278	1.30	\$2,460
Governmental & Institutional Tariff	\$0	\$48	0.00	-\$48
C&I Demand Response Program – Small	\$80	\$54	1.46	\$25
C&I Demand Response Program – Large	\$3,733	\$1,700	2.20	\$2,032
<b>Non-Residential Subtotal</b>	<b>\$21,666</b>	<b>\$17,173</b>	<b>1.26</b>	<b>\$4,493</b>
<b>Portfolio Total</b>	<b>\$29,879</b>	<b>\$26,287</b>	<b>1.14</b>	<b>\$3,593</b>

<sup>1</sup> Costs and benefits are expressed as follows: PY8 = 2016, PY9 = 2017, PY10 = 2018, PY11 = 2019, PY12 = 2020

Table 46, Table 47, Table 48, and Table 49 summarize cost-effectiveness by program respectively for Met-Ed, Penelec, Penn Power, and WPP for Phase III of Act 129. P3TD costs and benefits are expressed in 2016 dollars regardless of program or reporting year.

**Table 46: P3TD Gross TRC Ratios by Program (\$1,000) for Met-Ed**

Program	TRC NPV Benefits	TRC NPV Costs	TRC Ratio	TRC Net Benefits (Benefits – Costs)
Appliance Turn-in	\$6,019	\$3,004	2.00	\$3,015
Energy Efficient Homes	\$50,638	\$29,817	1.70	\$20,821
Energy Efficient Products	\$57,017	\$37,423	1.52	\$19,594
Low Income Energy Efficiency	\$9,891	\$12,838	0.77	-\$2,947
<b>Residential Subtotal</b>	<b>\$123,565</b>	<b>\$83,082</b>	<b>1.49</b>	<b>\$40,483</b>
C&I Energy Solutions for Business - Small	\$47,674	\$28,871	1.65	\$18,803
C&I Energy Solutions for Business - Large	\$77,353	\$54,660	1.42	\$22,693
Governmental & Institutional Tariff	\$829	\$796	1.04	\$33
C&I Demand Response Program – Small	\$820	\$340	2.41	\$481
C&I Demand Response Program – Large	\$8,893	\$4,066	2.19	\$4,826
<b>Non-Residential Subtotal</b>	<b>\$135,568</b>	<b>\$88,733</b>	<b>1.53</b>	<b>\$46,836</b>
<b>Portfolio Total</b>	<b>\$259,133</b>	<b>\$171,815</b>	<b>1.51</b>	<b>\$87,319</b>
<sup>1</sup> Costs and benefits are expressed as follows: PY8 = 2016, PY9 = 2017, PY10 = 2018, PY11 = 2019, PY12 = 2020				

**Table 47: P3TD Gross TRC Ratios by Program (\$1,000) for Penelec**

Program	TRC NPV Benefits	TRC NPV Costs	TRC Ratio	TRC Net Benefits (Benefits – Costs)
Appliance Turn-in	\$5,057	\$2,800	1.81	\$2,257
Energy Efficient Homes	\$41,774	\$23,812	1.75	\$17,962
Energy Efficient Products	\$56,930	\$31,885	1.79	\$25,044
Low Income Energy Efficiency	\$10,348	\$12,629	0.82	-\$2,281
<b>Residential Subtotal</b>	<b>\$114,109</b>	<b>\$71,127</b>	<b>1.60</b>	<b>\$42,982</b>
C&I Energy Solutions for Business - Small	\$48,027	\$40,376	1.19	\$7,651
C&I Energy Solutions for Business - Large	\$66,198	\$56,764	1.17	\$9,435
Governmental & Institutional Tariff	\$1,442	\$1,746	0.83	-\$304
<b>Non-Residential Subtotal</b>	<b>\$115,667</b>	<b>\$98,886</b>	<b>1.17</b>	<b>\$16,782</b>
<b>Portfolio Total</b>	<b>\$229,776</b>	<b>\$170,012</b>	<b>1.35</b>	<b>\$59,764</b>
<sup>1</sup> Costs and benefits are expressed as follows: PY8 = 2016, PY9 = 2017, PY10 = 2018, PY11 = 2019, PY12 = 2020				

**Table 48: P3TD Gross TRC Ratios by Program (\$1,000) for Penn Power**

Program	TRC NPV Benefits	TRC NPV Costs	TRC Ratio	TRC Net Benefits (Benefits – Costs)
Appliance Turn-in	\$1,392	\$837	1.66	\$556
Energy Efficient Homes	\$14,310	\$9,967	1.44	\$4,343
Energy Efficient Products	\$19,495	\$10,546	1.85	\$8,949
Low Income Energy Efficiency	\$2,925	\$3,677	0.80	-\$752
<b>Residential Subtotal</b>	<b>\$38,122</b>	<b>\$25,027</b>	<b>1.52</b>	<b>\$13,096</b>
C&I Energy Solutions for Business - Small	\$24,441	\$18,246	1.34	\$6,195
C&I Energy Solutions for Business - Large	\$11,613	\$9,757	1.19	\$1,856
Governmental & Institutional Tariff	\$704	\$505	1.39	\$199
C&I Demand Response Program – Small	\$15	\$39	0.38	-\$24
C&I Demand Response Program – Large	\$6,686	\$1,668	4.01	\$5,018
<b>Non-Residential Subtotal</b>	<b>\$43,459</b>	<b>\$30,215</b>	<b>1.44</b>	<b>\$13,244</b>
<b>Portfolio Total</b>	<b>\$81,581</b>	<b>\$55,241</b>	<b>1.48</b>	<b>\$26,340</b>

<sup>1</sup> Costs and benefits are expressed as follows: PY8 = 2016, PY9 = 2017, PY10 = 2018, PY11 = 2019, PY12 = 2020

**Table 49: P3TD Gross TRC Ratios by Program (\$1,000) for WPP**

Program	TRC NPV Benefits	TRC NPV Costs	TRC Ratio	TRC Net Benefits (Benefits – Costs)
Appliance Turn-in	\$6,389	\$3,247	1.97	\$3,141
Energy Efficient Homes	\$36,782	\$25,902	1.42	\$10,880
Energy Efficient Products	\$59,173	\$40,569	1.46	\$18,604
Low Income Energy Efficiency	\$8,880	\$13,613	0.65	-\$4,733
<b>Residential Subtotal</b>	<b>\$111,223</b>	<b>\$83,331</b>	<b>1.33</b>	<b>\$27,892</b>
C&I Energy Solutions for Business - Small	\$53,452	\$47,993	1.11	\$5,459
C&I Energy Solutions for Business - Large	\$55,054	\$44,426	1.24	\$10,628
Governmental & Institutional Tariff	\$6,948	\$8,056	0.86	-\$1,108
C&I Demand Response Program – Small	\$424	\$217	1.95	\$207
C&I Demand Response Program – Large	\$20,736	\$6,522	3.18	\$14,214
<b>Non-Residential Subtotal</b>	<b>\$136,614</b>	<b>\$107,215</b>	<b>1.27</b>	<b>\$29,400</b>
<b>Portfolio Total</b>	<b>\$247,837</b>	<b>\$190,546</b>	<b>1.30</b>	<b>\$57,292</b>

<sup>1</sup> Costs and benefits are expressed as follows: PY8 = 2016, PY9 = 2017, PY10 = 2018, PY11 = 2019, PY12 = 2020

Table 50, Table 51, Table 52, and Table 53 present P3TD 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 2016 dollars.

**Table 50: P3TD Net TRC Ratios by Program (\$1,000) for Met-Ed**

Program	TRC NPV Benefits	TRC NPV Costs	TRC Ratio	TRC Net Benefits (Benefits – Costs)
Appliance Turn-in	\$2,840	\$3,004	0.95	-\$164
Energy Efficient Homes	\$41,846	\$28,086	1.49	\$13,760
Energy Efficient Products	\$20,389	\$17,918	1.14	\$2,471
Low Income Energy Efficiency	\$9,891	\$12,838	0.77	-\$2,947
<b>Residential Subtotal</b>	<b>\$74,966</b>	<b>\$61,846</b>	<b>1.21</b>	<b>\$13,120</b>
C&I Energy Solutions for Business - Small	\$29,800	\$19,810	1.50	\$9,990
C&I Energy Solutions for Business - Large	\$45,915	\$34,359	1.34	\$11,556
Governmental & Institutional Tariff	\$528	\$589	0.90	-\$61
C&I Demand Response Program – Small	\$820	\$340	2.41	\$481
C&I Demand Response Program – Large	\$8,893	\$4,066	2.19	\$4,826
<b>Non-Residential Subtotal</b>	<b>\$85,955</b>	<b>\$59,164</b>	<b>1.45</b>	<b>\$26,792</b>
<b>Portfolio Total</b>	<b>\$160,921</b>	<b>\$121,010</b>	<b>1.33</b>	<b>\$39,911</b>

<sup>1</sup> Costs and benefits are expressed as follows: PY8 = 2016, PY9 = 2017, PY10 = 2018, PY11 = 2019, PY12 = 2020

**Table 51: P3TD Net TRC Ratios by Program (\$1,000) for Penelec**

Program	TRC NPV Benefits	TRC NPV Costs	TRC Ratio	TRC Net Benefits (Benefits – Costs)
Appliance Turn-in	\$2,306	\$2,800	0.82	-\$494
Energy Efficient Homes	\$35,542	\$23,378	1.52	\$12,163
Energy Efficient Products	\$19,932	\$15,666	1.27	\$4,266
Low Income Energy Efficiency	\$10,348	\$12,629	0.82	-\$2,281
<b>Residential Subtotal</b>	<b>\$68,127</b>	<b>\$54,474</b>	<b>1.25</b>	<b>\$13,653</b>
C&I Energy Solutions for Business - Small	\$37,888	\$32,979	1.15	\$4,910
C&I Energy Solutions for Business - Large	\$52,799	\$43,896	1.20	\$8,902
Governmental & Institutional Tariff	\$1,166	\$1,491	0.78	-\$326
<b>Non-Residential Subtotal</b>	<b>\$91,853</b>	<b>\$78,366</b>	<b>1.17</b>	<b>\$13,486</b>
<b>Portfolio Total</b>	<b>\$159,980</b>	<b>\$132,840</b>	<b>1.20</b>	<b>\$27,140</b>

<sup>1</sup> Costs and benefits are expressed as follows: PY8 = 2016, PY9 = 2017, PY10 = 2018, PY11 = 2019, PY12 = 2020

**Table 52: P3TD Net TRC Ratios by Program (\$1,000) for Penn Power**

Program	TRC NPV Benefits	TRC NPV Costs	TRC Ratio	TRC Net Benefits (Benefits – Costs)
Appliance Turn-in	\$735	\$837	0.88	-\$101
Energy Efficient Homes	\$11,358	\$8,889	1.28	\$2,470
Energy Efficient Products	\$6,789	\$5,011	1.35	\$1,779
Low Income Energy Efficiency	\$2,925	\$3,677	0.80	-\$752
<b>Residential Subtotal</b>	<b>\$21,808</b>	<b>\$18,414</b>	<b>1.18</b>	<b>\$3,394</b>
C&I Energy Solutions for Business - Small	\$18,161	\$13,928	1.30	\$4,233
C&I Energy Solutions for Business - Large	\$7,967	\$6,939	1.15	\$1,028
Governmental & Institutional Tariff	\$529	\$412	1.28	\$117
C&I Demand Response Program – Small	\$15	\$39	0.38	-\$24
C&I Demand Response Program – Large	\$6,686	\$1,668	4.01	\$5,018
<b>Non-Residential Subtotal</b>	<b>\$33,359</b>	<b>\$22,986</b>	<b>1.45</b>	<b>\$10,372</b>
<b>Portfolio Total</b>	<b>\$55,167</b>	<b>\$41,400</b>	<b>1.33</b>	<b>\$13,767</b>

<sup>1</sup> Costs and benefits are expressed as follows: PY8 = 2016, PY9 = 2017, PY10 = 2018, PY11 = 2019, PY12 = 2020

**Table 53: P3TD Net TRC Ratios by Program (\$1,000) for WPP**

Program	TRC NPV Benefits	TRC NPV Costs	TRC Ratio	TRC Net Benefits (Benefits – Costs)
Appliance Turn-in	\$3,073	\$3,247	0.95	-\$174
Energy Efficient Homes	\$30,824	\$23,896	1.29	\$6,927
Energy Efficient Products	\$17,554	\$19,022	0.92	-\$1,468
Low Income Energy Efficiency	\$8,880	\$13,613	0.65	-\$4,733
<b>Residential Subtotal</b>	<b>\$60,331</b>	<b>\$59,778</b>	<b>1.01</b>	<b>\$552</b>
C&I Energy Solutions for Business - Small	\$37,980	\$36,645	1.04	\$1,335
C&I Energy Solutions for Business - Large	\$35,187	\$30,274	1.16	\$4,913
Governmental & Institutional Tariff	\$5,521	\$6,618	0.83	-\$1,097
C&I Demand Response Program – Small	\$424	\$217	1.95	\$207
C&I Demand Response Program – Large	\$20,736	\$6,522	3.18	\$14,214
<b>Non-Residential Subtotal</b>	<b>\$99,849</b>	<b>\$80,277</b>	<b>1.24</b>	<b>\$19,572</b>
<b>Portfolio Total</b>	<b>\$160,180</b>	<b>\$140,056</b>	<b>1.14</b>	<b>\$20,124</b>

<sup>1</sup> Costs and benefits are expressed as follows: PY8 = 2016, PY9 = 2017, PY10 = 2018, PY11 = 2019, PY12 = 2020

## 2.11 COMPARISON OF PERFORMANCE TO APPROVED EE&C PLAN

Table 54, Table 55, Table 56, and Table 57 present PY12 expenditures, by program, compared to the budget estimates set forth in the EE&C plan for PY12 for Met-Ed, Penelec, Penn Power, and WPP. All the dollars in these tables are presented in 2019 dollars

**Table 54: Comparison of PYTD Expenditures to EE&C Plan (\$1,000) Met-Ed**

Program	PY12 Budget from EE&C Plan	PY12 Actual Expenditures	Ratio (Actual/Plan)
Appliance Turn In Program	\$ 1,159.21	\$ 699.33	0.60
Energy Efficient Homes Program	\$ 3,166.61	\$ 1,858.00	0.59
Energy Efficient Products Program	\$ 3,262.16	\$ 1,826.23	0.56
Low Income Energy Efficiency Program	\$ 3,048.91	\$ 1,902.13	0.62
C&I Energy Solutions for Business Program - Small	\$ 4,449.41	\$ 1,825.05	0.41
C&I Demand Response Program - Small	\$ 206.13	\$ 78.92	0.38
C&I Energy Solutions for Business Program - Large	\$ 4,177.97	\$ 2,860.18	0.68
C&I Demand Response Program - Large	\$ 1,849.01	\$ 903.90	0.49
Governmental & Institutional Tariff Program	\$ 353.68	\$ 61.32	0.17
<b>Total</b>	<b>\$ 21,673.09</b>	<b>\$ 12,015.07</b>	<b>0.55</b>

**Table 55: Comparison of PYTD Expenditures to EE&C Plan (\$1,000) Penelec**

Program	PY12 Budget from EE&C Plan	PY12 Actual Expenditures	Ratio (Actual/Plan)
Appliance Turn In Program	\$ 1,217.01	\$ 612.57	0.50
Energy Efficient Homes Program	\$ 2,670.48	\$ 786.65	0.29
Energy Efficient Products Program	\$ 2,924.00	\$ 1,453.94	0.50
Low Income Energy Efficiency Program	\$ 3,466.68	\$ 1,520.24	0.44
C&I Energy Solutions for Business Program - Small	\$ 4,777.14	\$ 2,109.01	0.44
C&I Energy Solutions for Business Program - Large	\$ 3,693.84	\$ 1,796.89	0.49
Governmental & Institutional Tariff Program	\$ 576.75	\$ 139.47	0.24
<b>Total</b>	<b>\$ 19,325.90</b>	<b>\$ 8,418.77</b>	<b>0.44</b>

**Table 56: Comparison of PYTD Expenditures to EE&C Plan (\$1,000) Penn Power**

Program	PY12 Budget from EE&C Plan	PY12 Actual Expenditures	Ratio (Actual/Plan)
Appliance Turn In Program	\$ 279.49	\$ (3.23)	(0.01)
Energy Efficient Homes Program	\$ 1,074.18	\$ 617.41	0.57
Energy Efficient Products Program	\$ 736.19	\$ 449.15	0.61
Low Income Energy Efficiency Program	\$ 1,068.10	\$ 294.83	0.28
C&I Energy Solutions for Business Program - Small	\$ 1,178.28	\$ 1,123.39	0.95
C&I Demand Response Program - Small	\$ 70.82	\$ 6.18	0.09
C&I Energy Solutions for Business Program - Large	\$ 836.66	\$ 292.48	0.35
C&I Demand Response Program - Large	\$ 634.86	\$ 259.12	0.41
Governmental & Institutional Tariff Program	\$ 122.84	\$ 18.26	0.15
<b>Total</b>	<b>\$ 6,001.42</b>	<b>\$ 3,057.58</b>	<b>0.51</b>

**Table 57: Comparison of PYTD Expenditures to EE&C Plan (\$1,000) WPP**

Program	PY12 Budget from EE&C Plan	PY12 Actual Expenditures	Ratio (Actual/Plan)
Appliance Turn In Program	\$ 1,153.42	\$ 658.20	0.57
Energy Efficient Homes Program	\$ 3,273.49	\$ 1,777.25	0.54
Energy Efficient Products Program	\$ 3,141.76	\$ 2,110.04	0.67
Low Income Energy Efficiency Program	\$ 3,289.78	\$ 1,521.51	0.46
C&I Energy Solutions for Business Program - Small	\$ 4,768.75	\$ 3,620.35	0.76
C&I Demand Response Program - Small	\$ 260.57	\$ 59.46	0.23
C&I Energy Solutions for Business Program - Large	\$ 3,345.58	\$ 2,204.53	0.66
C&I Demand Response Program - Large	\$ 2,345.11	\$ 1,915.55	0.82
Governmental & Institutional Tariff Program	\$ 487.21	\$ 47.80	0.10
<b>Total</b>	<b>\$ 22,065.66</b>	<b>\$ 13,914.70</b>	<b>0.63</b>

Table 58, Table 59, Table 60, and Table 61 present P3TD expenditures, by program, compared to the budget estimates set forth in the EE&C plan through PY12 for Met-Ed, Penelec, Penn Power, and WPP respectively. All the dollars in these tables are presented in 2016 dollars. As the Companies' anticipated, the acquisition costs increased through the end of Phase III as participation among higher cost programs and measures increased to offset the reduction in residential lighting that occurred in PY12.

**Table 58: Comparison of P3TD Expenditures to EE&C Plan (\$1,000) Met-Ed**

Program	Phase III Budget from EE&C Plan through PY12	P3TD Actual Expenditures	Ratio (Actual/Plan)
Appliance Turn In Program	\$ 5,077.21	\$ 3,740.49	0.74
Energy Efficient Homes Program	\$ 26,065.58	\$ 20,775.33	0.80
Energy Efficient Products Program	\$ 19,019.83	\$ 10,911.67	0.57
Low Income Energy Efficiency Program	\$ 16,018.53	\$ 10,855.20	0.68
C&I Energy Solutions for Business Program - Small	\$ 18,705.24	\$ 9,459.64	0.51
C&I Demand Response Program - Small	\$ 737.32	\$ 328.63	0.45
C&I Energy Solutions for Business Program - Large	\$ 16,179.79	\$ 12,607.54	0.78
C&I Demand Response Program - Large	\$ 6,616.15	\$ 4,618.42	0.70
Governmental & Institutional Tariff Program	\$ 1,394.99	\$ 307.19	0.22
<b>Total</b>	<b>\$ 109,814.65</b>	<b>\$ 73,604.11</b>	<b>0.67</b>



**Table 59: Comparison of P3TD Expenditures to EE&C Plan (\$1,000) Penelec**

Program	Phase III Budget from EE&C Plan through PY12	P3TD Actual Expenditures	Ratio (Actual/Plan)
Appliance Turn In Program	\$ 5,282.14	\$ 3,415.42	0.65
Energy Efficient Homes Program	\$ 24,013.22	\$ 17,088.95	0.71
Energy Efficient Products Program	\$ 17,902.05	\$ 9,932.06	0.55
Low Income Energy Efficiency Program	\$ 17,716.66	\$ 10,836.33	0.61
C&I Energy Solutions for Business Program - Small	\$ 19,669.70	\$ 10,981.56	0.56
C&I Energy Solutions for Business Program - Large	\$ 14,520.53	\$ 10,989.20	0.76
Governmental & Institutional Tariff Program	\$ 2,326.03	\$ 626.80	0.27
<b>Total</b>	<b>\$ 101,430.32</b>	<b>\$ 63,870.31</b>	<b>0.63</b>

**Table 60: Comparison of P3TD Expenditures to EE&C Plan (\$1,000) Penn Power**

Program	Phase III Budget from EE&C Plan through PY12	P3TD Actual Expenditures	Ratio (Actual/Plan)
Appliance Turn In Program	\$ 1,216.71	\$ 928.29	0.76
Energy Efficient Homes Program	\$ 7,269.51	\$ 5,464.85	0.75
Energy Efficient Products Program	\$ 4,063.23	\$ 3,104.01	0.76
Low Income Energy Efficiency Program	\$ 5,389.99	\$ 3,201.02	0.59
C&I Energy Solutions for Business Program - Small	\$ 5,090.17	\$ 5,000.66	0.98
C&I Demand Response Program - Small	\$ 249.53	\$ 39.08	0.16
C&I Energy Solutions for Business Program - Large	\$ 3,285.66	\$ 2,143.75	0.65
C&I Demand Response Program - Large	\$ 2,237.80	\$ 1,603.49	0.72
Governmental & Institutional Tariff Program	\$ 510.01	\$ 244.03	0.48
<b>Total</b>	<b>\$ 29,312.62</b>	<b>\$ 21,729.17</b>	<b>0.74</b>

**Table 61: Comparison of P3TD Expenditures to EE&C Plan (\$1,000) WPP**

Program	Phase III Budget from EE&C Plan through PY12	P3TD Actual Expenditures	Ratio (Actual/Plan)
Appliance Turn In Program	\$ 5,053.99	\$ 4,010.75	0.79
Energy Efficient Homes Program	\$ 20,145.58	\$ 17,102.04	0.85
Energy Efficient Products Program	\$ 17,755.00	\$ 12,554.55	0.71
Low Income Energy Efficiency Program	\$ 16,890.87	\$ 13,556.72	0.80
C&I Energy Solutions for Business Program - Small	\$ 19,228.24	\$ 13,482.62	0.70
C&I Demand Response Program - Small	\$ 928.57	\$ 220.24	0.24
C&I Energy Solutions for Business Program - Large	\$ 13,463.61	\$ 9,691.91	0.72
C&I Demand Response Program - Large	\$ 8,357.11	\$ 6,430.34	0.77
Governmental & Institutional Tariff Program	\$ 1,899.93	\$ 1,394.19	0.73
<b>Total</b>	<b>\$ 103,722.91</b>	<b>\$ 78,443.37</b>	<b>0.76</b>

Table 62, Table 63, Table 64, and Table 65 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 62: Comparison of PYTD Actual Program Savings to EE&C Plan Projections for Met-Ed**

Program	EE&C Plan Projections for PY12	PY12 VTD Gross MWh Savings	Ratio (Actual/Plan)
Appliance Turn In Program	6,129	2,877	0.47
Energy Efficient Homes Program	18,422	21,991	1.19
Energy Efficient Products Program	5,691	17,784	3.12
Low Income Energy Efficiency Program	4,748	3,688	0.78
C&I Energy Solutions for Business Program - Small	28,025	14,952	0.53
C&I Demand Response Program - Small	0	0	n/a
C&I Energy Solutions for Business Program - Large	36,654	41,186	1.12
C&I Demand Response Program - Large	0	0	n/a
Governmental & Institutional Tariff Program	1,208	478	0.40
<b>Total</b>	<b>100,877</b>	<b>102,958</b>	<b>1.02</b>

**Table 63: Comparison of PYTD Actual Program Savings to EE&C Plan Projections for Penelec**

Program	EE&C Plan Projections for PY12	PY12 VTD Gross MWh Savings	Ratio (Actual/Plan)
Appliance Turn In Program	6,925	2,295	0.33
Energy Efficient Homes Program	11,487	14,653	1.28
Energy Efficient Products Program	4,711	18,128	3.85
Low Income Energy Efficiency Program	4,267	2,520	0.59
C&I Energy Solutions for Business Program - Small	29,039	16,490	0.57
C&I Energy Solutions for Business Program - Large	31,627	26,142	0.83
Governmental & Institutional Tariff Program	1,566	1,396	0.89
<b>Total</b>	<b>89,621</b>	<b>81,623</b>	<b>0.91</b>

**Table 64: Comparison of PYTD Actual Program Savings to EE&C Plan Projections for Penn Power**

Program	EE&C Plan Projections for PY12	PY12 VTD Gross MWh Savings	Ratio (Actual/Plan)
Appliance Turn In Program	1,645	0	0.00
Energy Efficient Homes Program	4,907	5,509	1.12
Energy Efficient Products Program	1,290	4,618	3.58
Low Income Energy Efficiency Program	1,202	755	0.63
C&I Energy Solutions for Business Program - Small	8,074	10,925	1.35
C&I Demand Response Program - Small	0	0	n/a
C&I Energy Solutions for Business Program - Large	7,417	1,792	0.24
C&I Demand Response Program - Large	0	0	n/a
Governmental & Institutional Tariff Program	472	0	0.00
<b>Total</b>	<b>25,006</b>	<b>23,599</b>	<b>0.94</b>

**Table 65: Comparison of PYTD Actual Program Savings to EE&C Plan Projections for WPP**

Program	EE&C Plan Projections for PY12	PY12 VTD Gross MWh Savings	Ratio (Actual/Plan)
Appliance Turn In Program	6,671	2,581	0.39
Energy Efficient Homes Program	22,291	19,734	0.89
Energy Efficient Products Program	4,817	21,173	4.40
Low Income Energy Efficiency Program	4,234	2,405	0.57
C&I Energy Solutions for Business Program - Small	29,103	22,885	0.79
C&I Demand Response Program - Small	0	0	n/a
C&I Energy Solutions for Business Program - Large	27,604	36,212	1.31
C&I Demand Response Program - Large	0	0	n/a
Governmental & Institutional Tariff Program	1,490	1	0.00
<b>Total</b>	<b>96,209</b>	<b>104,990</b>	<b>1.09</b>

Table 66, Table 67, Table 68, and Table 69 compare Phase III 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 66: Comparison of Phase III Actual Program Savings to EE&C Plan Projections for Phase III for Met-Ed**

Program	EE&C Plan through PY12	VTD Gross MWh Savings	Ratio (Actual/Plan)
Appliance Turn In Program	30,647	19,786	0.65
Energy Efficient Homes Program	157,301	231,070	1.47
Energy Efficient Products Program	97,527	159,814	1.64
Low Income Energy Efficiency Program	35,484	42,563	1.20
C&I Energy Solutions for Business Program - Small	133,409	110,788	0.83
C&I Demand Response Program - Small	0	0	n/a
C&I Energy Solutions for Business Program - Large	162,309	180,135	1.11
C&I Demand Response Program - Large	0	0	n/a
Governmental & Institutional Tariff Program	5,451	2,498	0.46
<b>Total</b>	<b>622,126</b>	<b>746,655</b>	<b>1.20</b>

**Table 67: Comparison of Phase III Actual Program Savings to EE&C Plan Projections for Phase III for Penelec**

Program	EE&C Plan through PY12	VTD Gross MWh Savings	Ratio (Actual/Plan)
Appliance Turn In Program	34,627	17,792	0.51
Energy Efficient Homes Program	130,399	175,945	1.35
Energy Efficient Products Program	101,778	170,517	1.68
Low Income Energy Efficiency Program	33,819	41,250	1.22
C&I Energy Solutions for Business Program - Small	136,489	118,519	0.87
C&I Energy Solutions for Business Program - Large	143,566	167,484	1.17
Governmental & Institutional Tariff Program	7,063	4,687	0.66
<b>Total</b>	<b>587,742</b>	<b>696,193</b>	<b>1.18</b>

**Table 68: Comparison of Phase III Actual Program Savings to EE&C Plan Projections for Phase III for Penn Power**

Program	EE&C Plan through PY12	VTD Gross MWh Savings	Ratio (Actual/Plan)
Appliance Turn In Program	8,226	4,890	0.59
Energy Efficient Homes Program	38,878	52,788	1.36
Energy Efficient Products Program	24,328	60,345	2.48
Low Income Energy Efficiency Program	9,478	11,953	1.26
C&I Energy Solutions for Business Program - Small	40,443	62,185	1.54
C&I Demand Response Program - Small	0	0	n/a
C&I Energy Solutions for Business Program - Large	33,842	29,838	0.88
C&I Demand Response Program - Large	0	0	n/a
Governmental & Institutional Tariff Program	2,327	1,948	0.84
<b>Total</b>	<b>157,522</b>	<b>223,948</b>	<b>1.42</b>

**Table 69: Comparison of Phase III Actual Program Savings to EE&C Plan Projections for Phase III for WPP**

Program	EE&C Plan through PY12	VTD Gross MWh Savings	Ratio (Actual/Plan)
Appliance Turn In Program	33,354	22,769	0.68
Energy Efficient Homes Program	141,955	174,136	1.23
Energy Efficient Products Program	92,633	181,896	1.96
Low Income Energy Efficiency Program	32,097	37,447	1.17
C&I Energy Solutions for Business Program - Small	134,701	133,184	0.99
C&I Demand Response Program - Small	0	0	n/a
C&I Energy Solutions for Business Program - Large	128,147	138,410	1.08
C&I Demand Response Program - Large	0	0	n/a
Governmental & Institutional Tariff Program	6,797	21,624	3.18
<b>Total</b>	<b>569,684</b>	<b>709,466</b>	<b>1.25</b>

Overall, the Companies exceeded their annual MWh targets while staying within budget. Participation levels in the Appliance Turn-In program were lower than planned amounts for all four PA Companies, but this was not a major concern as all Companies demonstrated compliance with Act 129 targets for Phase III.

All other residential programs generally exceeded expectations, while remaining within budget (normalized to MWh). Part of the reason for the apparent over performance of the Energy Efficient Homes and Low-Income Energy Efficiency programs is attributable to the Home Energy Reports (“HER”) program component. On average, HER customers saved 10% to 15% more than the 180 kWh/home that was used in portfolio planning assumptions. This may be due to a number of reasons including increased savings with the duration of messaging and weather-related factors. Energy efficiency kits also constituted a greater proportion of the Energy Efficient Homes program, with approximately ten percent more participation than planned. This tends to increase savings and cost-effectiveness as kits are generally more cost effective than the direct install and new homes program components. The Energy Efficient Products program was buoyed by higher-than-expected participation in the upstream lighting component, and also by cross-sector sales (which are only accounted for in the verified impacts, not in planned or reported impacts).

As the Companies’ anticipated, the acquisition costs increase through the end of Phase III as participation among higher cost programs and measures increased to offset the reduction in residential lighting that occurred in PY12.

The Commercial and Industrial Programs, overall, met or exceeded planned energy savings, while staying on budget. Participation for the small rate-restricted Government and Institutional Tariff Program was highly variable, as expected for such programs. West Penn Power continues to have higher savings than planned and Penn Power is now exceeding the plan savings, but the other two EDCs are short of participation and savings targets.

Costs for the Commercial and Industrial Demand Response Programs were generally comparable to budgeted amounts in the EE&C plan.

## 2.12 FINDINGS AND RECOMMENDATIONS

The impact and process evaluation activities completed by the ADM and Tetra Tech team led to recommendations for program improvement. Table 70 lists the overarching recommendations that affect more than one program, the evaluation activity(ies) that uncovered the finding, and the ADM and Tetra Tech team’s recommendation(s) to the Companies to address the finding. All the overarching recommendations are intended to reduce noncompliance risks for Phase IV. Only the Behavioral Demand Response program underwent process evaluation this year, and the associated recommendations are listed in Section 3.8.6.

**Table 70: Summary of Evaluation Recommendations**

Evaluation Activity	Finding	Recommendation
General Evaluation	While the Phase III programs have performed well, there is lingering uncertainty related to the depth and duration of the COVID-induced economic disruption.	Consider early testing of Phase IV contingency strategies related to compliance with demand reduction targets early in Phase IV.
General Evaluation	The Companies expect to have Carryover Savings for Phase IV due to strong program performance in PY8-PY12.	Consider program and incentive structures that prioritize demand reduction. This could include a per-kW incentive amounts and targeting customers that have favorable peak demand profiles.

### 3 Evaluation Results by Program

This section documents the gross impact, net impact, and process evaluation activities conducted in Phase III along with the outcomes of those activities. Not every program receives an evaluation every year. Planned evaluation activities for Phase III are shown in Figure 29. Activities shown beyond this program year are subject to change, but the table provides the reader with a general idea of the frequency and timing of evaluation activities. In Figure 29 below, the letter “G” denotes gross impact evaluation, “N” denotes net impact evaluation, and “P” denotes process evaluation.

**Figure 29: Evaluation Activity Matrix**

Program / Initiative	PY8			PY9			PY10			PY11			PY12		
	G	N	P	G	N	P	G	N	P	G	N	P	G	N	P
Res Appliance Turn-In	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓		
Res Appliances	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓		
Res HVAC	✓	✓	✓	✓			✓			✓	✓	✓	✓		
Res Upstream Lighting	✓	✓	✓	✓			✓	✓	✓	✓			✓		
Res Upstream Electronics	✓		✓	✓			✓	✓	✓	✓			✓		
Res EE Kits	✓	✓	✓	✓			✓	✓	✓	✓			-		
Res Direct Install	✓			✓			✓	✓	✓						
Res Home Energy Reports	✓		✓	✓			✓		✓	✓			✓		
Res New Homes	✓			✓		✓	✓	✓	✓	✓					
Res Behavioral DR				✓			✓		✓	✓			✓		✓
Res LI Appliance Turn-In	✓		✓	✓		✓	✓		✓	✓			✓		
Res LI Appliance Rebates	✓		✓	✓			✓			✓		✓	✓		
Res LI Kits	✓			✓			✓			✓			-		
Res LI Home Energy Reports	✓		✓	✓			✓		✓	✓			✓		
Res LI Direct Install	✓		✓	✓			✓			✓		✓	✓		
C&I Appliance Turn-In	✓			✓			✓			✓					
C&I Audits/DI				✓						✓					
C&I Lighting	✓	✓	✓	✓			✓	✓	✓	✓			✓		
C&I Prescriptive	✓	✓	✓	✓			✓	✓	✓	✓			✓		
C&I Custom	✓	✓	✓	✓			✓	✓	✓	✓			✓		
Small CI DR				✓		✓	✓			✓		✓	✓		
Large CI DR				✓		✓	✓			✓		✓	✓		

#### 3.1 APPLIANCE TURN-IN PROGRAM

The Companies have retained ARCA to administer the Appliance Turn-In Program. Through this program, residential customers are eligible for a cash incentive and disposal of up to two large older inefficient appliances (refrigerators or freezers); and two Room Air Conditioners (RAC) or dehumidifiers per household per calendar year. All units must be working and meet established

size requirements. The participation count for reporting purposes is the count of rebate applications, which corresponds to appliance pick-up events.

### 3.1.1 Participation and Reported Savings by Customer Segment

Table 71 presents the participation counts, reported energy and demand savings, and incentive payments for the Appliance Turn-In Program in PY12 by customer segment and EDC. This program serves only the residential customer segment. The EE&C portfolios include separate Appliance Turn-In program components, also administered by ARCA, to serve the low-income residential and the nonresidential customer segments. Note that Penn Power did not offer the program in PY12.

**Table 71: Appliance Turn-In 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	2,852	2,297	0	2,697
PYRTD MWh/yr	2,883	2,573	0	2,883
PYRTD MW/yr	0.42	0.36	0.00	0.38
PYTD Incentives (\$1000)	165.55	133.10	0.00	152.48

### 3.1.2 Gross Impact Evaluation

The impact evaluation of this program is described in detail in Appendix D.1. Table 72 summarizes program verified impacts and realization rates for each EDC.

**Table 72: Appliance Turn-In Program Gross Impact Evaluation Summary for PY12**

EDC	Sampling Initiative	Gross Verified MWh	Gross Verified MW	MWh Realization Rate	MW Realization Rate
Met-Ed	Appliance Turn-In	2,877	0.39	99.8%	93.0%
Penelec	Appliance Turn-In	2,295	0.32	89.2%	87.0%
Penn Power	Appliance Turn-In	0	0.00	100.0%	100.0%
WPP	Appliance Turn-In	2,581	0.34	89.5%	88.9%

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. Although verification rates determined through surveys were approximately 100%, the realization rates are generally lower than 100% because the part-use factors are lower than the TRM default values, and the calculated unit energy consumptions were lower than what would expect from application of default parameters in the TRM.

#### 3.1.2.1 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 PY12 evaluation was not altered due to COVID-19 induced social distancing measures.



### 3.1.3 Net Impact Evaluation

Tetra-Tech conducted a Net-to-Gross evaluation for this program in PY8, PY9, and also updated results in PY10. The net impact evaluation for this program is described in Appendix D.2. Table 73 summarizes program verified gross and net energy impacts and net-to-gross ratios for each EDC. The NTG results are similar to PY8.

**Table 73: Appliance Turn-In Program Net Impact Evaluation Summary for PY12**

EDC	Sampling Initiative	Gross Verified MWh	NTG	Net Verified MWh
Met-Ed	Appliance Turn-In	2,877	45.0%	1,295
Penelec	Appliance Turn-In	2,295	47.0%	1,078
Penn Power	Appliance Turn-In	0	51.0%	0
WPP	Appliance Turn-In	2,581	48.0%	1,239

#### 3.1.3.1 High-Impact Measure Research

The Appliance Turn-In Initiative was not treated as a High-Impact Measure for Net Impact Evaluation purposes in PY12. However, a full net impact evaluation was conducted by Tetra Tech in PY10. Details of the net impact evaluation can be found in Appendix D.2.

### 3.1.4 Verified Savings Estimates

In Table 74 the realization rates and net-to-gross ratios determined by ADM are applied to the reported energy and demand savings estimates to calculate the verified savings estimates for the Appliance Turn-In Program in PY12. These totals are added to the verified savings achieved in previous program years to calculate the P3TD program impacts.

**Table 74: PYTD and P3TD Savings Summary**

Savings Type	Met-Ed		Penelec		Penn Power		WPP	
	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	2,883	0.42	2,573	0.36	0	0.00	2,883	0.38
PYVTD Gross	2,877	0.39	2,295	0.32	0	0.00	2,581	0.34
PYVTD Net	1,295	0.18	1,078	0.15	0	0.00	1,239	0.16
RTD	20,092	2.86	19,087	2.59	5,635	0.72	23,620	3.07
VTD Gross	19,786	2.72	17,792	2.38	4,890	0.63	22,769	2.97
VTD Net	9,288	1.28	8,140	1.09	2,583	0.33	10,967	1.43

### 3.1.5 Process Evaluation

This program underwent process evaluation in PY10. The appliance turn-in program process evaluation relied on program staff and ICSP interviews as well as participant customer surveys. The survey was streamlined given that the program design has not changed since the PY8 evaluation, and was administered through a combination of web and phone. The researchable

issues for process evaluation related to customer satisfaction and program awareness. The results of both of these metrics remain similar to Phase II, suggesting that program operation was stable during Phase III. The results are also similar across the FirstEnergy EDCs. The sample for the survey was randomly selected for each EDC. The sample design is shown in Table 75.

**Table 75: ATI Program Process Evaluation Sample Design**

EDC	Population Size	Achieved Sample Size	Response Rate
Met-Ed	5,008	851	20.0%
Penelec	4,485	717	20.0%
Penn Power	1,641	302	21.0%
WPP	5,682	870	21.0%

Key findings and recommendations are listed in Section 3.1.7.

### 3.1.6 Cost-Effectiveness Reporting<sup>9 10</sup>

A detailed breakdown of program finances and cost-effectiveness is presented in Table 76, Table 77, Table 78, and Table 79 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 2019 dollars. NPV costs and benefits for P3TD financials are expressed in the 2016 dollars.

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<sup>9</sup> Any negative values reflected within this section are due to issues such as, but not limited to, reversals of prior period accruals, accounting journal entries, and/or revenues received from participation in historic capacity auctions during prior Phases of Act 129.

<sup>10</sup> Certain cost categories presented in the “Summary of Program Finances” tables reflect allocated percentages of actual costs.

**Table 76: Summary of Program Finances – Met-Ed**

Row #	Cost Category	Gross PYTD (\$1,000)		Gross P3TD (\$1,000)		Net PYTD (\$1,000)		Net P3TD (\$1,000)	
1	EDC Incentives to Participants <sup>[1]</sup>	166		1,148		166		1,148	
2	EDC Incentives to Trade Allies	0		0		0		0	
3	Participant Costs (net of incentives/rebates paid by utilities)	0		0		0		0	
4	Incremental Measure Costs (Just row 3 for Appliance Recycling)	0		0		0		0	
		EDC	CSP	EDC	CSP	EDC	CSP	EDC	CSP
5	Design & Development <sup>[2]</sup>	9	1	13	100	9	1	13	100
6	Administration, Management, and Technical Assistance <sup>[3]</sup>	71	74	274	460	71	74	274	460
7	Marketing <sup>[4]</sup>	-48	74	12	518	-48	74	12	518
8	Program Delivery <sup>[5]</sup>	0	297	0	1,744	0	297	0	1,744
9	EDC Evaluation Costs	39		151		39		151	
10	SWE Audit Costs	16		107		16		107	
11	Program Overhead Costs (Sum of rows 5 through 10)	534		3,379		534		3,379	
12	NPV of increases in costs of natural gas (or other fuels) for fuel switching programs	0		0		0		0	
13	Total NPV TRC Costs <sup>[6]</sup> (Net present value of sum of rows 4, 11, and 12)	534		3,004		534		3,004	
14	Total NPV Lifetime Electric Energy Benefits	797		4,605		359		2,167	
15	Total NPV Lifetime Electric Capacity Benefits	180		1,415		81		673	
16	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	0		0		0		0	
17	Total NPV Lifetime Non-Electric Benefits (Fossil Fuel, Water)	0		0		0		0	
18	Total NPV TRC Benefits <sup>[7]</sup> (Sum of rows 14 through 17)	977		6,019		440		2,840	
19	TRC Benefit-Cost Ratio <sup>[8]</sup>	1.83		2.00		0.82		0.95	

[1] Includes direct install equipment costs and costs for EE&C kits.  
 [2] Includes direct costs attributable to plan and advance the programs. Note: The design of the HERs program should be included here, while the actual development and mailing of HERs would be attributable to Program Delivery.  
 [3] Includes rebate processing, tracking system, general administration, program management, general management and legal, and technical assistance. Any common portfolio costs that are allocated across programs should be shown in this row.  
 [4] Includes the marketing CSP and marketing costs by program CSPs.  
 [5] Direct program implementation costs. Labor, fuel, and vehicle operation costs for appliance recycling and direct install programs. For behavioral programs, this includes the printing and postage of HERs.  
 [6] Total TRC Costs includes Total EDC Costs and Participant Costs.  
 [7] Total TRC Benefits equals the sum of Total Lifetime Electric and Non-Electric Benefits. Benefits include: avoided supply costs, including the reduction in costs of electric energy, generation, transmission, and distribution capacity, and natural gas valued at marginal cost for periods when there is a load reduction. Savings carried over from Phase II are not included as a part of Total TRC Benefits for Phase III.  
 [8] TRC Ratio equals Total NPV TRC Benefits divided by Total NPV TRC Costs.  
 \* Rows 1-11 are presented in nominal dollars

**Table 77: 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	EDC Incentives to Participants <sup>[1]</sup>	133		986		133		986	
2	EDC Incentives to Trade Allies	0		0		0		0	
3	Participant Costs (net of incentives/rebates paid by utilities)	0		0		0		0	
4	Incremental Measure Costs (Just row 3 for Appliance Recycling)	0		0		0		0	
		EDC	CSP	EDC	CSP	EDC	CSP	EDC	CSP
5	Design & Development <sup>[2]</sup>	11	1	15	93	11	1	15	93
6	Administration, Management, and Technical Assistance <sup>[3]</sup>	78	64	301	418	78	64	301	418
7	Marketing <sup>[4]</sup>	-51	60	9	455	-51	60	9	455
8	Program Delivery <sup>[5]</sup>	0	257	0	1,581	0	257	0	1,581
9	EDC Evaluation Costs	42		163		42		163	
10	SWE Audit Costs	18		117		18		117	
11	Program Overhead Costs (Sum of rows 5 through 10)	479		3,151		479		3,151	
12	NPV of increases in costs of natural gas (or other fuels) for fuel switching programs	0		0		0		0	
13	Total NPV TRC Costs <sup>[6]</sup> (Net present value of sum of rows 4, 11, and 12)	479		2,800		479		2,800	
14	Total NPV Lifetime Electric Energy Benefits	602		3,858		283		1,763	
15	Total NPV Lifetime Electric Capacity Benefits	138		1,199		65		542	
16	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	0		0		0		0	
17	Total NPV Lifetime Non-Electric Benefits (Fossil Fuel, Water)	0		0		0		0	
18	Total NPV TRC Benefits <sup>[7]</sup> (Sum of rows 14 through 17)	740		5,057		348		2,306	
19	TRC Benefit-Cost Ratio <sup>[8]</sup>	1.54		1.81		0.73		0.82	

[1] Includes direct install equipment costs and costs for EE&C kits.

[2] Includes direct costs attributable to plan and advance the programs. Note: The design of the HERs program should be included here, while the actual development and mailing of HERs would be attributable to Program Delivery.

[3] Includes rebate processing, tracking system, general administration, program management, general management and legal, and technical assistance. Any common portfolio costs that are allocated across programs should be shown in this row.

[4] Includes the marketing CSP and marketing costs by program CSPs.

[5] Direct program implementation costs. Labor, fuel, and vehicle operation costs for appliance recycling and direct install programs. For behavioral programs, this includes the printing and postage of HERs.

[6] Total TRC Costs includes Total EDC Costs and Participant Costs.

[7] Total TRC Benefits equals the sum of Total Lifetime Electric and Non-Electric Benefits. Benefits include: avoided supply costs, including the reduction in costs of electric energy, generation, transmission, and distribution capacity, and natural gas valued at marginal cost for periods when there is a load reduction. Savings carried over from Phase II are not included as a part of Total TRC Benefits for Phase III.

[8] TRC Ratio equals Total NPV TRC Benefits divided by Total NPV TRC Costs.

\* Rows 1-11 are presented in nominal dollars

**Table 78: 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	EDC Incentives to Participants <sup>[1]</sup>	0		283		0		283	
2	EDC Incentives to Trade Allies	0		0		0		0	
3	Participant Costs (net of incentives/rebates paid by utilities)	0		0		0		0	
4	Incremental Measure Costs (Just row 3 for Appliance Recycling)	0		0		0		0	
		EDC	CSP	EDC	CSP	EDC	CSP	EDC	CSP
5	Design & Development <sup>[2]</sup>	0	0	0	36	0	0	0	36
6	Administration, Management, and Technical Assistance <sup>[3]</sup>	4	0	53	134	4	0	53	134
7	Marketing <sup>[4]</sup>	-14	0	5	134	-14	0	5	134
8	Program Delivery <sup>[5]</sup>	0	0	0	499	0	0	0	499
9	EDC Evaluation Costs	6		33		6		33	
10	SWE Audit Costs	0		22		0		22	
11	Program Overhead Costs (Sum of rows 5 through 10)	-3		915		-3		915	
12	NPV of increases in costs of natural gas (or other fuels) for fuel switching programs	0		0		0		0	
13	Total NPV TRC Costs <sup>[6]</sup> (Net present value of sum of rows 4, 11, and 12)	-3		837		-3		837	
14	Total NPV Lifetime Electric Energy Benefits	0		1,102		0		582	
15	Total NPV Lifetime Electric Capacity Benefits	0		290		0		153	
16	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	0		0		0		0	
17	Total NPV Lifetime Non-Electric Benefits (Fossil Fuel, Water)	0		0		0		0	
18	Total NPV TRC Benefits <sup>[7]</sup> (Sum of rows 14 through 17)	0		1,392		0		735	
19	TRC Benefit-Cost Ratio <sup>[8]</sup>	0.00		1.66		0.00		0.88	

[1] Includes direct install equipment costs and costs for EE&C kits.  
 [2] Includes direct costs attributable to plan and advance the programs. Note: The design of the HERs program should be included here, while the actual development and mailing of HERs would be attributable to Program Delivery.  
 [3] Includes rebate processing, tracking system, general administration, program management, general management and legal, and technical assistance. Any common portfolio costs that are allocated across programs should be shown in this row.  
 [4] Includes the marketing CSP and marketing costs by program CSPs.  
 [5] Direct program implementation costs. Labor, fuel, and vehicle operation costs for appliance recycling and direct install programs. For behavioral programs, this includes the printing and postage of HERs.  
 [6] Total TRC Costs includes Total EDC Costs and Participant Costs.  
 [7] Total TRC Benefits equals the sum of Total Lifetime Electric and Non-Electric Benefits. Benefits include: avoided supply costs, including the reduction in costs of electric energy, generation, transmission, and distribution capacity, and natural gas valued at marginal cost for periods when there is a load reduction. Savings carried over from Phase II are not included as a part of Total TRC Benefits for Phase III.  
 [8] TRC Ratio equals Total NPV TRC Benefits divided by Total NPV TRC Costs.  
 \* Rows 1-11 are presented in nominal dollars

**Table 79: 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	EDC Incentives to Participants <sup>[1]</sup>	152		1,238		152		1,238	
2	EDC Incentives to Trade Allies	0		0		0		0	
3	Participant Costs (net of incentives/rebates paid by utilities)	0		0		0		0	
4	Incremental Measure Costs (Just row 3 for Appliance Recycling)	0		0		0		0	
		EDC	CSP	EDC	CSP	EDC	CSP	EDC	CSP
5	Design & Development <sup>[2]</sup>	9	1	13	115	9	1	13	115
6	Administration, Management, and Technical Assistance <sup>[3]</sup>	70	70	279	500	70	70	279	500
7	Marketing <sup>[4]</sup>	-49	70	12	580	-49	70	12	580
8	Program Delivery <sup>[5]</sup>	0	282	0	1,889	0	282	0	1,889
9	EDC Evaluation Costs	38		150		38		150	
10	SWE Audit Costs	14		98		14		98	
11	Program Overhead Costs (Sum of rows 5 through 10)	506		3,635		506		3,635	
12	NPV of increases in costs of natural gas (or other fuels) for fuel switching programs	0		0		0		0	
13	Total NPV TRC Costs <sup>[6]</sup> (Net present value of sum of rows 4, 11, and 12)	506		3,247		506		3,247	
14	Total NPV Lifetime Electric Energy Benefits	678		5,053		325		2,432	
15	Total NPV Lifetime Electric Capacity Benefits	152		1,336		73		642	
16	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	0		0		0		0	
17	Total NPV Lifetime Non-Electric Benefits (Fossil Fuel, Water)	0		0		0		0	
18	Total NPV TRC Benefits <sup>[7]</sup> (Sum of rows 14 through 17)	830		6,389		398		3,073	
19	TRC Benefit-Cost Ratio <sup>[8]</sup>	1.64		1.97		0.79		0.95	

[1] Includes direct install equipment costs and costs for EE&C kits.  
 [2] Includes direct costs attributable to plan and advance the programs. Note: The design of the HERs program should be included here, while the actual development and mailing of HERs would be attributable to Program Delivery.  
 [3] Includes rebate processing, tracking system, general administration, program management, general management and legal, and technical assistance. Any common portfolio costs that are allocated across programs should be shown in this row.  
 [4] Includes the marketing CSP and marketing costs by program CSPs.  
 [5] Direct program implementation costs. Labor, fuel, and vehicle operation costs for appliance recycling and direct install programs. For behavioral programs, this includes the printing and postage of HERs.  
 [6] Total TRC Costs includes Total EDC Costs and Participant Costs.  
 [7] Total TRC Benefits equals the sum of Total Lifetime Electric and Non-Electric Benefits. Benefits include: avoided supply costs, including the reduction in costs of electric energy, generation, transmission, and distribution capacity, and natural gas valued at marginal cost for periods when there is a load reduction. Savings carried over from Phase II are not included as a part of Total TRC Benefits for Phase III.  
 [8] TRC Ratio equals Total NPV TRC Benefits divided by Total NPV TRC Costs.  
 \* Rows 1-11 are presented in nominal dollars.

### 3.1.7 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.

## 3.2 ENERGY EFFICIENT HOMES PROGRAM

Energy Efficiency Homes Program has seven distinct components: Energy Efficiency Kits, Online Audits, School Education, Behavioral Home Energy Reports, Residential Energy Audits, New Homes, and Behavioral Demand Response.

Energy Efficiency Kits is administered by Power Direct. In this program, customers must request to receive a kit filled with energy savings measures. Note that this program component was not implemented in PY12.

The Online Audit component is administered by both PowerDirect and Oracle (as of April 2018) and Aclara previous to April 2018. Customers complete a questionnaire with questions about their home and receive tips for how to save energy. This is also available via telephone for customers without internet access. Upon completion of the audit, Power Direct sends a kit with energy savings measures.

AM Conservation Group (AMCG) administers the School Education program. Students receive a 25-minute performance delivered by professionally trained actors around energy conservation. Teachers also use a corresponding curriculum to continue to teach about energy conservation topics. Parents are then encouraged to request a kit filled with energy-savings measures and to continue discussions regarding energy conservation in the home. The School Education program was not implemented in PY12.

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 Companies have retained GoodCents to administer the Direct Install (branded as Home Audit) component in Phase III. Through this program component, customers receive 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.

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 efficiencies through the installation of efficient building shell measures, HVAC systems, appliances, lighting, or 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).

The program also includes a Behavioral Demand Response (BDR) program component, which is administered by Oracle. The BDR program component is discussed separately in Section 3.8. However, costs and benefits for BDR are included in the EE Homes cost effectiveness tables in Section 3.2.6.

### 3.2.1 Participation and Reported Savings by Customer Segment

Table 80 presents the participation counts, reported energy and demand savings, and incentive payments for the Energy Efficient Homes Program in PY12 by customer segment and 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 80: 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	120,449	124,189	22,451	145,820
PYRTD MWh/yr	22,781	15,286	5,404	24,797
PYRTD MW/yr	4.49	2.20	1.24	5.01
PYTD Incentives (\$1000)	603.42	167.92	248.66	749.95

### 3.2.2 Gross Impact Evaluation

Each program component is treated as a separate evaluation initiative. The gross impact evaluation of the EE Kits Initiative is described in Appendix E. The impact evaluation of the HER Initiative is described in Appendix E. The impact evaluation of the Res DI Initiative is described in Appendix G. The impact evaluation of the Res NC Initiative is described in Table 81 summarizes program verified impacts and realization rates for each EDC.



**Table 81: EEH Program Gross Impact Evaluation Summary for PY12**

EDC	Sampling Initiative	Gross Verified MWh	Gross Verified MW	MWh Realization Rate	MW Realization Rate
Met-Ed	EE Kits	0	0.00	100.0%	100.0%
Met-Ed	Home Energy Reports	20,461	2.32	98.4%	64.0%
Met-Ed	Direct Install	94	0.01	95.8%	92.4%
Met-Ed	New Homes	1,435	0.75	76.1%	87.5%
<b>Met-Ed Total</b>		<b>21,991</b>	<b>3.08</b>	<b>97%</b>	<b>69%</b>
Penelec	EE Kits	0	0.00	100.0%	100.0%
Penelec	Home Energy Reports	14,199	1.61	96.2%	79.0%
Penelec	Direct Install	158	0.02	99.9%	90.8%
Penelec	New Homes	296	0.14	81.4%	92.9%
<b>Penelec Total</b>		<b>14,653</b>	<b>1.76</b>	<b>96%</b>	<b>80%</b>
Penn Power	EE Kits	0	0.00	100.0%	100.0%
Penn Power	Home Energy Reports	4,896	0.55	106.4%	73.0%
Penn Power	Direct Install	20	0.00	102.9%	100.5%
Penn Power	New Homes	594	0.40	75.9%	81.9%
<b>Penn Power Total</b>		<b>5,509</b>	<b>0.95</b>	<b>102%</b>	<b>77%</b>
WPP	EE Kits	0	0.00	100.0%	100.0%
WPP	Home Energy Reports	17,835	1.96	79.7%	49.8%
WPP	Direct Install	156	0.02	98.4%	105.9%
WPP	New Homes	1,743	0.88	77.3%	83.4%
<b>WPP Total</b>		<b>19,734</b>	<b>2.86</b>	<b>80%</b>	<b>57%</b>

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 higher than 100% due to higher in-service rates than planning estimates. Home Energy Reports energy savings varied from reported values due to differences in data validation and the cross-participation corrections.

### 3.2.2.1 Evaluation Adjustments in Response to the COVID-19 Pandemic

Data to support evaluation, measurement, and verification of the EE kits are collected with remote online and telephone surveys, while customer billing data are used to evaluate the Home Energy Reports program component. In PY12, gross impact evaluation was not conducted for the New Homes and Direct Install program components. This was done to continue social isolation to combat COVID-19, and also because these programs accounted for a small share (less than 0.5%) of impacts over Phase III.

### 3.2.3 Net Impact Evaluation

Tetra-Tech conducted a Net-to-Gross evaluation for the EE Kits Initiative in PY8. The net impact evaluation for the EE Kits Initiative is described in Appendix E of the PY8 annual report. NTG studies for the New Homes and Direct Install initiatives were completed in PY10. The New Homes Program is estimated to have an NTG ratio of 73%, as described in Appendix H.2.1.

This value is somewhat higher than the 60% estimate that was applied in PY9, derived from a literature review of other residential new construction programs.

Due to limited participation in the Direct Install initiative, Tetra Tech surveyed participants spanning both PY9 and PY10. A self-report methodology was applied, as described in Appendix H.2.1. The NTG for this initiative is estimated to be 101%, with spillover essentially cancelling free ridership.

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<sup>11</sup>.

Table 82 summarizes program verified gross and net energy impacts and net-to-gross ratios for each EDC.

**Table 82: EEH Program Net Impact Evaluation Summary for PY12**

EDC	Sampling Initiative	Gross Verified MWh	NTG	Net Verified MWh
Met-Ed	EE Kits	0	82.0%	0
Met-Ed	Home Energy Reports	20,461	100.0%	20,461
Met-Ed	Direct Install	94	95.0%	90
Met-Ed	New Homes	1,435	73.0%	1,048
<b>Met-Ed Total</b>		<b>21,991</b>	<b>98.2%</b>	<b>21,599</b>
Penelec	EE Kits	0	83.0%	0
Penelec	Home Energy Reports	14,199	100.0%	14,199
Penelec	Direct Install	158	103.0%	162
Penelec	New Homes	296	73.0%	216
<b>Penelec Total</b>		<b>14,653</b>	<b>99.5%</b>	<b>14,578</b>
Penn Power	EE Kits	0	82.0%	0
Penn Power	Home Energy Reports	4,896	100.0%	4,896
Penn Power	Direct Install	20	100.0%	20
Penn Power	New Homes	594	73.0%	434
<b>Penn Power Total</b>		<b>5,509</b>	<b>97.1%</b>	<b>5,349</b>
WPP	EE Kits	0	82.0%	0
WPP	Home Energy Reports	17,835	100.0%	17,835
WPP	Direct Install	156	104.0%	162
WPP	New Homes	1,743	73.0%	1,272
<b>WPP Total</b>		<b>19,734</b>	<b>97.6%</b>	<b>19,270</b>

### 3.2.3.1 High-Impact Measure Research

The EE Kits Initiative, which includes the EE Kits distributed in the Energy Efficient Homes Program, was treated as a High-Impact Measure for Net Impact Evaluation purposes in PY8. Details of the net impact evaluation can be found in Appendix E of the PY8 annual report. No Initiatives from this program have been designated as high impact measures for PY12, as the only other program element with high impacts is Home Energy Reports, which has a net-to-

<sup>11</sup> This estimation assumes that non-participant spillover is negligible.

gross of approximately 1.0 (and deemed to be such) as a consequence of the gross impact evaluation methodology.

### 3.2.4 Verified Savings Estimates

In Table 83 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 PY12. These totals are added to the verified savings achieved in previous program years to calculate the P3TD program impacts.

**Table 83: PYTD and P3TD Savings Summary**

Savings Type	Met-Ed		Penelec		Penn Power		WPP	
	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	22,781	4.49	15,286	2.20	5,404	1.24	24,797	5.01
PYVTD Gross	21,991	3.08	14,653	1.76	5,509	0.95	19,734	2.86
PYVTD Net	21,599	2.88	14,578	1.72	5,349	0.84	19,270	2.62
RTD	218,193	31.45	165,406	21.05	47,755	8.08	183,818	31.18
VTD Gross	231,070	28.47	175,945	19.31	52,788	7.70	174,136	22.82
VTD Net	213,762	25.74	159,827	17.52	48,139	6.57	164,243	20.62

### 3.2.5 Process Evaluation

Process evaluation activities were conducted for the EE Kits and Home Energy Reports program components in PY8, and for New Homes in PY9. In PY10, Tetra Tech conducted process evaluations for Online Audit Kits, Behavioral Demand Response, Audit/Direct Install and Home Energy Reports components in PY10. The only program component to undergo process evaluation in PY12 was Behavioral Demand Response (BDR). The process evaluation for Behavioral Demand Response is described in section 3.8.4. The participant survey and other evaluation activity sample design for multi-year process evaluation effort is shown in Table 84.

**Table 84: EEH Program Process Evaluation Sample Design**

EDC / Measure	Latest Activity	Population Size	Achieved Sample Size	Response Rate
ME - EE Kits	Participant Surveys (PY8)	61,344	172	14%
PN - EE Kits	Participant Surveys (PY8)	54,474	171	14%
PP - EE Kits	Participant Surveys (PY8)	16,105	181	15%
WP - EE Kits	Participant Surveys (PY8)	58,301	193	16%
ME - Online Audit Kits	Participant Surveys (PY10)	3,077	97	9%
PN - Online Audit Kits	Participant Surveys (PY10)	2,198	71	6%
PP - Online Audit Kits	Participant Surveys (PY10)	792	72	9%
WP - Online Audit Kits	Participant Surveys (PY10)	5,303	90	8%
ME - Behavioral	Participant Surveys (PY10)	121,988	56	6%
PN - Behavioral	Participant Surveys (PY10)	119,567	70	8%
PP - Behavioral	Participant Surveys (PY10)	22,164	70	8%
WP - Behavioral	Participant Surveys (PY10)	140,869	64	7%
ME - Behavioral DR	Participant Surveys (PY10)	125,016	109	5%
ME - Behavioral DR	Opt-Out Surveys (PY10)	5,306	84	3%
ME - Behavioral DR	Participant Surveys (PY12)	191,898	57	23%
PP - Behavioral DR	Participant Surveys (PY10)	30,989	121	5%
PP - Behavioral DR	Opt-Out Surveys (PY10)	86	14	16%
PP - Behavioral DR	Participant Surveys (PY12)	30,208	59	24%
WP - Behavioral DR	Participant Surveys (PY10)	49,898	140	3%
WP - Behavioral DR	Opt-Out Surveys (PY10)	3,511	109	3%
WP - Behavioral DR	Participant Surveys (PY12)	56,934	58	23%
ALL EDCs - In-Home Audits	Participant Surveys (PY10)	1,128	331	29%
	Auditor Interviews (PY10)	16	11	69%
	Audit Ride-Alongs (PY10)	16	3	6%
All EDCs - New Homes	Builder Surveys (PY9)	43	9	21%
	Rater Surveys (PY9)	27	4	33%
<b>Program Total</b>		<b>1,101,258</b>	<b>2,416</b>	<b>8.2%</b>

Key findings and recommendations are listed in Section 3.2.7.

### 3.2.5.1 Energy Efficiency and Online Audit Kits

The Energy Efficient Homes programs contains several subprograms that deliver kits of energy-efficient measures to customers through different channels. The opt-in Energy Efficiency Kits, School Education Kits and Online Audit with Kits components have been evaluated in PY8, and the Online Audit Kits were again evaluated in PY10. Each evaluation began with program staff and ICSP interviews, and the bulk of the evaluation was conducted through participant surveys. The participant survey was administered through a combination of web and phone.

Researchable issues for the kits sub-programs focused on participant satisfaction, program marketing, and awareness. The sample for the survey was randomly selected for each EDC.

In regard to the Online Audit with Kits, which was evaluated in PY10, program staff believe the program is running well and the working relationship with the ICSP is effective. The software tool was updated in April 2018 to be embedded into each EDC's website, instead of being hosted on a separate site. FirstEnergy reports being more satisfied with the updated tool, as it is more seamless for their customers. Likewise, PowerDirect noted they have been working well with FirstEnergy for eight years on this program and process have been streamlined well. More recently, the ICSP has worked to improve data transfer processes, which have helped stay within promised shipping windows for the kits.

### 3.2.5.2 Home Energy Reports

In the PY10 process evaluation effort for Home Energy Report, Tetra Tech conducted both qualitative and quantitative research as part of the process evaluation activities. The qualitative research included semi-structured interviews with FirstEnergy program managers and the program implementer. A survey of participating customers was the primary source of data to assess experiences of participants and their engagement with the program. The survey was primarily a quantitative study, but evaluators asked open-ended questions to provide context for the qualitative results.

FirstEnergy and ICSP staff noted a low drop-out rate, and low volume of feedback from participants to the program, suggesting that there are not issues that cause participants to be dissatisfied. Both FirstEnergy and the ICSP felt the program design was working well, which is unchanged since Phase II. The participant survey provided consistent findings. The participant survey researched customer engagement with the home energy reports, energy-saving behaviors, and barriers to energy-saving behaviors. The survey sample was randomly selected for each EDC from all customers receiving home energy reports, including a stratum for the low-income subprogram.

### 3.2.5.3 Behavioral Demand Response

The process evaluation activities, findings, and recommendations for this program component are discussed in Section 3.8.4 and Section 3.8.6.

### 3.2.5.4 New Homes

The process evaluation effort, conducted previously in PY9, included a documentation review and interviews. The documentation review included reviews of sample rebate applications, of the program website, and of FirstEnergy's program implementation plan. FirstEnergy program managers were interviewed first, followed by an interview with managers at Performance Systems Development, Inc. (PSD), the program implementer. Tetra Tech also conducted in-depth interviews with ten participating builders and five participating HERS raters. Both the builders and raters reported high satisfaction rates with program communications via PSD, and had positive feedback regarding steps that PSD has taken to reduce the rebate application burden. PSD was seen as a resource for disseminating information about the recent efficiency

code update in Pennsylvania, although both builders and raters report widespread code enforcement in Pennsylvania. Tetra Tech also conducted surveys and interviews with builders and raters in PY10, but focused on net impact evaluation.

### 3.2.5.5 In Home Audits

The process evaluation effort for In-Home Audits occurred during both PY9 and PY10 and included semi-structured interviews with the FirstEnergy program manager, representatives of the ICSP, home energy auditors, in-home energy audit ride-alongs, and a review of program data and marketing materials. The research also included structured surveys with program participants. The evaluation team interviewed the FirstEnergy program manager and the program implementer to review program design, understand how the program has evolved since its inception, identify lessons learned from the implementation, and ascertain any challenges going forward. The focus of the auditor interviews was to assess how the program is working from their perspective. The ride-alongs provided an opportunity to directly observe a participant's experience with the program and how the audit is performed.

The quantitative survey captured customers' perceptions of, and experiences with, the program; awareness and attitudes of energy efficiency and conservation; participation in other FirstEnergy programs; customer satisfaction; and possible areas for improvement from the customer's perspective.

### 3.2.6 Cost-Effectiveness Reporting

A detailed breakdown of program finances and cost-effectiveness is presented Table 85, Table 86, Table 87, and Table 88 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 2019 dollars. NPV costs and benefits for P3TD financials are expressed in the 2016 dollars. Note that the program costs and benefits include costs and benefits for the Behavioral Demand Response program component. The Behavioral Demand Response benefits and costs are also reported individually in Section 3.8.5.

**Table 85: Summary of Program Finances – Met-Ed**

Row #	Cost Category	Gross PYTD (\$1,000)		Gross P3TD (\$1,000)		Net PYTD (\$1,000)		Net P3TD (\$1,000)	
1	EDC Incentives to Participants <sup>[1]</sup>	603		12,707		603		12,707	
2	EDC Incentives to Trade Allies	0		0		0		0	
3	Participant Costs (net of incentives/rebates paid by utilities)	1,066		8,256		789		6,339	
4	Incremental Measure Costs (Sum of rows 1 through 3)	1,669		20,963		1,392		19,046	
		EDC	CSP	EDC	CSP	EDC	CSP	EDC	CSP
5	Design & Development <sup>[2]</sup>	29	54	42	802	29	54	42	802
6	Administration, Management, and Technical Assistance <sup>[3]</sup>	221	161	1,013	4,137	221	161	1,013	4,137
7	Marketing <sup>[4]</sup>	-178	36	-39	1,008	-178	36	-39	1,008
8	Program Delivery <sup>[5]</sup>	0	786	0	4,168	0	786	0	4,168
9	EDC Evaluation Costs	97		712		97		712	
10	SWE Audit Costs	49		368		49		368	
11	Program Overhead Costs (Sum of rows 5 through 10)	1,255		12,211		1,255		12,211	
12	NPV of increases in costs of natural gas (or other fuels) for fuel switching programs	0		0		0		0	
13	Total NPV TRC Costs <sup>[6]</sup> (Net present value of sum of rows 4, 11, and 12)	2,924		29,817		2,647		28,086	
14	Total NPV Lifetime Electric Energy Benefits	1,509		25,695		1,320		21,590	
15	Total NPV Lifetime Electric Capacity Benefits	1,395		10,525		1,236		8,813	
16	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	0		2,913		0		2,363	
17	Total NPV Lifetime Non-Electric Benefits (Fossil Fuel, Water)	1,731		11,506		1,268		9,080	
18	Total NPV TRC Benefits <sup>[7]</sup> (Sum of rows 14 through 17)	4,635		50,638		3,823		41,846	
19	TRC Benefit-Cost Ratio <sup>[8]</sup>	1.59		1.70		1.44		1.49	

[1] Includes direct install equipment costs and costs for EE&C kits.  
 [2] Includes direct costs attributable to plan and advance the programs. Note: The design of the HERs program should be included here, while the actual development and mailing of HERs would be attributable to Program Delivery.  
 [3] Includes rebate processing, tracking system, general administration, program management, general management and legal, and technical assistance. Any common portfolio costs that are allocated across programs should be shown in this row.  
 [4] Includes the marketing CSP and marketing costs by program CSPs.  
 [5] Direct program implementation costs. Labor, fuel, and vehicle operation costs for appliance recycling and direct install programs. For behavioral programs, this includes the printing and postage of HERs.  
 [6] Total TRC Costs includes Total EDC Costs and Participant Costs.  
 [7] Total TRC Benefits equals the sum of Total Lifetime Electric and Non-Electric Benefits. Benefits include: avoided supply costs, including the reduction in costs of electric energy, generation, transmission, and distribution capacity, and natural gas valued at marginal cost for periods when there is a load reduction. Savings carried over from Phase II are not included as a part of Total TRC Benefits for Phase III.  
 [8] TRC Ratio equals Total NPV TRC Benefits divided by Total NPV TRC Costs.  
 \* Rows 1-11 are presented in nominal dollars

**Table 86: 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	EDC Incentives to Participants <sup>[1]</sup>	168		11,276		168		11,276	
2	EDC Incentives to Trade Allies	0		0		0		0	
3	Participant Costs (net of incentives/rebates paid by utilities)	207		5,128		159		4,663	
4	Incremental Measure Costs (Sum of rows 1 through 3)	375		16,404		327		15,938	
		EDC	CSP	EDC	CSP	EDC	CSP	EDC	CSP
5	Design & Development <sup>[2]</sup>	27	3	39	620	27	3	39	620
6	Administration, Management, and Technical Assistance <sup>[3]</sup>	206	39	944	3,742	206	39	944	3,742
7	Marketing <sup>[4]</sup>	-163	38	-34	969	-163	38	-34	969
8	Program Delivery <sup>[5]</sup>	0	340	0	2,636	0	340	0	2,636
9	EDC Evaluation Costs	83		587		83		587	
10	SWE Audit Costs	45		348		45		348	
11	Program Overhead Costs (Sum of rows 5 through 10)	619		9,850		619		9,850	
12	NPV of increases in costs of natural gas (or other fuels) for fuel switching programs	0		0		0		0	
13	Total NPV TRC Costs <sup>[6]</sup> (Net present value of sum of rows 4, 11, and 12)	993		23,812		946		23,378	
14	Total NPV Lifetime Electric Energy Benefits	738		22,270		702		18,952	
15	Total NPV Lifetime Electric Capacity Benefits	228		6,498		201		5,471	
16	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	0		3,162		0		2,620	
17	Total NPV Lifetime Non-Electric Benefits (Fossil Fuel, Water)	858		9,845		795		8,499	
18	Total NPV TRC Benefits <sup>[7]</sup> (Sum of rows 14 through 17)	1,823		41,774		1,698		35,542	
19	TRC Benefit-Cost Ratio <sup>[8]</sup>	1.84		1.75		1.80		1.52	

[1] Includes direct install equipment costs and costs for EE&C kits.

[2] Includes direct costs attributable to plan and advance the programs. Note: The design of the HERs program should be included here, while the actual development and mailing of HERs would be attributable to Program Delivery.

[3] Includes rebate processing, tracking system, general administration, program management, general management and legal, and technical assistance. Any common portfolio costs that are allocated across programs should be shown in this row.

[4] Includes the marketing CSP and marketing costs by program CSPs.

[5] Direct program implementation costs. Labor, fuel, and vehicle operation costs for appliance recycling and direct install programs. For behavioral programs, this includes the printing and postage of HERs.

[6] Total TRC Costs includes Total EDC Costs and Participant Costs.

[7] Total TRC Benefits equals the sum of Total Lifetime Electric and Non-Electric Benefits. Benefits include: avoided supply costs, including the reduction in costs of electric energy, generation, transmission, and distribution capacity, and natural gas valued at marginal cost for periods when there is a load reduction. Savings carried over from Phase II are not included as a part of Total TRC Benefits for Phase III.

[8] TRC Ratio equals Total NPV TRC Benefits divided by Total NPV TRC Costs.

\* Rows 1-11 are presented in nominal dollars



**Table 87: 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	EDC Incentives to Participants <sup>[1]</sup>	249		3,628		249		3,628	
2	EDC Incentives to Trade Allies	0		0		0		0	
3	Participant Costs (net of incentives/rebates paid by utilities)	506		4,041		370		2,855	
4	Incremental Measure Costs (Sum of rows 1 through 3)	755		7,669		619		6,483	
		EDC	CSP	EDC	CSP	EDC	CSP	EDC	CSP
5	Design & Development <sup>[2]</sup>	9	10	13	190	9	10	13	190
6	Administration, Management, and Technical Assistance <sup>[3]</sup>	88	43	385	921	88	43	385	921
7	Marketing <sup>[4]</sup>	-51	25	-16	311	-51	25	-16	311
8	Program Delivery <sup>[5]</sup>	0	199	0	1,271	0	199	0	1,271
9	EDC Evaluation Costs	29		232		29		232	
10	SWE Audit Costs	16		112		16		112	
11	Program Overhead Costs (Sum of rows 5 through 10)	369		3,420		369		3,420	
12	NPV of increases in costs of natural gas (or other fuels) for fuel switching programs	0		0		0		0	
13	Total NPV TRC Costs <sup>[6]</sup> (Net present value of sum of rows 4, 11, and 12)	1,124		9,967		988		8,889	
14	Total NPV Lifetime Electric Energy Benefits	478		6,669		404		5,438	
15	Total NPV Lifetime Electric Capacity Benefits	442		3,400		363		2,670	
16	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	0		576		0		450	
17	Total NPV Lifetime Non-Electric Benefits (Fossil Fuel, Water)	751		3,665		546		2,801	
18	Total NPV TRC Benefits <sup>[7]</sup> (Sum of rows 14 through 17)	1,670		14,310		1,313		11,358	
19	TRC Benefit-Cost Ratio <sup>[8]</sup>	1.49		1.44		1.33		1.28	

[1] Includes direct install equipment costs and costs for EE&C kits.  
 [2] Includes direct costs attributable to plan and advance the programs. Note: The design of the HERs program should be included here, while the actual development and mailing of HERs would be attributable to Program Delivery.  
 [3] Includes rebate processing, tracking system, general administration, program management, general management and legal, and technical assistance. Any common portfolio costs that are allocated across programs should be shown in this row.  
 [4] Includes the marketing CSP and marketing costs by program CSPs.  
 [5] Direct program implementation costs. Labor, fuel, and vehicle operation costs for appliance recycling and direct install programs. For behavioral programs, this includes the printing and postage of HERs.  
 [6] Total TRC Costs includes Total EDC Costs and Participant Costs.  
 [7] Total TRC Benefits equals the sum of Total Lifetime Electric and Non-Electric Benefits. Benefits include: avoided supply costs, including the reduction in costs of electric energy, generation, transmission, and distribution capacity, and natural gas valued at marginal cost for periods when there is a load reduction. Savings carried over from Phase II are not included as a part of Total TRC Benefits for Phase III.  
 [8] TRC Ratio equals Total NPV TRC Benefits divided by Total NPV TRC Costs.  
 \* Rows 1-11 are presented in nominal dollars

**Table 88: 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	EDC Incentives to Participants <sup>[1]</sup>	750		8,114		750		8,114	
2	EDC Incentives to Trade Allies	0		0		0		0	
3	Participant Costs (net of incentives/rebates paid by utilities)	1,353		9,069		996		6,842	
4	Incremental Measure Costs (Sum of rows 1 through 3)	2,103		17,183		1,746		14,956	
		EDC	CSP	EDC	CSP	EDC	CSP	EDC	CSP
5	Design & Development <sup>[2]</sup>	30	19	44	751	30	19	44	751
6	Administration, Management, and Technical Assistance <sup>[3]</sup>	235	103	1,108	4,377	235	103	1,108	4,377
7	Marketing <sup>[4]</sup>	-179	61	-63	730	-179	61	-63	730
8	Program Delivery <sup>[5]</sup>	0	607	0	3,551	0	607	0	3,551
9	EDC Evaluation Costs	104		677		104		677	
10	SWE Audit Costs	47		342		47		342	
11	Program Overhead Costs (Sum of rows 5 through 10)	1,027		11,516		1,027		11,516	
12	NPV of increases in costs of natural gas (or other fuels) for fuel switching programs	0		0		0		0	
13	Total NPV TRC Costs <sup>[6]</sup> (Net present value of sum of rows 4, 11, and 12)	3,130		25,902		2,773		23,896	
14	Total NPV Lifetime Electric Energy Benefits	1,545		17,359		1,330		14,702	
15	Total NPV Lifetime Electric Capacity Benefits	1,004		7,296		828		5,893	
16	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	0		617		0		504	
17	Total NPV Lifetime Non-Electric Benefits (Fossil Fuel, Water)	2,950		11,510		2,504		9,724	
18	Total NPV TRC Benefits <sup>[7]</sup> (Sum of rows 14 through 17)	5,500		36,782		4,663		30,824	
19	TRC Benefit-Cost Ratio <sup>[8]</sup>	1.76		1.42		1.68		1.29	

[1] Includes direct install equipment costs and costs for EE&C kits.  
 [2] Includes direct costs attributable to plan and advance the programs. Note: The design of the HERs program should be included here, while the actual development and mailing of HERs would be attributable to Program Delivery.  
 [3] Includes rebate processing, tracking system, general administration, program management, general management and legal, and technical assistance. Any common portfolio costs that are allocated across programs should be shown in this row.  
 [4] Includes the marketing CSP and marketing costs by program CSPs.  
 [5] Direct program implementation costs. Labor, fuel, and vehicle operation costs for appliance recycling and direct install programs. For behavioral programs, this includes the printing and postage of HERs.  
 [6] Total TRC Costs includes Total EDC Costs and Participant Costs.  
 [7] Total TRC Benefits equals the sum of Total Lifetime Electric and Non-Electric Benefits. Benefits include: avoided supply costs, including the reduction in costs of electric energy, generation, transmission, and distribution capacity, and natural gas valued at marginal cost for periods when there is a load reduction. Savings carried over from Phase II are not included as a part of Total TRC Benefits for Phase III.  
 [8] TRC Ratio equals Total NPV TRC Benefits divided by Total NPV TRC Costs.  
 \* Rows 1-11 are presented in nominal dollars

### 3.2.7 Status of Recommendations

No program components (other than BDR which is described in Section 3.8.6) were evaluated in PY12. Findings and recommendations from previous process evaluation efforts are available in the PY8 and PY9, and PY10 annual reports.

### 3.3 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 retailers for point of sale price cuts for customers purchasing energy efficient light bulbs and ENERGY STAR® qualified computers, printers, monitors, and televisions. The Companies have retained Honeywell to administer the program.

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 HVAC units and HVAC tune-ups rebated by the program. For the upstream electronics component of the program, the participant count is equal to the number of electronics equipment sold. For Upstream Lighting component of the program, the participant count is equal to the number of packs sold.

#### 3.3.1 Participation and Reported Savings by Customer Segment

This program serves primarily the residential customer segment. However, some small commercial and GNI contributions result from “cross sector” sales, where a small fraction of the efficient lighting is purchased from participating retailers and installed in nonresidential settings. Table 89, Table 90, Table 91, and Table 92 present the participation counts, reported energy and demand savings, and incentive payments for the EEP Program in PY12 by customer segment and EDC.

**Table 89: EEP Program Participation and Reported Impacts for Met-Ed**

Parameter	Residential (Non-LI)	Small C&I (Non-GNI)	GNI	Total
PYTD # Participants	114,703	4,590	2,799	122,092
PYRTD MWh/yr	13,057	460	280	13,797
PYRTD MW/yr	1.88	0.05	0.03	1.97
PYTD Incentives (\$1000)	1,011.63	12.74	7.77	1,032

**Table 90: EEP Program Participation and Reported Impacts for Penelec**

Parameter	Residential (Non-LI)	Small C&I (Non-GNI)	GNI	Total
PYTD # Participants	113,776	4,797	2,925	121,498
PYRTD MWh/yr	13,468	519	316	14,303
PYRTD MW/yr	1.78	0.05	0.03	1.87
PYTD Incentives (\$1000)	678.39	13.13	8.01	700

**Table 91: EEP Program Participation and Reported Impacts for Penn Power**

Parameter	Residential (Non-LI)	Small C&I (Non-GNI)	GNI	Total
PYTD # Participants	26,081	944	576	27,601
PYRTD MWh/yr	3,168	103	63	3,334
PYRTD MW/yr	0.45	0.01	0.01	0.47
PYTD Incentives (\$1000)	287.47	2.67	1.63	292

**Table 92: EEP Program Participation and Reported Impacts for WPP**

Parameter	Residential (Non-LI)	Small C&I (Non-GNI)	GNI	Total
PYTD # Participants	135,865	5,378	3,279	144,522
PYRTD MWh/yr	15,894	577	352	16,823
PYRTD MW/yr	2.46	0.07	0.05	2.58
PYTD Incentives (\$1000)	1,087.90	14.84	9.05	1,112

### 3.3.2 Gross Impact Evaluation

This program is disaggregated into four initiatives for evaluation. The impact evaluation of the Upstream Lighting initiative is described in detail in Appendix I. The impact evaluation of the Upstream Electronics initiative is described in detail in Appendix J. The impact evaluation of the Res HVAC initiative is described in detail in Appendix K. The impact evaluation of the Res Appliances initiative is described in detail in Appendix L. Table 93 summarizes program verified impacts and realization rates for each EDC.

**Table 93: EEP Program Gross Impact Evaluation Summary for PY12**

EDC	Sampling Initiative	Gross Verified MWh	Gross Verified MW	MWh Realization Rate	MW Realization Rate
Met-Ed	Upstream Lighting	12,565	1.60	121.2%	129.7%
Met-Ed	Upstream Electronics	202	0.02	123.0%	113.1%
Met-Ed	HVAC	2,479	0.53	165.2%	120.4%
Met-Ed	Appliances	2,539	0.40	143.8%	145.5%
<b>Met-Ed Total</b>		<b>17,784</b>	<b>2.56</b>	<b>129%</b>	<b>130%</b>
Penelec	Upstream Lighting	13,845	1.61	118.4%	130.7%
Penelec	Upstream Electronics	102	0.01	134.8%	125.1%
Penelec	HVAC	2,188	0.27	190.9%	73.6%
Penelec	Appliances	1,993	0.37	144.1%	145.4%
<b>Penelec Total</b>		<b>18,128</b>	<b>2.27</b>	<b>127%</b>	<b>121%</b>
Penn Power	Upstream Lighting	2,886	0.36	124.0%	133.5%
Penn Power	Upstream Electronics	86	0.01	137.4%	128.4%
Penn Power	HVAC	905	0.16	211.8%	152.2%
Penn Power	Appliances	741	0.13	143.6%	144.4%
<b>Penn Power Total</b>		<b>4,618</b>	<b>0.66</b>	<b>139%</b>	<b>140%</b>
WPP	Upstream Lighting	15,645	2.10	120.2%	125.8%
WPP	Upstream Electronics	325	0.04	132.3%	124.0%
WPP	HVAC	2,861	0.77	146.7%	128.2%
WPP	Appliances	2,342	0.41	145.1%	146.7%
<b>WPP Total</b>		<b>21,173</b>	<b>3.32</b>	<b>126%</b>	<b>129%</b>

The gross realization rates for energy savings were driven primarily by the realization rates of the upstream lighting programs, which account for most of the program impacts. The reported impacts for upstream lighting are somewhat conservative because reported impacts do not include additional savings contributions from cross sector sales. Reported impacts for HVAC, appliances, and electronics were also conservative and the realization rates reflect measure impacts as calculated with measure-specific attributes using corresponding protocols in the TRM.

### 3.3.2.1 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 PY12 evaluation was not altered due to COVID-19 induced social distancing measures.

### 3.3.3 Net Impact Evaluation

Tetra-Tech conducted a Net-to-Gross evaluation for the HVAC and Appliances portion of this program in PY11, while all components were also evaluated in previous years. The net impact evaluation of the Upstream Lighting Initiative is described in Appendix I.2. The net impact evaluation of the Upstream Electronics Initiative as described in Appendix J.2. The net impact evaluation for the Res HVAC Initiative is described in Appendix K.2. The NTG evaluation for the Res Appliances Initiative is described in Appendix L.2. Table 94 summarizes program verified gross and net energy impacts and net-to-gross ratios for each EDC.

**Table 94: EEP Program Net Impact Evaluation Summary for PY12**

EDC	Sampling Initiative	Gross Verified MWh	NTG	Net Verified MWh
Met-Ed	Upstream Lighting	12,565	29.0%	3,644
Met-Ed	Upstream Electronics	202	58.3%	118
Met-Ed	HVAC	2,479	50.7%	1,257
Met-Ed	Appliances	2,539	50.2%	1,274
<b>Met-Ed Total</b>		<b>17,784</b>	<b>35.4%</b>	<b>6,293</b>
Penelec	Upstream Lighting	13,845	31.0%	4,292
Penelec	Upstream Electronics	102	58.3%	60
Penelec	HVAC	2,188	52.3%	1,145
Penelec	Appliances	1,993	60.0%	1,196
<b>Penelec Total</b>		<b>18,128</b>	<b>36.9%</b>	<b>6,692</b>
Penn Power	Upstream Lighting	2,886	26.0%	750
Penn Power	Upstream Electronics	86	58.3%	50
Penn Power	HVAC	905	54.8%	496
Penn Power	Appliances	741	56.2%	416
<b>Penn Power Total</b>		<b>4,618</b>	<b>37.1%</b>	<b>1,713</b>
WPP	Upstream Lighting	15,645	23.0%	3,598
WPP	Upstream Electronics	325	58.3%	190
WPP	HVAC	2,861	52.0%	1,488
WPP	Appliances	2,342	64.7%	1,515
<b>WPP Total</b>		<b>21,173</b>	<b>32.1%</b>	<b>6,791</b>

**3.3.3.1 High-Impact Measure Research**

The Upstream Lighting Initiative was identified as a High-Impact Measure and researched for net-to-gross in PY8. The net impact evaluation of the Upstream Lighting Initiative is described in Appendix I.2.

**3.3.4 Verified Savings Estimates**

In Table 95 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 PY12. These totals are added to the verified savings achieved in previous program years to calculate the P3TD program impacts.

**Table 95: PYTD and P3TD Savings Summary**

Savings Type	Met-Ed		Penelec		Penn Power		WPP	
	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	13,797	1.97	14,303	1.87	3,334	0.47	16,823	2.58
PYVTD Gross	17,784	2.56	18,128	2.27	4,618	0.66	21,173	3.32
PYVTD Net	6,293	0.95	6,692	0.87	1,713	0.26	6,791	1.17
RTD	104,730	13.69	116,910	13.62	34,954	4.49	121,924	17.14
VTD Gross	159,814	21.72	170,517	20.74	60,345	8.11	181,896	25.93
VTD Net	54,972	7.64	58,149	7.22	19,808	2.78	51,010	7.59

### 3.3.5 Process Evaluation

Process evaluation activities were conducted for various components of this program in each of the first three program years of Phase III, as summarized in in Table 96 below. No process evaluations were conducted for this program in PY12.

**Table 96: EEP Program Process Evaluation Sample Design**

EDC	Measure	Activity	Population Size	Achieved Sample Size	Response Rate
Met-Ed	Appliances and HVAC	Customer Surveys (PY8)	3,424	150	27%
Penelec	Appliances and HVAC		2,736	144	27%
Penn Power	Appliances and HVAC		785	117	26%
WPP	Appliances and HVAC		4,167	146	26%
Met-Ed	Appliances	Retailer Surveys (PY9)	282	20	34%
Penelec	Appliances		350	13	24%
Penn Power	Appliances		242	23	40%
WPP	Appliances		88	15	29%
Met-Ed	Lighting	Customer General Population Survey (PY10)	391,882	233	19.2%
Penelec	Lighting		352,700	276	22.3%
Penn Power	Lighting		114,596	255	21.1%
WPP	Lighting		321,468	237	18.6%
All EDCs	Lighting	Retailer Interviews (PY10)	275	140	52.7%
All EDCs	Lighting	Shelf Stocking Study (PY10)	275	17	4.4%
All EDCs	Electronics	Retailer Interviews (PY10)	11	5	45.5%
Met-Ed	Appliances and HVAC	Customer Surveys (PY11)	4,200	146	20.9%
Penelec	Appliances and HVAC		7,586	151	20.2%
Penn Power	Appliances and HVAC		4,379	148	24.2%
WPP	Appliances and HVAC		3,675	137	18.9%
Met-Ed	Appliances and HVAC	Appliance Retailer Surveys (PY11)	297	44	17.4%
Penelec	Appliances and HVAC		233	35	22.7%
Penn Power	Appliances and HVAC		79	7	17.9%
WPP	Appliances and HVAC		258	38	20.3%
All EDCs	Midstream Appliances	Retailer Interviews (PY11)	54	3	5.6%
All EDCs	HVAC and Water Heating	Participating Contractor Interviews (PY11)	894	6	9.4%
All EDCs	HVAC and Water Heating	Nonparticipating Contractor Interviews (PY11)	na	6	9.4%
<b>Program Total</b>			<b>1,214,936</b>	<b>2,512</b>	<b>23.9%</b>

Process evaluation efforts for each program component are summarized below. Key findings and recommendations are listed in Section 3.3.7.

#### 3.3.5.1 Appliances & HVAC

The appliances and HVAC sub-programs were combined for process evaluation in PY9 since they are both downstream delivery that provide incentives directly to customers. In PY11, the

two programs were again combined for evaluation, although since PY9 the Companies have added midstream offerings for dehumidifiers and heat pump water heaters.

The PY11 process evaluation kicked off with interviews of FirstEnergy and ICSP program staff. The evaluation followed up with a participant customer survey, a survey of participating appliance retailers, and interviews with midstream appliance retailers, HVAC and water heating contractors, and nonparticipating HVAC and water heating contractors. Researchable issues focused on program awareness and marketing, interactions with contractors and retailers, retailer perspectives on appliance attributes that are important to customers, barriers to participation, satisfaction, and participation in the low-income appliance component. The survey sample was randomly selected for each EDC. Related results and recommendations are included in Section 3.3.7.

### 3.3.5.2 Lighting

The lighting sub-program process evaluation began with interviews with FirstEnergy and ICSP program staff. Additionally, the evaluation included a web survey of FirstEnergy residential customers to gather information on their awareness, perception, and preference of different types of lighting, purchase behaviors, and awareness of the FirstEnergy program. Because the program provides a discount on the purchase price as opposed to a customer incentive, participants do not need to be aware of the program to participate. The survey reached customers who likely participated, as well as some who did not. Tetra Tech also conducted shelf stocking studies at 12 participating and five nonparticipating stores. The purpose of these visits was to collect data to evaluate three market progress indicators (MPIs) identified in the Pennsylvania Evaluation Framework:

- Are program products readily available and identifiable on store shelves?
- Are there direct alternatives to program products, whether efficient or inefficient?
- How do the prices of program products compare to similar non-program products?

Tetra Tech also conducted 140 telephone surveys with participating retail stores. The process evaluation component of the survey was designed to gather information on the energy-efficient lighting products sold, sales trends over the past year, expectations about future LED sales, program marketing activities, customer preferences, and suggestions on how to improve the program. Related results and recommendations are included in Section 3.3.7.

Program staff feel the Lighting subprogram is running smoothly: They have a good relationship with retail partners and they are happy with the ICSP. Likewise, the ICSP said communication with FirstEnergy is going well, and they do not have difficulties maintaining a sufficient number of participating stores. The ICSP markets the Lighting subprogram with email and direct mail campaigns and the subcomponents of the EEP program are cross-promoted. The ICSP tries to participate in a community event promoting the program every month.

### 3.3.5.3 Electronics

The electronics sub-program process evaluation began with interviews with FirstEnergy and ICSP program staff. Additionally, all eleven participating retailers were invited to participate in telephone interviews, of which five participated. The survey included net-to-gross and process



evaluation components, similar to those fielded to lighting retailers. Related results and recommendations are included in Section 3.3.7.

Discussion with the FirstEnergy staff in PY10 revealed that the program is running as expected despite not yet reaching its goals. They have a good working relationship with Best Buy (the sole participating retailer) and have no concerns about the measures eligible through the program. Honeywell, the ICSP, believes the program is running smoothly and they have a good working relationship with FirstEnergy and Best Buy. Enrolling stores in the program is a challenge because of the data processing requirements.

### 3.3.6 Cost-Effectiveness Reporting

A detailed breakdown of program finances and cost-effectiveness is presented in Table 98, Table 99, Table 100, and Table 101 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 2019 dollars. NPV costs and benefits for P3TD financials are expressed in the 2016 dollars.

The TRCs presented in this report are considered conservative, as they reflect a dual baseline protocol for residential lighting measures consistent with the current TRM. The TRM specifies that *“calculations for bulbs expected to be installed or remain in use past 2020. For these bulbs, [post EISA 2007 baseline wattages] should be used for the savings calculations until 2020, followed by the [post 2020 baseline wattages] for the remainder of the measure life.”* The Companies note that since the TRM was adopted in 2015, there is growing uncertainty about the likelihood of DOE enforcement of EISA 2020 standard changes as well as the availability of pre 2020 baseline bulbs in the market. This has resulted in most states not adopting the prospective change in standards in cost effectiveness calculations, resulting in higher lifetime savings and benefits.

If TRCs were not to use the dual baselines, gross and net TRCs for the Energy Efficient Products program would increase by 64% and 55% respectively, on average per EDC. Gross and Net TRCs for the EE Products programs, with and without dual baseline treatment are presented in the following table:

**Table 97: Energy Efficient Products Program TRC with and without Dual Baseline Calculations**

EDC	Gross		Net	
	Dual Baseline	Without Dual Baseline	Dual Baseline	Without Dual Baseline
Met-Ed	0.91	2.09	0.70	1.37
Penelec	1.07	2.57	0.81	1.67
Penn Power	1.00	3.01	0.78	1.72
WPP	0.87	1.90	0.63	1.08
Average	0.96	2.39	0.73	1.46

**Table 98: Summary of Program Finances – Met-Ed**

Row #	Cost Category	Gross PYTD (\$1,000)		Gross P3TD (\$1,000)		Net PYTD (\$1,000)		Net P3TD (\$1,000)	
1	EDC Incentives to Participants <sup>[1]</sup>	1,032		8,152		1,032		8,152	
2	EDC Incentives to Trade Allies	0		0		0		0	
3	Participant Costs (net of incentives/rebates paid by utilities)	5,325		29,432		1,832		7,274	
4	Incremental Measure Costs (Sum of rows 1 through 3)	6,357		37,583		2,865		15,426	
		EDC	CSP	EDC	CSP	EDC	CSP	EDC	CSP
5	Design & Development <sup>[2]</sup>	13	1	18	142	13	1	18	142
6	Administration, Management, and Technical Assistance <sup>[3]</sup>	106	173	332	930	106	173	332	930
7	Marketing <sup>[4]</sup>	-68	47	-11	331	-68	47	-11	331
8	Program Delivery <sup>[5]</sup>	0	403	0	2,490	0	403	0	2,490
9	EDC Evaluation Costs	95		573		95		573	
10	SWE Audit Costs	23		151		23		151	
11	Program Overhead Costs (Sum of rows 5 through 10)	794		4,956		794		4,956	
12	NPV of increases in costs of natural gas (or other fuels) for fuel switching programs	0		0		0		0	
13	Total NPV TRC Costs <sup>[6]</sup> (Net present value of sum of rows 4, 11, and 12)	7,151		37,423		3,659		17,918	
14	Total NPV Lifetime Electric Energy Benefits	3,523		30,633		1,466		11,192	
15	Total NPV Lifetime Electric Capacity Benefits	1,002		10,457		430		3,900	
16	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	1,653		17,515		479		5,679	
17	Total NPV Lifetime Non-Electric Benefits (Fossil Fuel, Water)	316		-1,588		189		-382	
18	Total NPV TRC Benefits <sup>[7]</sup> (Sum of rows 14 through 17)	6,494		57,017		2,565		20,389	
19	TRC Benefit-Cost Ratio <sup>[8]</sup>	0.91		1.52		0.70		1.14	

[1] Includes direct install equipment costs and costs for EE&C kits.  
 [2] Includes direct costs attributable to plan and advance the programs. Note: The design of the HERs program should be included here, while the actual development and mailing of HERs would be attributable to Program Delivery.  
 [3] Includes rebate processing, tracking system, general administration, program management, general management and legal, and technical assistance. Any common portfolio costs that are allocated across programs should be shown in this row.  
 [4] Includes the marketing CSP and marketing costs by program CSPs.  
 [5] Direct program implementation costs. Labor, fuel, and vehicle operation costs for appliance recycling and direct install programs. For behavioral programs, this includes the printing and postage of HERs.  
 [6] Total TRC Costs includes Total EDC Costs and Participant Costs.  
 [7] Total TRC Benefits equals the sum of Total Lifetime Electric and Non-Electric Benefits. Benefits include: avoided supply costs, including the reduction in costs of electric energy, generation, transmission, and distribution capacity, and natural gas valued at marginal cost for periods when there is a load reduction. Savings carried over from Phase II are not included as a part of Total TRC Benefits for Phase III.  
 [8] TRC Ratio equals Total NPV TRC Benefits divided by Total NPV TRC Costs.  
 \* Rows 1-11 are presented in nominal dollars

**Table 99: 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	EDC Incentives to Participants <sup>[1]</sup>	700		6,893		700		6,893	
2	EDC Incentives to Trade Allies	0		0		0		0	
3	Participant Costs (net of incentives/rebates paid by utilities)	3,916		24,419		1,447		6,056	
4	Incremental Measure Costs (Sum of rows 1 through 3)	4,615		31,312		2,146		12,949	
		EDC	CSP	EDC	CSP	EDC	CSP	EDC	CSP
5	Design & Development <sup>[2]</sup>	14	1	20	153	14	1	20	153
6	Administration, Management, and Technical Assistance <sup>[3]</sup>	112	164	351	922	112	164	351	922
7	Marketing <sup>[4]</sup>	-68	32	-11	271	-68	32	-11	271
8	Program Delivery <sup>[5]</sup>	0	383	0	2,496	0	383	0	2,496
9	EDC Evaluation Costs	91		550		91		550	
10	SWE Audit Costs	24		154		24		154	
11	Program Overhead Costs (Sum of rows 5 through 10)	754		4,906		754		4,906	
12	NPV of increases in costs of natural gas (or other fuels) for fuel switching programs	0		0		0		0	
13	Total NPV TRC Costs <sup>[6]</sup> (Net present value of sum of rows 4, 11, and 12)	5,370		31,885		2,901		15,666	
14	Total NPV Lifetime Electric Energy Benefits	3,215		31,455		1,410		11,244	
15	Total NPV Lifetime Electric Capacity Benefits	756		10,180		341		3,644	
16	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	1,779		18,609		552		6,019	
17	Total NPV Lifetime Non-Electric Benefits (Fossil Fuel, Water)	-7		-3,315		42		-976	
18	Total NPV TRC Benefits <sup>[7]</sup> (Sum of rows 14 through 17)	5,743		56,930		2,345		19,932	
19	TRC Benefit-Cost Ratio <sup>[8]</sup>	1.07		1.79		0.81		1.27	
<p>[1] Includes direct install equipment costs and costs for EE&amp;C kits.</p> <p>[2] Includes direct costs attributable to plan and advance the programs. Note: The design of the HERs program should be included here, while the actual development and mailing of HERs would be attributable to Program Delivery.</p> <p>[3] Includes rebate processing, tracking system, general administration, program management, general management and legal, and technical assistance. Any common portfolio costs that are allocated across programs should be shown in this row.</p> <p>[4] Includes the marketing CSP and marketing costs by program CSPs.</p> <p>[5] Direct program implementation costs. Labor, fuel, and vehicle operation costs for appliance recycling and direct install programs. For behavioral programs, this includes the printing and postage of HERs.</p> <p>[6] Total TRC Costs includes Total EDC Costs and Participant Costs.</p> <p>[7] Total TRC Benefits equals the sum of Total Lifetime Electric and Non-Electric Benefits. Benefits include: avoided supply costs, including the reduction in costs of electric energy, generation, transmission, and distribution capacity, and natural gas valued at marginal cost for periods when there is a load reduction. Savings carried over from Phase II are not included as a part of Total TRC Benefits for Phase III.</p> <p>[8] TRC Ratio equals Total NPV TRC Benefits divided by Total NPV TRC Costs.</p> <p>* Rows 1-11 are presented in nominal dollars</p>									

**Table 100: 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	EDC Incentives to Participants <sup>[1]</sup>	292		2,484		292		2,484	
2	EDC Incentives to Trade Allies	0		0		0		0	
3	Participant Costs (net of incentives/rebates paid by utilities)	1,227		8,353		477		2,033	
4	Incremental Measure Costs (Sum of rows 1 through 3)	1,518		10,837		769		4,518	
		EDC	CSP	EDC	CSP	EDC	CSP	EDC	CSP
5	Design & Development <sup>[2]</sup>	3	0	4	34	3	0	4	34
6	Administration, Management, and Technical Assistance <sup>[3]</sup>	32	32	57	251	32	32	57	251
7	Marketing <sup>[4]</sup>	-16	8	-3	52	-16	8	-3	52
8	Program Delivery <sup>[5]</sup>	0	74	0	662	0	74	0	662
9	EDC Evaluation Costs	19		118		19		118	
10	SWE Audit Costs	6		35		6		35	
11	Program Overhead Costs (Sum of rows 5 through 10)	157		1,211		157		1,211	
12	NPV of increases in costs of natural gas (or other fuels) for fuel switching programs	0		0		0		0	
13	Total NPV TRC Costs <sup>[6]</sup> (Net present value of sum of rows 4, 11, and 12)	1,676		10,546		926		5,011	
14	Total NPV Lifetime Electric Energy Benefits	982		10,801		449		3,843	
15	Total NPV Lifetime Electric Capacity Benefits	264		3,120		124		1,159	
16	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	366		6,444		95		2,007	
17	Total NPV Lifetime Non-Electric Benefits (Fossil Fuel, Water)	67		-870		50		-218	
18	Total NPV TRC Benefits <sup>[7]</sup> (Sum of rows 14 through 17)	1,679		19,495		718		6,789	
19	TRC Benefit-Cost Ratio <sup>[8]</sup>	1.00		1.85		0.78		1.35	

[1] Includes direct install equipment costs and costs for EE&C kits.  
 [2] Includes direct costs attributable to plan and advance the programs. Note: The design of the HERs program should be included here, while the actual development and mailing of HERs would be attributable to Program Delivery.  
 [3] Includes rebate processing, tracking system, general administration, program management, general management and legal, and technical assistance. Any common portfolio costs that are allocated across programs should be shown in this row.  
 [4] Includes the marketing CSP and marketing costs by program CSPs.  
 [5] Direct program implementation costs. Labor, fuel, and vehicle operation costs for appliance recycling and direct install programs. For behavioral programs, this includes the printing and postage of HERs.  
 [6] Total TRC Costs includes Total EDC Costs and Participant Costs.  
 [7] Total TRC Benefits equals the sum of Total Lifetime Electric and Non-Electric Benefits. Benefits include: avoided supply costs, including the reduction in costs of electric energy, generation, transmission, and distribution capacity, and natural gas valued at marginal cost for periods when there is a load reduction. Savings carried over from Phase II are not included as a part of Total TRC Benefits for Phase III.  
 [8] TRC Ratio equals Total NPV TRC Benefits divided by Total NPV TRC Costs.  
 \* Rows 1-11 are presented in nominal dollars

**Table 101: 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	EDC Incentives to Participants <sup>[1]</sup>	1,112		8,677		1,112		8,677	
2	EDC Incentives to Trade Allies	0		0		0		0	
3	Participant Costs (net of incentives/rebates paid by utilities)	6,044		31,447		2,189		6,998	
4	Incremental Measure Costs (Sum of rows 1 through 3)	7,155		40,124		3,301		15,674	
		EDC	CSP	EDC	CSP	EDC	CSP	EDC	CSP
5	Design & Development <sup>[2]</sup>	15	1	21	166	15	1	21	166
6	Administration, Management, and Technical Assistance <sup>[3]</sup>	119	206	456	1,080	119	206	456	1,080
7	Marketing <sup>[4]</sup>	-76	123	-13	692	-76	123	-13	692
8	Program Delivery <sup>[5]</sup>	0	481	0	2,895	0	481	0	2,895
9	EDC Evaluation Costs	107		625		107		625	
10	SWE Audit Costs	23		158		23		158	
11	Program Overhead Costs (Sum of rows 5 through 10)	998		6,079		998		6,079	
12	NPV of increases in costs of natural gas (or other fuels) for fuel switching programs	0		0		0		0	
13	Total NPV TRC Costs <sup>[6]</sup> (Net present value of sum of rows 4, 11, and 12)	8,154		40,569		4,299		19,022	
14	Total NPV Lifetime Electric Energy Benefits	3,792		31,651		1,580		9,755	
15	Total NPV Lifetime Electric Capacity Benefits	1,208		11,920		532		3,689	
16	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	2,000		19,121		460		4,691	
17	Total NPV Lifetime Non-Electric Benefits (Fossil Fuel, Water)	102		-3,520		146		-581	
18	Total NPV TRC Benefits <sup>[7]</sup> (Sum of rows 14 through 17)	7,101		59,173		2,718		17,554	
19	TRC Benefit-Cost Ratio <sup>[8]</sup>	0.87		1.46		0.63		0.92	

[1] Includes direct install equipment costs and costs for EE&C kits.  
 [2] Includes direct costs attributable to plan and advance the programs. Note: The design of the HERs program should be included here, while the actual development and mailing of HERs would be attributable to Program Delivery.  
 [3] Includes rebate processing, tracking system, general administration, program management, general management and legal, and technical assistance. Any common portfolio costs that are allocated across programs should be shown in this row.  
 [4] Includes the marketing CSP and marketing costs by program CSPs.  
 [5] Direct program implementation costs. Labor, fuel, and vehicle operation costs for appliance recycling and direct install programs. For behavioral programs, this includes the printing and postage of HERs.  
 [6] Total TRC Costs includes Total EDC Costs and Participant Costs.  
 [7] Total TRC Benefits equals the sum of Total Lifetime Electric and Non-Electric Benefits. Benefits include: avoided supply costs, including the reduction in costs of electric energy, generation, transmission, and distribution capacity, and natural gas valued at marginal cost for periods when there is a load reduction. Savings carried over from Phase II are not included as a part of Total TRC Benefits for Phase III.  
 [8] TRC Ratio equals Total NPV TRC Benefits divided by Total NPV TRC Costs.  
 \* Rows 1-11 are presented in nominal dollars.

### 3.3.7 Status of Recommendations

No program components were evaluated in PY12. Findings and recommendations from previous process evaluation efforts are available in the PY8, PY9, and PY10 annual reports.

### 3.4 LOW-INCOME ENERGY EFFICIENCY PROGRAM

The Low-Income Energy Efficiency Program (LIEEP) has six distinct components, 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.

The *Low-Income Appliance Turn-In* (LI ATI) component is administered by ARCA. The program is implemented in parallel with the main residential Appliance Turn-In 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:

- Low-Income EE Kits administered by PowerDirect
- Low-Income School Education Program administered by AM Conservation Group (AMCG)

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. Each kit is treated as a participant.

The *Low-Income Appliance Rebates* (LI Appliances) component is administered by Honeywell 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 *New Homes* component is similar to the New Homes component in the Energy Efficient Homes Program, but is targeted to low-income customers.

### 3.4.1 Participation and Reported Savings by Customer Segment

Table 102 presents the participation counts, reported energy and demand savings, and incentive payments for the Appliance Turn-In Program in PY12 by customer segment and EDC. This program serves only the residential customer segment. The EE&C portfolios include separate Appliance Turn-In program components, also administered by ARCA, to serve the low-income residential and the nonresidential customer segments.

**Table 102: LIEEP Participation and Reported Impacts**

Parameter	Met-Ed LI Residential	Penelec LI Residential	Penn Power LI Residential	WPP LI Residential
PYTD # Participants	12,061	15,580	2,857	14,151
PYRTD MWh/yr	3,275	2,792	691	3,164
PYRTD MW/yr	0.49	0.36	0.11	0.48
PYTD Incentives (\$1000)	59.30	60.79	5.92	46.20

### 3.4.2 Gross Impact Evaluation

The gross impact evaluation of this program is described in detail in Appendix D.1. Table 103 summarizes program verified impacts and realization rates for each EDC.

**Table 103: LIEEP Gross Impact Evaluation Summary for PY12**

EDC	Sampling Initiative	Gross Verified MWh	Gross Verified MW	MWh Realization Rate	MW Realization Rate
Met-Ed	Appliances	25	0.00	127.0%	118.5%
Met-Ed	Appliance Turn-In	400	0.05	96.9%	85.1%
Met-Ed	Direct Install	1,012	0.11	100.7%	101.2%
Met-Ed	Home Energy Reports	2,231	0.25	123.3%	80.4%
Met-Ed	Kits	0	0.00	100.0%	100.0%
Met-Ed	New Homes	21	0.00	76.1%	87.5%
<b>Met-Ed Total</b>		<b>3,688</b>	<b>0.42</b>	<b>113%</b>	<b>86%</b>
Penelec	Appliances	33	0.00	129.5%	125.8%
Penelec	Appliance Turn-In	543	0.07	95.2%	90.4%
Penelec	Direct Install	747	0.07	98.5%	97.9%
Penelec	Home Energy Reports	1,197	0.13	83.3%	66.4%
Penelec	Kits	0	0.00	0.0%	0.0%
Penelec	New Homes	0	0.00	81.4%	92.9%
<b>Penelec Total</b>		<b>2,520</b>	<b>0.29</b>	<b>90%</b>	<b>79%</b>
Penn Power	Appliances	11	0.00	135.8%	126.5%
Penn Power	Appliance Turn-In	0	0.00	100.0%	100.0%
Penn Power	Direct Install	103	0.01	101.8%	103.2%
Penn Power	Home Energy Reports	639	0.07	110.2%	76.9%
Penn Power	Kits	0	0.00	100.0%	100.0%
Penn Power	New Homes	2	0.00	75.9%	81.9%
<b>Penn Power Total</b>		<b>755</b>	<b>0.09</b>	<b>109%</b>	<b>80%</b>
WPP	Appliances	30	0.00	126.8%	116.0%
WPP	Appliance Turn-In	361	0.05	92.8%	86.6%
WPP	Direct Install	756	0.08	97.7%	100.4%
WPP	Home Energy Reports	1,258	0.13	63.6%	38.2%
WPP	Kits	0	0.00	100.0%	100.0%
WPP	New Homes	0	0.00	77.3%	83.4%
<b>WPP Total</b>		<b>2,405</b>	<b>0.26</b>	<b>76%</b>	<b>54%</b>

The gross realization rates for energy savings were driven primarily by the two largest components, Home Energy Reports and Direct Install. The smaller program components: Appliances, Kits, and New Homes, had more variability in realization rates than the larger program components.

### 3.4.2.1 Evaluation Adjustments in Response to the COVID-19 Pandemic

As discussed in previous sections, the evaluation effort for the Appliances, Appliance Turn-In, Home Energy Reports, and Energy Conservation Kit components were not impacted by the COVID-19 pandemic. Gross impact evaluation was not conducted for the New Homes component in PY12. Evaluation of the Direct Install component does leverages data collected during on-site inspections by the Companies' QA/QC contractors. These inspections resumed in PY12 and yielded sufficient data for gross impact evaluation.



### 3.4.3 Net Impact Evaluation

Net impact evaluation was not formally conducted for this program in PY12, in accordance with our evaluation plan. NTG results are available for the Appliance Turn-In program component. The NTG for the Low-Income Energy Efficiency Program is estimated as 1.0 at this time for the purpose of net cost effectiveness calculations.

### 3.4.4 Verified Savings Estimates

In Table 104 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 PY12. These totals are added to the verified savings achieved in previous program years to calculate the P3TD program impacts.

**Table 104: PYTD and P3TD Savings Summary**

Savings Type	Met-Ed		Penelec		Penn Power		WPP	
	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	3,275	0.49	2,792	0.36	691	0.11	3,164	0.48
PYVTD Gross	3,688	0.42	2,520	0.29	755	0.09	2,405	0.26
PYVTD Net	3,688	0.42	2,520	0.29	755	0.09	2,405	0.26
RTD	37,394	4.74	37,935	4.46	11,692	1.49	36,883	5.01
VTD Gross	42,563	4.92	41,250	4.43	11,953	1.39	37,447	4.38
VTD Net	42,563	4.92	41,250	4.43	11,953	1.39	37,447	4.38

### 3.4.5 Process Evaluation

Tetra Tech conducted a process evaluation for this program in PY8, and again in PY11. The PY11 process evaluation for the Low-Income WARM and Multifamily components began with an interview of the program managers, followed by interviews with energy specialists (auditors and installers), and customer surveys.

Process evaluations for the Appliance Rebate, Behavioral, and Kits sub-programs were conducted with the similar Non-Low-Income programs in the Energy Efficient Products and Energy Efficient Homes programs, respectively. Findings and recommendations for those program components are reported in those sections. The sample design for the WARM and Multifamily process evaluation is shown in Table 105. Please note that the population counts in the table are from PY8 and PY11 as indicated under the “Activity” column.

**Table 105: LIP Program Process Evaluation Sample Design**

EDC	Measure	Activity	Population Size	Achieved Sample Size	Response Rate
Met-Ed	Dired Install	Customer Surveys (PY8)	1,551	80	30.0%
Penelec	Dired Install		2,433	85	38.0%
Penn Power	Dired Install		842	73	36.0%
WPP	Dired Install		1,954	101	35.0%
Met-Ed	Dired Install	Customer Surveys (PY11)	818	105	25.0%
Penelec	Dired Install		1,391	105	25.0%
Penn Power	Dired Install		572	94	25.0%
WPP	Dired Install		1,117	105	25.0%
All EDCs	Dired Install	Energy Specialist Interviews (PY11)	30	9	30.0%

Key findings and recommendations are listed in Section 3.4.7.

### 3.4.6 Cost-Effectiveness Reporting

A detailed breakdown of program finances and cost-effectiveness is presented in Table 106, Table 107, Table 108, and Table 109 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 2019 dollars. NPV costs and benefits for P3TD financials are expressed in the 2016 dollars.

**Table 106: Summary of Program Finances – Met-Ed**

Row #	Cost Category	Gross PYTD (\$1,000)		Gross P3TD (\$1,000)		Net PYTD (\$1,000)		Net P3TD (\$1,000)	
1	EDC Incentives to Participants <sup>[1]</sup>	59		411		59		411	
2	EDC Incentives to Trade Allies	0		0		0		0	
3	Participant Costs (net of incentives/rebates paid by utilities)	19		96		19		96	
4	Incremental Measure Costs (Sum of rows 1 through 3)	78		507		78		507	
		EDC	CSP	EDC	CSP	EDC	CSP	EDC	CSP
5	Design & Development <sup>[2]</sup>	18	2	28	205	18	2	28	205
6	Administration, Management, and Technical Assistance <sup>[3]</sup>	101	41	699	1,227	101	41	699	1,227
7	Marketing <sup>[4]</sup>	0	113	78	609	0	113	78	609
8	Program Delivery <sup>[5]</sup>	85	1,378	513	9,572	85	1,378	513	9,572
9	EDC Evaluation Costs	76		508		76		508	
10	SWE Audit Costs	30		282		30		282	
11	Program Overhead Costs (Sum of rows 5 through 10)	1,843		13,719		1,843		13,719	
12	NPV of increases in costs of natural gas (or other fuels) for fuel switching programs	0		0		0		0	
13	Total NPV TRC Costs <sup>[6]</sup> (Net present value of sum of rows 4, 11, and 12)	1,921		12,838		1,921		12,838	
14	Total NPV Lifetime Electric Energy Benefits	441		6,787		441		6,787	
15	Total NPV Lifetime Electric Capacity Benefits	93		1,895		93		1,895	
16	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	0		489		0		489	
17	Total NPV Lifetime Non-Electric Benefits (Fossil Fuel, Water)	-7		720		-7		720	
18	Total NPV TRC Benefits <sup>[7]</sup> (Sum of rows 14 through 17)	527		9,891		527		9,891	
19	TRC Benefit-Cost Ratio <sup>[8]</sup>	0.27		0.77		0.27		0.77	

[1] Includes direct install equipment costs and costs for EE&C kits.  
 [2] Includes direct costs attributable to plan and advance the programs. Note: The design of the HERs program should be included here, while the actual development and mailing of HERs would be attributable to Program Delivery.  
 [3] Includes rebate processing, tracking system, general administration, program management, general management and legal, and technical assistance. Any common portfolio costs that are allocated across programs should be shown in this row.  
 [4] Includes the marketing CSP and marketing costs by program CSPs.  
 [5] Direct program implementation costs. Labor, fuel, and vehicle operation costs for appliance recycling and direct install programs. For behavioral programs, this includes the printing and postage of HERs.  
 [6] Total TRC Costs includes Total EDC Costs and Participant Costs.  
 [7] Total TRC Benefits equals the sum of Total Lifetime Electric and Non-Electric Benefits. Benefits include: avoided supply costs, including the reduction in costs of electric energy, generation, transmission, and distribution capacity, and natural gas valued at marginal cost for periods when there is a load reduction. Savings carried over from Phase II are not included as a part of Total TRC Benefits for Phase III.  
 [8] TRC Ratio equals Total NPV TRC Benefits divided by Total NPV TRC Costs.  
 \* Rows 1-11 are presented in nominal dollars

**Table 107: 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	EDC Incentives to Participants <sup>[1]</sup>	61		472		61		472	
2	EDC Incentives to Trade Allies	0		0		0		0	
3	Participant Costs (net of incentives/rebates paid by utilities)	16		96		16		96	
4	Incremental Measure Costs (Sum of rows 1 through 3)	77		568		77		568	
		EDC	CSP	EDC	CSP	EDC	CSP	EDC	CSP
5	Design & Development <sup>[2]</sup>	20	2	31	224	20	2	31	224
6	Administration, Management, and Technical Assistance <sup>[3]</sup>	121	22	786	1,246	121	22	786	1,246
7	Marketing <sup>[4]</sup>	0	90	83	510	0	90	83	510
8	Program Delivery <sup>[5]</sup>	110	983	632	9,064	110	983	632	9,064
9	EDC Evaluation Costs	78		538		78		538	
10	SWE Audit Costs	33		298		33		298	
11	Program Overhead Costs (Sum of rows 5 through 10)	1,459		13,411		1,459		13,411	
12	NPV of increases in costs of natural gas (or other fuels) for fuel switching programs	0		0		0		0	
13	Total NPV TRC Costs <sup>[6]</sup> (Net present value of sum of rows 4, 11, and 12)	1,536		12,629		1,536		12,629	
14	Total NPV Lifetime Electric Energy Benefits	363		7,232		363		7,232	
15	Total NPV Lifetime Electric Capacity Benefits	75		1,890		75		1,890	
16	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	0		434		0		434	
17	Total NPV Lifetime Non-Electric Benefits (Fossil Fuel, Water)	7		793		7		793	
18	Total NPV TRC Benefits <sup>[7]</sup> (Sum of rows 14 through 17)	445		10,348		445		10,348	
19	TRC Benefit-Cost Ratio <sup>[8]</sup>	0.29		0.82		0.29		0.82	
<p>[1] Includes direct install equipment costs and costs for EE&amp;C kits.</p> <p>[2] Includes direct costs attributable to plan and advance the programs. Note: The design of the HERs program should be included here, while the actual development and mailing of HERs would be attributable to Program Delivery.</p> <p>[3] Includes rebate processing, tracking system, general administration, program management, general management and legal, and technical assistance. Any common portfolio costs that are allocated across programs should be shown in this row.</p> <p>[4] Includes the marketing CSP and marketing costs by program CSPs.</p> <p>[5] Direct program implementation costs. Labor, fuel, and vehicle operation costs for appliance recycling and direct install programs. For behavioral programs, this includes the printing and postage of HERs.</p> <p>[6] Total TRC Costs includes Total EDC Costs and Participant Costs.</p> <p>[7] Total TRC Benefits equals the sum of Total Lifetime Electric and Non-Electric Benefits. Benefits include: avoided supply costs, including the reduction in costs of electric energy, generation, transmission, and distribution capacity, and natural gas valued at marginal cost for periods when there is a load reduction. Savings carried over from Phase II are not included as a part of Total TRC Benefits for Phase III.</p> <p>[8] TRC Ratio equals Total NPV TRC Benefits divided by Total NPV TRC Costs.</p> <p>* Rows 1-11 are presented in nominal dollars</p>									

**Table 108: 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	EDC Incentives to Participants <sup>[1]</sup>	6		127		6		127	
2	EDC Incentives to Trade Allies	0		0		0		0	
3	Participant Costs (net of incentives/rebates paid by utilities)	5		62		5		62	
4	Incremental Measure Costs (Sum of rows 1 through 3)	11		188		11		188	
		EDC	CSP	EDC	CSP	EDC	CSP	EDC	CSP
5	Design & Development <sup>[2]</sup>	6	1	9	56	6	1	9	56
6	Administration, Management, and Technical Assistance <sup>[3]</sup>	38	2	237	309	38	2	237	309
7	Marketing <sup>[4]</sup>	0	28	23	169	0	28	23	169
8	Program Delivery <sup>[5]</sup>	56	127	279	2,520	56	127	279	2,520
9	EDC Evaluation Costs	22		172		22		172	
10	SWE Audit Costs	10		86		10		86	
11	Program Overhead Costs (Sum of rows 5 through 10)	289		3,859		289		3,859	
12	NPV of increases in costs of natural gas (or other fuels) for fuel switching programs	0		0		0		0	
13	Total NPV TRC Costs <sup>[6]</sup> (Net present value of sum of rows 4, 11, and 12)	300		3,677		300		3,677	
14	Total NPV Lifetime Electric Energy Benefits	53		2,113		53		2,113	
15	Total NPV Lifetime Electric Capacity Benefits	11		525		11		525	
16	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	0		140		0		140	
17	Total NPV Lifetime Non-Electric Benefits (Fossil Fuel, Water)	10		147		10		147	
18	Total NPV TRC Benefits <sup>[7]</sup> (Sum of rows 14 through 17)	73		2,925		73		2,925	
19	TRC Benefit-Cost Ratio <sup>[8]</sup>	0.24		0.80		0.24		0.80	

[1] Includes direct install equipment costs and costs for EE&C kits.  
 [2] Includes direct costs attributable to plan and advance the programs. Note: The design of the HERs program should be included here, while the actual development and mailing of HERs would be attributable to Program Delivery.  
 [3] Includes rebate processing, tracking system, general administration, program management, general management and legal, and technical assistance. Any common portfolio costs that are allocated across programs should be shown in this row.  
 [4] Includes the marketing CSP and marketing costs by program CSPs.  
 [5] Direct program implementation costs. Labor, fuel, and vehicle operation costs for appliance recycling and direct install programs. For behavioral programs, this includes the printing and postage of HERs.  
 [6] Total TRC Costs includes Total EDC Costs and Participant Costs.  
 [7] Total TRC Benefits equals the sum of Total Lifetime Electric and Non-Electric Benefits. Benefits include: avoided supply costs, including the reduction in costs of electric energy, generation, transmission, and distribution capacity, and natural gas valued at marginal cost for periods when there is a load reduction. Savings carried over from Phase II are not included as a part of Total TRC Benefits for Phase III.  
 [8] TRC Ratio equals Total NPV TRC Benefits divided by Total NPV TRC Costs.  
 \* Rows 1-11 are presented in nominal dollars

**Table 109: 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	EDC Incentives to Participants <sup>[1]</sup>	46		352		46		352	
2	EDC Incentives to Trade Allies	0		0		0		0	
3	Participant Costs (net of incentives/rebates paid by utilities)	14		76		14		76	
4	Incremental Measure Costs (Sum of rows 1 through 3)	60		428		60		428	
		EDC	CSP	EDC	CSP	EDC	CSP	EDC	CSP
5	Design & Development <sup>[2]</sup>	17	2	26	201	17	2	26	201
6	Administration, Management, and Technical Assistance <sup>[3]</sup>	99	32	683	1,158	99	32	683	1,158
7	Marketing <sup>[4]</sup>	0	108	72	636	0	108	72	636
8	Program Delivery <sup>[5]</sup>	95	1,024	564	10,660	95	1,024	564	10,660
9	EDC Evaluation Costs	74		532		74		532	
10	SWE Audit Costs	26		239		26		239	
11	Program Overhead Costs (Sum of rows 5 through 10)	1,475		14,771		1,475		14,771	
12	NPV of increases in costs of natural gas (or other fuels) for fuel switching programs	0		0		0		0	
13	Total NPV TRC Costs <sup>[6]</sup> (Net present value of sum of rows 4, 11, and 12)	1,535		13,613		1,535		13,613	
14	Total NPV Lifetime Electric Energy Benefits	324		6,278		324		6,278	
15	Total NPV Lifetime Electric Capacity Benefits	64		1,609		64		1,609	
16	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	0		387		0		387	
17	Total NPV Lifetime Non-Electric Benefits (Fossil Fuel, Water)	47		606		47		606	
18	Total NPV TRC Benefits <sup>[7]</sup> (Sum of rows 14 through 17)	435		8,880		435		8,880	
19	TRC Benefit-Cost Ratio <sup>[8]</sup>	0.28		0.65		0.28		0.65	

[1] Includes direct install equipment costs and costs for EE&C kits.  
 [2] Includes direct costs attributable to plan and advance the programs. Note: The design of the HERs program should be included here, while the actual development and mailing of HERs would be attributable to Program Delivery.  
 [3] Includes rebate processing, tracking system, general administration, program management, general management and legal, and technical assistance. Any common portfolio costs that are allocated across programs should be shown in this row.  
 [4] Includes the marketing CSP and marketing costs by program CSPs.  
 [5] Direct program implementation costs. Labor, fuel, and vehicle operation costs for appliance recycling and direct install programs. For behavioral programs, this includes the printing and postage of HERs.  
 [6] Total TRC Costs includes Total EDC Costs and Participant Costs.  
 [7] Total TRC Benefits equals the sum of Total Lifetime Electric and Non-Electric Benefits. Benefits include: avoided supply costs, including the reduction in costs of electric energy, generation, transmission, and distribution capacity, and natural gas valued at marginal cost for periods when there is a load reduction. Savings carried over from Phase II are not included as a part of Total TRC Benefits for Phase III.  
 [8] TRC Ratio equals Total NPV TRC Benefits divided by Total NPV TRC Costs.  
 \* Rows 1-11 are presented in nominal dollars

### 3.4.7 Status of Recommendations

The most recent process evaluation for this program occurred in PY11. Findings and recommendations from that process evaluation effort are available in the PY11 annual report.

### 3.5 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 CLEAResult and ARCA for PY12. The Sodexo portion of the program includes downstream incentives for customers that install energy efficient equipment. Major program components include lighting (both new construction and retrofits), custom HVAC upgrades, compressed air projects, process improvements, and prescriptive HVAC, refrigeration, and food-service measures. The incentives for most downstream measures are proportional to the reported energy savings. The ARCA portion of the program included refrigerator, freezer, and room air conditioner recycling.

#### 3.5.1 Participation and Reported Savings by Customer Segment

Table 110 and Table 111 present the participation counts, reported energy and demand savings, and incentive payments for the ESB-Small Program in PY12 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 110: 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	223	37	260	349	26	375
PYRTD MWh/yr	14,170	1,370	15,540	14,735	2,853	17,588
PYRTD MW/yr	2.12	0.23	2.35	2.08	0.53	2.61
PYTD Incentives (\$1000)	745.66	70.42	816.08	716.65	124.56	841.22

**Table 111: 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	77	8	85	354	25	379
PYRTD MWh/yr	10,639	675	11,315	20,678	2,386	23,063
PYRTD MW/yr	1.29	0.11	1.39	3.04	0.46	3.50
PYTD Incentives (\$1000)	436.23	30.45	466.68	920.43	107.89	1,028.31

#### 3.5.2 Gross Impact Evaluation

The ESB-Small Program was disaggregated into four sampling initiatives for gross impact evaluation, as described in Appendix C. The Appliance Turn-In program component, administered by ARCA, was not evaluated in PY12. The gross realization rates for PY12 are taken as the averages of the PY11 and PY12 realization rates as is described in Appendix S. Lighting improvements were grouped into the C/I Lighting initiative, and evaluated according to PA TRM protocols as described in detail in Appendix P. Prescriptive HVAC and appliance

projects were grouped into the Prescriptive Initiative. The evaluation of Prescriptive projects is described in Appendix R. 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 Q. The program also has a Direct Install Initiative. Evaluation activities for the Direct Install Initiative are described in Appendix T. For all EDCs, the Lighting initiative attributed for the majority of program savings, followed by the Custom initiative. The Prescriptive and Appliance Turn-In initiatives accounted for small fractions of overall program impacts. Table 112 summarizes program verified impacts and realization rates for each EDC.

**Table 112: ESB-Small Program Gross Impact Evaluation Summary for PY12**

EDC	Sampling Initiative	Gross Verified MWh	Gross Verified MW	MWh Realization Rate	MW Realization Rate
Met-Ed	Lighting	10,730	1.51	95%	91%
Met-Ed	Custom	3,781	0.58	100%	90%
Met-Ed	Prescriptive	122	0.01	93%	84%
Met-Ed	Appliance Turn-In	65	0.01	111%	81%
Met-Ed	Direct Install	255	0.03	109%	109%
<b>Met-Ed Total</b>		<b>14,952</b>	<b>2.14</b>	<b>96%</b>	<b>91%</b>
Penelec	Lighting	12,873	2.35	92%	107%
Penelec	Custom	2,657	0.30	98%	100%
Penelec	Prescriptive	204	0.02	95%	85%
Penelec	Appliance Turn-In	43	0.01	85%	75%
Penelec	Direct Install	712	0.07	104%	104%
<b>Penelec Total</b>		<b>16,490</b>	<b>2.75</b>	<b>94%</b>	<b>106%</b>
Penn Power	Lighting	6,222	0.86	96%	94%
Penn Power	Custom	4,093	0.41	98%	100%
Penn Power	Prescriptive	149	0.03	98%	87%
Penn Power	Appliance Turn-In	0	0.00	100%	100%
Penn Power	Direct Install	461	0.04	95%	95%
<b>Penn Power Total</b>		<b>10,925</b>	<b>1.34</b>	<b>97%</b>	<b>96%</b>
WPP	Lighting	13,157	2.02	96%	96%
WPP	Custom	7,222	1.21	111%	107%
WPP	Prescriptive	282	0.05	98%	89%
WPP	Appliance Turn-In	37	0.00	96%	85%
WPP	Direct Install	2,186	0.19	86%	94%
<b>WPP Total</b>		<b>22,885</b>	<b>3.48</b>	<b>99%</b>	<b>99%</b>

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.

### 3.5.2.1 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 stopped conducting on-site visits in March 2020, but resumed on-site visits after businesses reopened and after ADM field staff



became fully vaccinated. ADM also continued to replace in-person visits with telephone interviews or virtual on-site visits with two-way video conferences when practicable, and when evaluation rigor was not impacted. In some cases, ADM sent data loggers to customers, who then installed, removed, and sent them back to ADM for analysis. To the extent possible ADM relied on trending data from energy management systems and customer billing data, however billing analyses were conducted only if ADM could determine that facility operations were not impacted by COVID during the periods of interest.

### 3.5.3 Net Impact Evaluation

Tetra-Tech conducted a Net-to-Gross evaluation for this program in PY10. The net impact evaluation of the Lighting Initiative is described in Appendix P.2. The net impact evaluation of the Custom Initiative is described in Appendix Q.2. The net impact evaluation of the Prescriptive Initiative is described in Appendix R.2. Net impact evaluation was not conducted for the Appliance Turn-In Initiative or the Direct Install Initiative. The NTG for the Appliance Turn-In Initiative is estimated to be the same as the NTG of the residential Appliance Turn-In Initiative, while the NTG of the Direct Install Initiative is estimated to be the same as for the Lighting Initiative, as all rebated projects to date were found to be lighting retrofits.

Table 113 summarizes program verified gross and net energy impacts and net-to-gross ratios for each EDC.

**Table 113: ESB-Small Program Net Impact Evaluation Summary for PY12**

EDC	Sampling Initiative	Gross Verified MWh	NTG	Net Verified MWh
Met-Ed	Lighting	10,730	62.0%	6,651
Met-Ed	Custom	3,781	55.5%	2,098
Met-Ed	Prescriptive	122	73.7%	90
Met-Ed	Appliance Turn-In	65	45.0%	29
Met-Ed	Direct Install	255	62.0%	158
<b>Met-Ed Total</b>		<b>14,952</b>	<b>60.4%</b>	<b>9,026</b>
Penelec	Lighting	12,873	81.4%	10,481
Penelec	Custom	2,657	81.1%	2,155
Penelec	Prescriptive	204	41.9%	86
Penelec	Appliance Turn-In	43	47.0%	20
Penelec	Direct Install	712	81.4%	580
<b>Penelec Total</b>		<b>16,490</b>	<b>80.8%</b>	<b>13,322</b>
Penn Power	Lighting	6,222	80.8%	5,026
Penn Power	Custom	4,093	61.2%	2,507
Penn Power	Prescriptive	149	46.2%	69
Penn Power	Appliance Turn-In	0	51.0%	0
Penn Power	Direct Install	461	80.8%	372
<b>Penn Power Total</b>		<b>10,925</b>	<b>73.0%</b>	<b>7,974</b>
WPP	Lighting	13,157	65.7%	8,648
WPP	Custom	7,222	53.0%	3,824
WPP	Prescriptive	282	41.2%	116
WPP	Appliance Turn-In	37	48.0%	18
WPP	Direct Install	2,186	65.7%	1,437
<b>WPP Total</b>		<b>22,885</b>	<b>61.4%</b>	<b>14,043</b>

### 3.5.3.1 High-Impact Measure Research

The Lighting and Custom Initiatives were identified as High-Impact Measures and researched for net-to-gross in PY10. The net impact evaluation of the Lighting Initiative is described in Appendix P.2. The net impact evaluation of the Custom Initiatives is described in Appendix Q.2.

### 3.5.4 Verified Savings Estimates

In Table 114 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 PY12. These totals are added to the verified savings achieved in previous program years to calculate the P3TD program impacts.

**Table 114: PYTD and P3TD Savings Summary**

Savings Type	Met-Ed		Penelec		Penn Power		WPP	
	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	15,540	2.35	17,588	2.61	11,315	1.39	23,063	3.50
PYVTD Gross	14,952	2.14	16,490	2.75	10,925	1.34	22,885	3.48
PYVTD Net	9,026	1.29	13,322	2.23	7,974	0.99	14,043	2.12
RTD	113,671	17.09	121,689	18.21	63,767	8.91	131,811	19.15
VTD Gross	110,788	16.52	118,519	17.49	62,185	8.66	133,184	18.93
VTD Net	69,135	10.36	93,011	13.89	46,276	6.46	93,852	13.39

### 3.5.5 Process Evaluation

Tetra Tech conducted process evaluations for this program in PY8 and PY10. The process evaluation kicked off with interviews with FirstEnergy and ICSP staff. These interviews led to identification of issues that were researched through a participant survey and contractor interviews. The participant survey was conducted over the phone. Researchable issues focused on satisfaction, customer awareness and marketing, incentive levels, and program processes. Tetra Tech also conducted Vendor surveys and in-depth interviews, and benchmarking against comparable programs offered by other utilities.

Process evaluation activities were combined for the Large C&I, Small C&I, and Government and Institutional programs given the similarities in program delivery. Survey strata were based on the project type, and were defined as Custom, Lighting, or Other, with the Other category including prescriptive downstream measures but excluding Appliance Turn-In. The sample design from the PY10 process evaluation effort is shown in Table 115, and represents all C&I energy efficiency programs offered by each EDC.

**Table 115: Combined C&I Program Process Evaluation Sample Design**

Stratum	Population Size	Achieved Sample Size	Response Rate
Met-Ed Custom	46	23	56%
Met-Ed Lighting	553	125	43%
Met-Ed Prescriptive	33	14	48%
Penelec Custom	111	29	28%
Penelec Lighting	801	159	44%
Penelec Prescriptive	60	39	71%
Penn Power Custom	21	10	56%
Penn Power Lighting	275	71	47%
Penn Power Prescriptive	12	8	67%
WPP Custom	50	19	40%
WPP Lighting	651	121	37%
WPP Prescriptive	48	22	47%
Vendor Surveys	192	80	42%
Vendor Interviews	192	8	38%
<b>Program Total</b>	<b>3,045</b>	<b>728</b>	<b>43%</b>

Key findings and recommendations are listed in Section 3.5.7

### 3.5.6 Cost-Effectiveness Reporting

A detailed breakdown of program finances and cost-effectiveness is presented in Table 116, Table 117, Table 118, and Table 119 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 2019 dollars. NPV costs and benefits for P3TD financials are expressed in the 2016 dollars.

**Table 116: Summary of Program Finances – Met-Ed**

Row #	Cost Category	Gross PYTD (\$1,000)		Gross P3TD (\$1,000)		Net PYTD (\$1,000)		Net P3TD (\$1,000)	
1	EDC Incentives to Participants <sup>[1]</sup>	816		5,164		816		5,164	
2	EDC Incentives to Trade Allies	0		0		0		0	
3	Participant Costs (net of incentives/rebates paid by utilities)	3,938		22,013		2,065		11,690	
4	Incremental Measure Costs (Sum of rows 1 through 3)	4,754		27,178		2,881		16,854	
		EDC	CSP	EDC	CSP	EDC	CSP	EDC	CSP
5	Design & Development <sup>[2]</sup>	17	16	24	136	17	16	24	136
6	Administration, Management, and Technical Assistance <sup>[3]</sup>	71	179	376	1,433	71	179	376	1,433
7	Marketing <sup>[4]</sup>	0	31	42	612	0	31	42	612
8	Program Delivery <sup>[5]</sup>	58	401	377	1,544	58	401	377	1,544
9	EDC Evaluation Costs	206		945		206		945	
10	SWE Audit Costs	29		195		29		195	
11	Program Overhead Costs (Sum of rows 5 through 10)	1,009		5,684		1,009		5,684	
12	NPV of increases in costs of natural gas (or other fuels) for fuel switching programs	0		0		0		0	
13	Total NPV TRC Costs <sup>[6]</sup> (Net present value of sum of rows 4, 11, and 12)	5,763		28,871		3,890		19,810	
14	Total NPV Lifetime Electric Energy Benefits	6,489		40,449		3,919		25,285	
15	Total NPV Lifetime Electric Capacity Benefits	1,596		11,720		962		7,370	
16	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	0		0		0		0	
17	Total NPV Lifetime Non-Electric Benefits (Fossil Fuel, Water)	-313		-4,496		-205		-2,855	
18	Total NPV TRC Benefits <sup>[7]</sup> (Sum of rows 14 through 17)	7,771		47,674		4,676		29,800	
19	TRC Benefit-Cost Ratio <sup>[8]</sup>	1.35		1.65		1.20		1.50	

[1] Includes direct install equipment costs and costs for EE&C kits.  
 [2] Includes direct costs attributable to plan and advance the programs. Note: The design of the HERs program should be included here, while the actual development and mailing of HERs would be attributable to Program Delivery.  
 [3] Includes rebate processing, tracking system, general administration, program management, general management and legal, and technical assistance. Any common portfolio costs that are allocated across programs should be shown in this row.  
 [4] Includes the marketing CSP and marketing costs by program CSPs.  
 [5] Direct program implementation costs. Labor, fuel, and vehicle operation costs for appliance recycling and direct install programs. For behavioral programs, this includes the printing and postage of HERs.  
 [6] Total TRC Costs includes Total EDC Costs and Participant Costs.  
 [7] Total TRC Benefits equals the sum of Total Lifetime Electric and Non-Electric Benefits. Benefits include: avoided supply costs, including the reduction in costs of electric energy, generation, transmission, and distribution capacity, and natural gas valued at marginal cost for periods when there is a load reduction. Savings carried over from Phase II are not included as a part of Total TRC Benefits for Phase III.  
 [8] TRC Ratio equals Total NPV TRC Benefits divided by Total NPV TRC Costs.  
 \* Rows 1-11 are presented in nominal dollars

**Table 117: 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	EDC Incentives to Participants <sup>[1]</sup>	841		6,321		841		6,321	
2	EDC Incentives to Trade Allies	0		0		0		0	
3	Participant Costs (net of incentives/rebates paid by utilities)	3,532		33,326		2,684		24,913	
4	Incremental Measure Costs (Sum of rows 1 through 3)	4,373		39,647		3,525		31,235	
		EDC	CSP	EDC	CSP	EDC	CSP	EDC	CSP
5	Design & Development <sup>[2]</sup>	19	22	27	147	19	22	27	147
6	Administration, Management, and Technical Assistance <sup>[3]</sup>	70	245	395	1,532	70	245	395	1,532
7	Marketing <sup>[4]</sup>	0	31	46	590	0	31	46	590
8	Program Delivery <sup>[5]</sup>	59	575	414	1,846	59	575	414	1,846
9	EDC Evaluation Costs	216		990		216		990	
10	SWE Audit Costs	31		208		31		208	
11	Program Overhead Costs (Sum of rows 5 through 10)	1,268		6,195		1,268		6,195	
12	NPV of increases in costs of natural gas (or other fuels) for fuel switching programs	0		0		0		0	
13	Total NPV TRC Costs <sup>[6]</sup> (Net present value of sum of rows 4, 11, and 12)	5,641		40,376		4,793		32,979	
14	Total NPV Lifetime Electric Energy Benefits	6,730		40,766		5,441		32,091	
15	Total NPV Lifetime Electric Capacity Benefits	1,962		11,994		1,590		9,571	
16	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	0		0		0		0	
17	Total NPV Lifetime Non-Electric Benefits (Fossil Fuel, Water)	-574		-4,733		-467		-3,773	
18	Total NPV TRC Benefits <sup>[7]</sup> (Sum of rows 14 through 17)	8,117		48,027		6,563		37,888	
19	TRC Benefit-Cost Ratio <sup>[8]</sup>	1.44		1.19		1.37		1.15	

[1] Includes direct install equipment costs and costs for EE&C kits.

[2] Includes direct costs attributable to plan and advance the programs. Note: The design of the HERs program should be included here, while the actual development and mailing of HERs would be attributable to Program Delivery.

[3] Includes rebate processing, tracking system, general administration, program management, general management and legal, and technical assistance. Any common portfolio costs that are allocated across programs should be shown in this row.

[4] Includes the marketing CSP and marketing costs by program CSPs.

[5] Direct program implementation costs. Labor, fuel, and vehicle operation costs for appliance recycling and direct install programs. For behavioral programs, this includes the printing and postage of HERs.

[6] Total TRC Costs includes Total EDC Costs and Participant Costs.

[7] Total TRC Benefits equals the sum of Total Lifetime Electric and Non-Electric Benefits. Benefits include: avoided supply costs, including the reduction in costs of electric energy, generation, transmission, and distribution capacity, and natural gas valued at marginal cost for periods when there is a load reduction. Savings carried over from Phase II are not included as a part of Total TRC Benefits for Phase III.

[8] TRC Ratio equals Total NPV TRC Benefits divided by Total NPV TRC Costs.

\* Rows 1-11 are presented in nominal dollars

**Table 118: 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	EDC Incentives to Participants <sup>[1]</sup>	467		3,167		467		3,167	
2	EDC Incentives to Trade Allies	0		0		0		0	
3	Participant Costs (net of incentives/rebates paid by utilities)	3,372		15,582		2,307		10,594	
4	Incremental Measure Costs (Sum of rows 1 through 3)	3,838		18,749		2,774		13,761	
		EDC	CSP	EDC	CSP	EDC	CSP	EDC	CSP
5	Design & Development <sup>[2]</sup>	5	13	7	73	5	13	7	73
6	Administration, Management, and Technical Assistance <sup>[3]</sup>	32	153	144	781	32	153	144	781
7	Marketing <sup>[4]</sup>	0	18	11	131	0	18	11	131
8	Program Delivery <sup>[5]</sup>	26	349	137	857	26	349	137	857
9	EDC Evaluation Costs	52		237		52		237	
10	SWE Audit Costs	8		53		8		53	
11	Program Overhead Costs (Sum of rows 5 through 10)	657		2,430		657		2,430	
12	NPV of increases in costs of natural gas (or other fuels) for fuel switching programs	0		0		0		0	
13	Total NPV TRC Costs <sup>[6]</sup> (Net present value of sum of rows 4, 11, and 12)	4,495		18,246		3,431		13,928	
14	Total NPV Lifetime Electric Energy Benefits	4,246		21,126		3,131		15,772	
15	Total NPV Lifetime Electric Capacity Benefits	910		5,855		678		4,363	
16	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	0		0		0		0	
17	Total NPV Lifetime Non-Electric Benefits (Fossil Fuel, Water)	-195		-2,540		-158		-1,974	
18	Total NPV TRC Benefits <sup>[7]</sup> (Sum of rows 14 through 17)	4,961		24,441		3,651		18,161	
19	TRC Benefit-Cost Ratio <sup>[8]</sup>	1.10		1.34		1.06		1.30	
<p>[1] Includes direct install equipment costs and costs for EE&amp;C kits.                      [2] Includes direct costs attributable to plan and advance the programs. Note: The design of the HERs program should be included here, while the actual development and mailing of HERs would be attributable to Program Delivery.                      [3] Includes rebate processing, tracking system, general administration, program management, general management and legal, and technical assistance. Any common portfolio costs that are allocated across programs should be shown in this row.                      [4] Includes the marketing CSP and marketing costs by program CSPs.                      [5] Direct program implementation costs. Labor, fuel, and vehicle operation costs for appliance recycling and direct install programs. For behavioral programs, this includes the printing and postage of HERs.                      [6] Total TRC Costs includes Total EDC Costs and Participant Costs.                      [7] Total TRC Benefits equals the sum of Total Lifetime Electric and Non-Electric Benefits. Benefits include: avoided supply costs, including the reduction in costs of electric energy, generation, transmission, and distribution capacity, and natural gas valued at marginal cost for periods when there is a load reduction. Savings carried over from Phase II are not included as a part of Total TRC Benefits for Phase III.                      [8] TRC Ratio equals Total NPV TRC Benefits divided by Total NPV TRC Costs.                      * Rows 1-11 are presented in nominal dollars</p>									

**Table 119: 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	EDC Incentives to Participants <sup>[1]</sup>	1,028		6,659		1,028		6,659	
2	EDC Incentives to Trade Allies	0		0		0		0	
3	Participant Costs (net of incentives/rebates paid by utilities)	6,243		39,268		3,473		26,050	
4	Incremental Measure Costs (Sum of rows 1 through 3)	7,271		45,927		4,502		32,709	
		EDC	CSP	EDC	CSP	EDC	CSP	EDC	CSP
5	Design & Development <sup>[2]</sup>	19	58	30	336	19	58	30	336
6	Administration, Management, and Technical Assistance <sup>[3]</sup>	61	364	413	2,062	61	364	413	2,062
7	Marketing <sup>[4]</sup>	0	36	48	853	0	36	48	853
8	Program Delivery <sup>[5]</sup>	47	1,734	390	3,378	47	1,734	390	3,378
9	EDC Evaluation Costs	243		1,080		243		1,080	
10	SWE Audit Costs	29		196		29		196	
11	Program Overhead Costs (Sum of rows 5 through 10)	2,592		8,784		2,592		8,784	
12	NPV of increases in costs of natural gas (or other fuels) for fuel switching programs	0		0		0		0	
13	Total NPV TRC Costs <sup>[6]</sup> (Net present value of sum of rows 4, 11, and 12)	9,863		47,993		7,094		36,645	
14	Total NPV Lifetime Electric Energy Benefits	9,610		46,117		5,896		32,723	
15	Total NPV Lifetime Electric Capacity Benefits	2,515		12,941		1,539		9,320	
16	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	0		0		0		0	
17	Total NPV Lifetime Non-Electric Benefits (Fossil Fuel, Water)	-599		-5,605		-318		-4,062	
18	Total NPV TRC Benefits <sup>[7]</sup> (Sum of rows 14 through 17)	11,526		53,452		7,116		37,980	
19	TRC Benefit-Cost Ratio <sup>[8]</sup>	1.17		1.11		1.00		1.04	

[1] Includes direct install equipment costs and costs for EE&C kits.  
 [2] Includes direct costs attributable to plan and advance the programs. Note: The design of the HERs program should be included here, while the actual development and mailing of HERs would be attributable to Program Delivery.  
 [3] Includes rebate processing, tracking system, general administration, program management, general management and legal, and technical assistance. Any common portfolio costs that are allocated across programs should be shown in this row.  
 [4] Includes the marketing CSP and marketing costs by program CSPs.  
 [5] Direct program implementation costs. Labor, fuel, and vehicle operation costs for appliance recycling and direct install programs. For behavioral programs, this includes the printing and postage of HERs.  
 [6] Total TRC Costs includes Total EDC Costs and Participant Costs.  
 [7] Total TRC Benefits equals the sum of Total Lifetime Electric and Non-Electric Benefits. Benefits include: avoided supply costs, including the reduction in costs of electric energy, generation, transmission, and distribution capacity, and natural gas valued at marginal cost for periods when there is a load reduction. Savings carried over from Phase II are not included as a part of Total TRC Benefits for Phase III.  
 [8] TRC Ratio equals Total NPV TRC Benefits divided by Total NPV TRC Costs.  
 \* Rows 1-11 are presented in nominal dollars.

### 3.5.7 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.



### 3.6 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 by CLEAResult in PY12. The program includes downstream incentives for customers that install energy efficient equipment. Major program components include lighting (both new construction and retrofits), custom HVAC upgrades, compressed air projects, process improvements, and prescriptive HVAC, refrigeration, and food-service measures. The incentives for most downstream measures are proportional to the reported energy savings.

#### 3.6.1 Participation and Reported Savings by Customer Segment

Table 120 and Table 121 present the participation counts, reported energy and demand savings, and incentive payments for the ESB-Small Program in PY12 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 120: 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	77	14	91	67	11	78
PYRTD MWh/yr	36,301	6,509	42,809	23,842	3,915	27,757
PYRTD MW/yr	4.79	1.32	6.11	3.43	0.82	4.25
PYTD Incentives (\$1000)	1,317.77	313.78	1,631.55	790.83	150.51	941.34

**Table 121: 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	2	9	82	15	97
PYRTD MWh/yr	1,655	208	1,863	27,884	7,716	35,600
PYRTD MW/yr	0.26	0.02	0.28	3.82	1.18	5.00
PYTD Incentives (\$1000)	75.07	5.20	80.27	1,015.48	262.76	1,278.24

#### 3.6.2 Gross Impact Evaluation

The ESB-Large Program was disaggregated into three sampling initiatives for gross impact evaluation, as described in Appendix C. Lighting improvements were grouped into the C/I Lighting initiative, and evaluated according to PA TRM protocols as described in detail in Appendix P. Prescriptive HVAC and appliance projects were grouped into the Prescriptive Initiative. The evaluation of Prescriptive projects is described in Appendix R. 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 Q. For all EDCs, the Lighting Initiative attributed the majority of program savings, followed by the Custom initiative. The Prescriptive and Appliance Turn-In initiatives accounted for small fractions of overall program impacts. Table 122 summarizes program verified impacts and realization rates for each EDC.

**Table 122: ESB-Large Program Gross Impact Evaluation Summary for PY12**

EDC	Sampling Initiative	Gross Verified MWh	Gross Verified MW	MWh Realization Rate	MW Realization Rate
Met-Ed	Lighting	28,738	4.16	95%	91%
Met-Ed	Custom	12,448	1.40	100%	90%
Met-Ed	Prescriptive	0	0.00	93%	84%
<b>Met-Ed Total</b>		<b>41,186</b>	<b>5.56</b>	<b>96.2%</b>	<b>90.9%</b>
Penelec	Lighting	17,478	3.14	92%	107%
Penelec	Custom	8,664	1.31	98%	100%
Penelec	Prescriptive	0	0.00	95%	85%
<b>Penelec Total</b>		<b>26,142</b>	<b>4.45</b>	<b>94.2%</b>	<b>104.7%</b>
Penn Power	Lighting	1,346	0.15	96%	94%
Penn Power	Custom	446	0.12	98%	100%
Penn Power	Prescriptive	0	0.00	98%	87%
<b>Penn Power Total</b>		<b>1,792</b>	<b>0.27</b>	<b>96.2%</b>	<b>97.1%</b>
WPP	Lighting	20,946	2.94	96%	96%
WPP	Custom	15,081	2.02	111%	107%
WPP	Prescriptive	185	0.04	98%	89%
<b>WPP Total</b>		<b>36,212</b>	<b>5.00</b>	<b>101.7%</b>	<b>100.2%</b>

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.

### 3.6.2.1 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 stopped conducting on-site visits in March 2020, but resumed on-site visits after businesses reopened and after ADM field staff became fully vaccinated. ADM also continued to replace in-person visits with telephone interviews or virtual on-site visits with two-way video conferences when practicable, and when evaluation rigor was not impacted. In some cases, ADM sent data loggers to customers, who then installed, removed, and sent them back to ADM for analysis. To the extent possible ADM relied on trending data from energy management systems and customer billing data, however billing analyses were conducted only if ADM could determine that facility operations were not impacted by COVID during the periods of interest.

### 3.6.3 Net Impact Evaluation

Tetra-Tech conducted a Net-to-Gross evaluation for this program in PY10. The net impact evaluation of the Lighting Initiative is described in Appendix P.2. The net impact evaluation of the Custom Initiative is described in Appendix Q.2. The net impact evaluation of the Prescriptive Initiative is described in Appendix R.2. Table 123 summarizes program verified gross and net energy impacts and net-to-gross ratios for each EDC.

**Table 123: ESB-Large Program Net Impact Evaluation Summary for PY10**

EDC	Sampling Initiative	Gross Verified MWh	NTG	Net Verified MWh
Met-Ed	Lighting	28,738	62.0%	17,813
Met-Ed	Custom	12,448	55.5%	6,908
Met-Ed	Prescriptive	0	73.7%	0
<b>Met-Ed Total</b>		<b>41,186</b>	<b>60.0%</b>	<b>24,722</b>
Penelec	Lighting	17,478	81.4%	14,231
Penelec	Custom	8,664	81.1%	7,028
Penelec	Prescriptive	0	41.9%	0
<b>Penelec Total</b>		<b>26,142</b>	<b>81.3%</b>	<b>21,258</b>
Penn Power	Lighting	1,346	80.8%	1,088
Penn Power	Custom	446	61.2%	273
Penn Power	Prescriptive	0	46.2%	0
<b>Penn Power Total</b>		<b>1,792</b>	<b>75.9%</b>	<b>1,361</b>
WPP	Lighting	20,946	65.7%	13,767
WPP	Custom	15,081	53.0%	7,985
WPP	Prescriptive	185	41.2%	76
<b>WPP Total</b>		<b>36,212</b>	<b>60.3%</b>	<b>21,829</b>

#### 3.6.3.1 High-Impact Measure Research

The Lighting and Custom Initiatives were identified as High-Impact Measures in PY10. The net impact evaluation of the Lighting Initiative is described in Appendix P.2. The net impact evaluation of the Custom Initiatives is described in Appendix Q.2.

### 3.6.4 Verified Savings Estimates

In Table 124 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 PY12. These totals are added to the verified savings achieved in previous program years to calculate the P3TD program impacts.

**Table 124: PYTD and P3TD Savings Summary**

Savings Type	Met-Ed		Penelec		Penn Power		WPP	
	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	42,809	6.11	27,757	4.25	1,863	0.28	35,600	5.00
PYVTD Gross	41,186	5.56	26,142	4.45	1,792	0.27	36,212	5.00
PYVTD Net	24,722	3.36	21,258	3.62	1,361	0.19	21,829	3.02
RTD	185,036	25.55	174,250	22.16	30,439	3.58	139,222	17.73
VTD Gross	180,135	24.49	167,484	20.89	29,838	3.40	138,410	17.13
VTD Net	106,420	14.40	133,083	16.74	20,712	2.36	88,676	11.28

### 3.6.5 Process Evaluation

The process evaluation effort for all three C&I Programs is described in Sections 3.5.5 and 3.5.7. Most practical aspects of the programs are managed as one general effort rather than three distinct programs, but applications are placed in one of three programs according to their associated rate classes.

### 3.6.6 Cost-Effectiveness Reporting

A detailed breakdown of program finances and cost-effectiveness is presented in Table 125, Table 126, Table 127, and Table 128 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 2019 dollars. NPV costs and benefits for P3TD financials are expressed in the 2016 dollars.

**Table 125: Summary of Program Finances – Met-Ed**

Row #	Cost Category	Gross PYTD (\$1,000)		Gross P3TD (\$1,000)		Net PYTD (\$1,000)		Net P3TD (\$1,000)	
1	EDC Incentives to Participants <sup>[1]</sup>	1,632		8,093		1,632		8,093	
2	EDC Incentives to Trade Allies	0		0		0		0	
3	Participant Costs (net of incentives/rebates paid by utilities)	11,355		45,694		6,182		22,973	
4	Incremental Measure Costs (Sum of rows 1 through 3)	12,987		53,787		7,813		31,066	
		EDC	CSP	EDC	CSP	EDC	CSP	EDC	CSP
5	Design & Development <sup>[2]</sup>	13	44	18	213	13	44	18	213
6	Administration, Management, and Technical Assistance <sup>[3]</sup>	65	346	324	1,617	65	346	324	1,617
7	Marketing <sup>[4]</sup>	0	24	32	404	0	24	32	404
8	Program Delivery <sup>[5]</sup>	29	476	183	2,292	29	476	183	2,292
9	EDC Evaluation Costs	209		1,021		209		1,021	
10	SWE Audit Costs	22		149		22		149	
11	Program Overhead Costs (Sum of rows 5 through 10)	1,229		6,254		1,229		6,254	
12	NPV of increases in costs of natural gas (or other fuels) for fuel switching programs	0		2,187		0		1,214	
13	Total NPV TRC Costs <sup>[6]</sup> (Net present value of sum of rows 4, 11, and 12)	14,215		54,660		9,042		34,359	
14	Total NPV Lifetime Electric Energy Benefits	17,949		65,280		10,777		38,535	
15	Total NPV Lifetime Electric Capacity Benefits	4,166		17,143		2,516		10,007	
16	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	0		0		0		0	
17	Total NPV Lifetime Non-Electric Benefits (Fossil Fuel, Water)	-1,004		-5,070		-657		-2,627	
18	Total NPV TRC Benefits <sup>[7]</sup> (Sum of rows 14 through 17)	21,111		77,353		12,636		45,915	
19	TRC Benefit-Cost Ratio <sup>[8]</sup>	1.49		1.42		1.40		1.34	

[1] Includes direct install equipment costs and costs for EE&C kits.  
 [2] Includes direct costs attributable to plan and advance the programs. Note: The design of the HERs program should be included here, while the actual development and mailing of HERs would be attributable to Program Delivery.  
 [3] Includes rebate processing, tracking system, general administration, program management, general management and legal, and technical assistance. Any common portfolio costs that are allocated across programs should be shown in this row.  
 [4] Includes the marketing CSP and marketing costs by program CSPs.  
 [5] Direct program implementation costs. Labor, fuel, and vehicle operation costs for appliance recycling and direct install programs. For behavioral programs, this includes the printing and postage of HERs.  
 [6] Total TRC Costs includes Total EDC Costs and Participant Costs.  
 [7] Total TRC Benefits equals the sum of Total Lifetime Electric and Non-Electric Benefits. Benefits include: avoided supply costs, including the reduction in costs of electric energy, generation, transmission, and distribution capacity, and natural gas valued at marginal cost for periods when there is a load reduction. Savings carried over from Phase II are not included as a part of Total TRC Benefits for Phase III.  
 [8] TRC Ratio equals Total NPV TRC Benefits divided by Total NPV TRC Costs.  
 \* Rows 1-11 are presented in nominal dollars

**Table 126: 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	EDC Incentives to Participants <sup>[1]</sup>	941		7,648		941		7,648	
2	EDC Incentives to Trade Allies	0		0		0		0	
3	Participant Costs (net of incentives/rebates paid by utilities)	5,542		48,443		4,331		36,693	
4	Incremental Measure Costs (Sum of rows 1 through 3)	6,483		56,092		5,273		44,341	
		EDC	CSP	EDC	CSP	EDC	CSP	EDC	CSP
5	Design & Development <sup>[2]</sup>	12	28	17	192	12	28	17	192
6	Administration, Management, and Technical Assistance <sup>[3]</sup>	55	215	311	1,478	55	215	311	1,478
7	Marketing <sup>[4]</sup>	0	22	30	274	0	22	30	274
8	Program Delivery <sup>[5]</sup>	24	296	164	2,062	24	296	164	2,062
9	EDC Evaluation Costs	183		896		183		896	
10	SWE Audit Costs	20		134		20		134	
11	Program Overhead Costs (Sum of rows 5 through 10)	856		5,558		856		5,558	
12	NPV of increases in costs of natural gas (or other fuels) for fuel switching programs	0		2,143		0		1,738	
13	Total NPV TRC Costs <sup>[6]</sup> (Net present value of sum of rows 4, 11, and 12)	7,339		56,764		6,128		43,896	
14	Total NPV Lifetime Electric Energy Benefits	10,614		57,105		8,631		45,431	
15	Total NPV Lifetime Electric Capacity Benefits	3,146		13,741		2,558		11,027	
16	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	0		0		0		0	
17	Total NPV Lifetime Non-Electric Benefits (Fossil Fuel, Water)	-1,150		-4,648		-936		-3,659	
18	Total NPV TRC Benefits <sup>[7]</sup> (Sum of rows 14 through 17)	12,610		66,198		10,253		52,799	
19	TRC Benefit-Cost Ratio <sup>[8]</sup>	1.72		1.17		1.67		1.20	

[1] Includes direct install equipment costs and costs for EE&C kits.

[2] Includes direct costs attributable to plan and advance the programs. Note: The design of the HERs program should be included here, while the actual development and mailing of HERs would be attributable to Program Delivery.

[3] Includes rebate processing, tracking system, general administration, program management, general management and legal, and technical assistance. Any common portfolio costs that are allocated across programs should be shown in this row.

[4] Includes the marketing CSP and marketing costs by program CSPs.

[5] Direct program implementation costs. Labor, fuel, and vehicle operation costs for appliance recycling and direct install programs. For behavioral programs, this includes the printing and postage of HERs.

[6] Total TRC Costs includes Total EDC Costs and Participant Costs.

[7] Total TRC Benefits equals the sum of Total Lifetime Electric and Non-Electric Benefits. Benefits include: avoided supply costs, including the reduction in costs of electric energy, generation, transmission, and distribution capacity, and natural gas valued at marginal cost for periods when there is a load reduction. Savings carried over from Phase II are not included as a part of Total TRC Benefits for Phase III.

[8] TRC Ratio equals Total NPV TRC Benefits divided by Total NPV TRC Costs.

\* Rows 1-11 are presented in nominal dollars

**Table 127: 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	EDC Incentives to Participants <sup>[1]</sup>	80		1,394		80		1,394	
2	EDC Incentives to Trade Allies	0		0		0		0	
3	Participant Costs (net of incentives/rebates paid by utilities)	521		8,366		371		5,232	
4	Incremental Measure Costs (Sum of rows 1 through 3)	602		9,761		452		6,627	
		EDC	CSP	EDC	CSP	EDC	CSP	EDC	CSP
5	Design & Development <sup>[2]</sup>	3	6	4	39	3	6	4	39
6	Administration, Management, and Technical Assistance <sup>[3]</sup>	23	46	111	301	23	46	111	301
7	Marketing <sup>[4]</sup>	0	16	6	48	0	16	6	48
8	Program Delivery <sup>[5]</sup>	11	63	56	414	11	63	56	414
9	EDC Evaluation Costs	40		194		40		194	
10	SWE Audit Costs	5		31		5		31	
11	Program Overhead Costs (Sum of rows 5 through 10)	212		1,204		212		1,204	
12	NPV of increases in costs of natural gas (or other fuels) for fuel switching programs	0		0		0		0	
13	Total NPV TRC Costs <sup>[6]</sup> (Net present value of sum of rows 4, 11, and 12)	814		9,757		664		6,939	
14	Total NPV Lifetime Electric Energy Benefits	713		10,273		546		7,147	
15	Total NPV Lifetime Electric Capacity Benefits	179		2,279		130		1,578	
16	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	0		0		0		0	
17	Total NPV Lifetime Non-Electric Benefits (Fossil Fuel, Water)	-82		-939		-66		-758	
18	Total NPV TRC Benefits <sup>[7]</sup> (Sum of rows 14 through 17)	810		11,613		609		7,967	
19	TRC Benefit-Cost Ratio <sup>[8]</sup>	1.00		1.19		0.92		1.15	

[1] Includes direct install equipment costs and costs for EE&C kits.  
 [2] Includes direct costs attributable to plan and advance the programs. Note: The design of the HERs program should be included here, while the actual development and mailing of HERs would be attributable to Program Delivery.  
 [3] Includes rebate processing, tracking system, general administration, program management, general management and legal, and technical assistance. Any common portfolio costs that are allocated across programs should be shown in this row.  
 [4] Includes the marketing CSP and marketing costs by program CSPs.  
 [5] Direct program implementation costs. Labor, fuel, and vehicle operation costs for appliance recycling and direct install programs. For behavioral programs, this includes the printing and postage of HERs.  
 [6] Total TRC Costs includes Total EDC Costs and Participant Costs.  
 [7] Total TRC Benefits equals the sum of Total Lifetime Electric and Non-Electric Benefits. Benefits include: avoided supply costs, including the reduction in costs of electric energy, generation, transmission, and distribution capacity, and natural gas valued at marginal cost for periods when there is a load reduction. Savings carried over from Phase II are not included as a part of Total TRC Benefits for Phase III.  
 [8] TRC Ratio equals Total NPV TRC Benefits divided by Total NPV TRC Costs.  
 \* Rows 1-11 are presented in nominal dollars

**Table 128: 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	EDC Incentives to Participants <sup>[1]</sup>	1,278		6,051		1,278		6,051	
2	EDC Incentives to Trade Allies	0		0		0		0	
3	Participant Costs (net of incentives/rebates paid by utilities)	9,448		38,020		5,207		22,575	
4	Incremental Measure Costs (Sum of rows 1 through 3)	10,726		44,071		6,486		28,626	
		EDC	CSP	EDC	CSP	EDC	CSP	EDC	CSP
5	Design & Development <sup>[2]</sup>	10	34	14	165	10	34	14	165
6	Administration, Management, and Technical Assistance <sup>[3]</sup>	36	263	253	1,285	36	263	253	1,285
7	Marketing <sup>[4]</sup>	0	23	26	322	0	23	26	322
8	Program Delivery <sup>[5]</sup>	15	362	134	1,767	15	362	134	1,767
9	EDC Evaluation Costs	168		823		168		823	
10	SWE Audit Costs	16		110		16		110	
11	Program Overhead Costs (Sum of rows 5 through 10)	926		4,898		926		4,898	
12	NPV of increases in costs of natural gas (or other fuels) for fuel switching programs	1,635		1,442		866		763	
13	Total NPV TRC Costs <sup>[6]</sup> (Net present value of sum of rows 4, 11, and 12)	13,287		44,426		8,278		30,274	
14	Total NPV Lifetime Electric Energy Benefits	15,324		47,713		9,236		30,655	
15	Total NPV Lifetime Electric Capacity Benefits	3,648		11,270		2,203		7,513	
16	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	0		0		0		0	
17	Total NPV Lifetime Non-Electric Benefits (Fossil Fuel, Water)	-989		-3,929		-701		-2,982	
18	Total NPV TRC Benefits <sup>[7]</sup> (Sum of rows 14 through 17)	17,984		55,054		10,738		35,187	
19	TRC Benefit-Cost Ratio <sup>[8]</sup>	1.35		1.24		1.30		1.16	
<p>[1] Includes direct install equipment costs and costs for EE&amp;C kits.                      [2] Includes direct costs attributable to plan and advance the programs. Note: The design of the HERs program should be included here, while the actual development and mailing of HERs would be attributable to Program Delivery.                      [3] Includes rebate processing, tracking system, general administration, program management, general management and legal, and technical assistance. Any common portfolio costs that are allocated across programs should be shown in this row.                      [4] Includes the marketing CSP and marketing costs by program CSPs.                      [5] Direct program implementation costs. Labor, fuel, and vehicle operation costs for appliance recycling and direct install programs. For behavioral programs, this includes the printing and postage of HERs.                      [6] Total TRC Costs includes Total EDC Costs and Participant Costs.                      [7] Total TRC Benefits equals the sum of Total Lifetime Electric and Non-Electric Benefits. Benefits include: avoided supply costs, including the reduction in costs of electric energy, generation, transmission, and distribution capacity, and natural gas valued at marginal cost for periods when there is a load reduction. Savings carried over from Phase II are not included as a part of Total TRC Benefits for Phase III.                      [8] TRC Ratio equals Total NPV TRC Benefits divided by Total NPV TRC Costs.                      * Rows 1-11 are presented in nominal dollars</p>									

### 3.6.7 Status of Recommendations

Recommendations for the nonresidential programs are listed in Section 3.5.7.



### 3.7 GOVERNMENT AND INSTITUTIONAL TARIFF PROGRAM

The Government and Institutional Tariff Program (referred to as the GAIT Program) is offered to customers with specific rate tariffs such as schools, municipalities, and volunteer fire departments. The impacts from this program are counted toward the Companies' GNI compliance targets, although most of the GNI participation is through the ESB-Small and ESB-Large programs. The program was implemented jointly by CLEAResult and ARCA for PY12. The Sodexo portion of the program includes downstream incentives for customers that install energy efficient equipment. All measures included in the other C&I EE Programs are offered in the GAIT Program. However, Lighting continues to account for the vast majority of impacts. The incentives for most downstream measures are proportional to the reported energy savings. The ARCA portion of the program included refrigerator, freezer, and room air conditioner recycling.

#### 3.7.1 Participation and Reported Savings by Customer Segment

Table 129 presents the participation counts, reported energy and demand savings, and incentive payments for the GAIT Program in PY12 by EDC. This program serves only the GNI customer segment. Each separate rebate application is counted as one participant.

**Table 129: GAIT Program Participation and Reported Impacts**

Parameter	Met-Ed GNI	Penelec GNI	Penn Power GNI	WPP GNI
PYTD # Participants	20	34	0	1
PYRTD MWh/yr	506	1,509	0	1
PYRTD MW/yr	0.00	0.00	0.00	0.00
PYTD Incentives (\$1000)	22.19	75.45	0.00	0.05

#### 3.7.2 Gross Impact Evaluation

The GAIT Program was disaggregated into four sampling initiatives for gross impact evaluation, as described in Appendix C. The Appliance Turn-In program component, administered by ARCA, was evaluated as a separate initiative. The gross impact evaluation for the Appliance Turn-In initiative is described in detail in Appendix S. Lighting improvements were grouped into the C/I Lighting initiative, and evaluated according to PA TRM protocols as described in detail in Appendix P. Prescriptive HVAC and appliance projects were grouped into the Prescriptive Initiative. The evaluation of Prescriptive projects is described in Appendix R. 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 Q, however there were no custom projects in the GAIT programs this year. For all EDCs, the Lighting initiative attributed for almost the entirety of program savings. Table 130 summarizes program verified impacts and realization rates for each EDC.

**Table 130: GAIT Program Gross Impact Evaluation Summary for PY12**

EDC	Sampling Initiative	Gross Verified MWh	Gross Verified MW	MWh Realization Rate	MW Realization Rate
Met-Ed	Lighting	478	0.00	95%	91%
Met-Ed	Prescriptive	0	0.00	93%	84%
Met-Ed	Appliance Turn-In	0	0.00	111%	81%
<b>Met-Ed Total</b>		<b>478</b>	<b>0.00</b>	<b>94.7%</b>	<b>100.0%</b>
Penelec	Lighting	1,395	0.00	92%	107%
Penelec	Prescriptive	0	0.00	95%	85%
Penelec	Appliance Turn-In	1	0.00	85%	75%
<b>PenelecTotal</b>		<b>1,396</b>	<b>0.00</b>	<b>92.5%</b>	<b>74.7%</b>
Penn Power	Lighting	0	0.00	96%	94%
Penn Power	Prescriptive	0	0.00	98%	87%
Penn Power	Appliance Turn-In	0	0.00	100%	100%
<b>Penn PowerTotal</b>		<b>0</b>	<b>0.00</b>	<b>100.0%</b>	<b>100.0%</b>
WPP	Lighting	0	0.00	96%	96%
WPP	Prescriptive	0	0.00	98%	89%
WPP	Appliance Turn-In	1	0.00	96%	85%
<b>WPP Total</b>		<b>1</b>	<b>0.00</b>	<b>95.7%</b>	<b>85.0%</b>

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 are primarily lighting hours of use, as most of the program’s impacts area attributed to lighting.

### 3.7.2.1 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 stopped conducting on-site visits in March 2020. After this time, ADM replaced in-person visits with telephone interviews or virtual on-site visits with two-way video conferences. In some cases, ADM sent data loggers to customers, who then installed, removed, and send them back to ADM for analysis. To the extent possible ADM relied on trending data from energy management systems and customer billing data, however billing analyses were conducted only if ADM could determine that facility operations were not impacted by COVID during the periods of interest.

### 3.7.3 Net Impact Evaluation

Tetra-Tech conducted a Net-to-Gross evaluation for this program in PY10. The net impact evaluation of the Lighting Initiative is described in Appendix P.2. The net impact evaluation of the Custom Initiative is described in Appendix Q.2. The net impact evaluation of the Prescriptive Initiative is described in Appendix R.2. Net impact evaluation was not conducted for the Appliance Turn-In Initiative or the Direct Install Initiative. The NTG for the Appliance Turn-In Initiative is estimated to be the same as the NTG of the residential Appliance Turn-In Initiative. Table 131 summarizes program verified gross and net energy impacts and net-to-gross ratios for each EDC.

**Table 131: GAIT Program Net Impact Evaluation Summary for PY12**

EDC	Sampling Initiative	Gross Verified MWh	NTG	Net Verified MWh
Met-Ed	Lighting	478	62.0%	297
Met-Ed	Prescriptive	0	73.7%	0
Met-Ed	Appliance Turn-In	0	45.0%	0
<b>Met-Ed Total</b>		<b>478</b>	<b>62.0%</b>	<b>297</b>
Penelec	Lighting	1,395	81.4%	1,135
Penelec	Prescriptive	0	41.9%	0
Penelec	Appliance Turn-In	1	47.0%	0
<b>Penelec</b>		<b>1,396</b>	<b>81.4%</b>	<b>1,136</b>
Penn Power	Lighting	0	80.8%	0
Penn Power	Prescriptive	0	46.2%	0
Penn Power	Appliance Turn-In	0	51.0%	0
<b>Penn Power</b>		<b>0</b>	<b>100.0%</b>	<b>0</b>
WPP	Lighting	0	65.7%	0
WPP	Prescriptive	0	41.2%	0
WPP	Appliance Turn-In	1	48.0%	0
<b>WPP</b>		<b>1</b>	<b>48.0%</b>	<b>0</b>

**3.7.3.1 High-Impact Measure Research**

The Lighting and Custom Initiatives were identified as High-Impact Measures in PY10. The net impact evaluation of the Lighting Initiative is described in Appendix P.2. The net impact evaluation of the Custom Initiative is described in Appendix Q.2.

**3.7.4 Verified Savings Estimates**

In Table 132 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 GAIT Program in PY12. These totals are added to the verified savings achieved in previous program years to calculate the P3TD program impacts.

**Table 132: PYTD and P3TD Savings Summary**

Savings Type	Met-Ed		Penelec		Penn Power		WPP	
	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	506	0.00	1,509	0.00	0	0.00	1	0.00
PYVTD Gross	478	0.00	1,396	0.00	0	0.00	1	0.00
PYVTD Net	297	0.00	1,136	0.00	0	0.00	0	0.00
RTD	2,567	0.04	4,936	0.07	2,034	0.07	20,468	0.20
VTD Gross	2,498	0.03	4,687	0.06	1,948	0.07	21,624	0.21
VTD Net	1,589	0.02	3,784	0.05	1,464	0.05	17,131	0.17

### 3.7.5 Process Evaluation

The process evaluation effort for all three C&I Programs is described in Section 3.5.7. Most practical aspects of the programs are managed as one general effort rather than three distinct programs, but applications are placed in one of three programs according to their associated rate classes.

### 3.7.6 Cost-Effectiveness Reporting

A detailed breakdown of program finances and cost-effectiveness is presented in Table 133, Table 134, Table 135, and Table 136 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 2019 dollars. NPV costs and benefits for P3TD financials are expressed in the 2016 dollars.

**Table 133: Summary of Program Finances – Met-Ed**

Row #	Cost Category	Gross PYTD (\$1,000)		Gross P3TD (\$1,000)		Net PYTD (\$1,000)		Net P3TD (\$1,000)	
1	EDC Incentives to Participants <sup>[1]</sup>	22		127		22		127	
2	EDC Incentives to Trade Allies	0		0		0		0	
3	Participant Costs (net of incentives/rebates paid by utilities)	133		526		74		288	
4	Incremental Measure Costs (Sum of rows 1 through 3)	156		653		96		416	
		EDC	CSP	EDC	CSP	EDC	CSP	EDC	CSP
5	Design & Development <sup>[2]</sup>	1	1	1	4	1	1	1	4
6	Administration, Management, and Technical Assistance <sup>[3]</sup>	5	12	16	72	5	12	16	72
7	Marketing <sup>[4]</sup>	0	3	3	45	0	3	3	45
8	Program Delivery <sup>[5]</sup>	2	5	14	28	2	5	14	28
9	EDC Evaluation Costs	10		60		10		60	
10	SWE Audit Costs	2		12		2		12	
11	Program Overhead Costs (Sum of rows 5 through 10)	39		255		39		255	
12	NPV of increases in costs of natural gas (or other fuels) for fuel switching programs	0		0		0		0	
13	Total NPV TRC Costs <sup>[6]</sup> (Net present value of sum of rows 4, 11, and 12)	195		796		136		589	
14	Total NPV Lifetime Electric Energy Benefits	209		915		130		582	
15	Total NPV Lifetime Electric Capacity Benefits	0		25		0		16	
16	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	0		0		0		0	
17	Total NPV Lifetime Non-Electric Benefits (Fossil Fuel, Water)	-26		-111		-16		-70	
18	Total NPV TRC Benefits <sup>[7]</sup> (Sum of rows 14 through 17)	184		829		114		528	
19	TRC Benefit-Cost Ratio <sup>[8]</sup>	0.94		1.04		0.84		0.90	

[1] Includes direct install equipment costs and costs for EE&C kits.  
 [2] Includes direct costs attributable to plan and advance the programs. Note: The design of the HERs program should be included here, while the actual development and mailing of HERs would be attributable to Program Delivery.  
 [3] Includes rebate processing, tracking system, general administration, program management, general management and legal, and technical assistance. Any common portfolio costs that are allocated across programs should be shown in this row.  
 [4] Includes the marketing CSP and marketing costs by program CSPs.  
 [5] Direct program implementation costs. Labor, fuel, and vehicle operation costs for appliance recycling and direct install programs. For behavioral programs, this includes the printing and postage of HERs.  
 [6] Total TRC Costs includes Total EDC Costs and Participant Costs.  
 [7] Total TRC Benefits equals the sum of Total Lifetime Electric and Non-Electric Benefits. Benefits include: avoided supply costs, including the reduction in costs of electric energy, generation, transmission, and distribution capacity, and natural gas valued at marginal cost for periods when there is a load reduction. Savings carried over from Phase II are not included as a part of Total TRC Benefits for Phase III.  
 [8] TRC Ratio equals Total NPV TRC Benefits divided by Total NPV TRC Costs.  
 \* Rows 1-11 are presented in nominal dollars

**Table 134: 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	EDC Incentives to Participants <sup>[1]</sup>	75		247		75		247	
2	EDC Incentives to Trade Allies	0		0		0		0	
3	Participant Costs (net of incentives/rebates paid by utilities)	293		1,278		225		985	
4	Incremental Measure Costs (Sum of rows 1 through 3)	369		1,525		300		1,232	
		EDC	CSP	EDC	CSP	EDC	CSP	EDC	CSP
5	Design & Development <sup>[2]</sup>	2	1	2	8	2	1	2	8
6	Administration, Management, and Technical Assistance <sup>[3]</sup>	7	28	37	158	7	28	37	158
7	Marketing <sup>[4]</sup>	0	3	4	58	0	3	4	58
8	Program Delivery <sup>[5]</sup>	3	5	20	65	3	5	20	65
9	EDC Evaluation Costs	14		89		14		89	
10	SWE Audit Costs	3		17		3		17	
11	Program Overhead Costs (Sum of rows 5 through 10)	64		459		64		459	
12	NPV of increases in costs of natural gas (or other fuels) for fuel switching programs	0		0		0		0	
13	Total NPV TRC Costs <sup>[6]</sup> (Net present value of sum of rows 4, 11, and 12)	433		1,746		364		1,491	
14	Total NPV Lifetime Electric Energy Benefits	578		1,617		470		1,308	
15	Total NPV Lifetime Electric Capacity Benefits	0		46		0		36	
16	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	0		0		0		0	
17	Total NPV Lifetime Non-Electric Benefits (Fossil Fuel, Water)	-92		-221		-75		-178	
18	Total NPV TRC Benefits <sup>[7]</sup> (Sum of rows 14 through 17)	486		1,442		396		1,166	
19	TRC Benefit-Cost Ratio <sup>[8]</sup>	1.12		0.83		1.09		0.78	

[1] Includes direct install equipment costs and costs for EE&C kits.

[2] Includes direct costs attributable to plan and advance the programs. Note: The design of the HERs program should be included here, while the actual development and mailing of HERs would be attributable to Program Delivery.

[3] Includes rebate processing, tracking system, general administration, program management, general management and legal, and technical assistance. Any common portfolio costs that are allocated across programs should be shown in this row.

[4] Includes the marketing CSP and marketing costs by program CSPs.

[5] Direct program implementation costs. Labor, fuel, and vehicle operation costs for appliance recycling and direct install programs. For behavioral programs, this includes the printing and postage of HERs.

[6] Total TRC Costs includes Total EDC Costs and Participant Costs.

[7] Total TRC Benefits equals the sum of Total Lifetime Electric and Non-Electric Benefits. Benefits include: avoided supply costs, including the reduction in costs of electric energy, generation, transmission, and distribution capacity, and natural gas valued at marginal cost for periods when there is a load reduction. Savings carried over from Phase II are not included as a part of Total TRC Benefits for Phase III.

[8] TRC Ratio equals Total NPV TRC Benefits divided by Total NPV TRC Costs.

\* Rows 1-11 are presented in nominal dollars

**Table 135: 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	EDC Incentives to Participants <sup>[1]</sup>	0		110		0		110	
2	EDC Incentives to Trade Allies	0		0		0		0	
3	Participant Costs (net of incentives/rebates paid by utilities)	0		275		0		179	
4	Incremental Measure Costs (Sum of rows 1 through 3)	0		384		0		289	
		EDC	CSP	EDC	CSP	EDC	CSP	EDC	CSP
5	Design & Development <sup>[2]</sup>	0	0	1	2	0	0	1	2
6	Administration, Management, and Technical Assistance <sup>[3]</sup>	3	4	12	68	3	4	12	68
7	Marketing <sup>[4]</sup>	0	2	1	14	0	2	1	14
8	Program Delivery <sup>[5]</sup>	1	3	7	15	1	3	7	15
9	EDC Evaluation Costs	3		21		3		21	
10	SWE Audit Costs	1		4		1		4	
11	Program Overhead Costs (Sum of rows 5 through 10)	18		145		18		145	
12	NPV of increases in costs of natural gas (or other fuels) for fuel switching programs	0		0		0		0	
13	Total NPV TRC Costs <sup>[6]</sup> (Net present value of sum of rows 4, 11, and 12)	18		505		18		412	
14	Total NPV Lifetime Electric Energy Benefits	0		735		0		553	
15	Total NPV Lifetime Electric Capacity Benefits	0		63		0		48	
16	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	0		0		0		0	
17	Total NPV Lifetime Non-Electric Benefits (Fossil Fuel, Water)	0		-94		0		-71	
18	Total NPV TRC Benefits <sup>[7]</sup> (Sum of rows 14 through 17)	0		704		0		529	
19	TRC Benefit-Cost Ratio <sup>[8]</sup>	0.00		1.39		0.00		1.28	

[1] Includes direct install equipment costs and costs for EE&C kits.  
 [2] Includes direct costs attributable to plan and advance the programs. Note: The design of the HERs program should be included here, while the actual development and mailing of HERs would be attributable to Program Delivery.  
 [3] Includes rebate processing, tracking system, general administration, program management, general management and legal, and technical assistance. Any common portfolio costs that are allocated across programs should be shown in this row.  
 [4] Includes the marketing CSP and marketing costs by program CSPs.  
 [5] Direct program implementation costs. Labor, fuel, and vehicle operation costs for appliance recycling and direct install programs. For behavioral programs, this includes the printing and postage of HERs.  
 [6] Total TRC Costs includes Total EDC Costs and Participant Costs.  
 [7] Total TRC Benefits equals the sum of Total Lifetime Electric and Non-Electric Benefits. Benefits include: avoided supply costs, including the reduction in costs of electric energy, generation, transmission, and distribution capacity, and natural gas valued at marginal cost for periods when there is a load reduction. Savings carried over from Phase II are not included as a part of Total TRC Benefits for Phase III.  
 [8] TRC Ratio equals Total NPV TRC Benefits divided by Total NPV TRC Costs.  
 \* Rows 1-11 are presented in nominal dollars

**Table 136: 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	EDC Incentives to Participants <sup>[1]</sup>	0		935		0		935	
2	EDC Incentives to Trade Allies	0		0		0		0	
3	Participant Costs (net of incentives/rebates paid by utilities)	0		6,933		0		5,390	
4	Incremental Measure Costs (Sum of rows 1 through 3)	0		7,868		0		6,324	
		EDC	CSP	EDC	CSP	EDC	CSP	EDC	CSP
5	Design & Development <sup>[2]</sup>	1	1	2	7	1	1	2	7
6	Administration, Management, and Technical Assistance <sup>[3]</sup>	5	12	30	458	5	12	30	458
7	Marketing <sup>[4]</sup>	0	3	3	45	0	3	3	45
8	Program Delivery <sup>[5]</sup>	2	10	16	51	2	10	16	51
9	EDC Evaluation Costs	12		76		12		76	
10	SWE Audit Costs	2		14		2		14	
11	Program Overhead Costs (Sum of rows 5 through 10)	48		701		48		701	
12	NPV of increases in costs of natural gas (or other fuels) for fuel switching programs	0		0		0		0	
13	Total NPV TRC Costs <sup>[6]</sup> (Net present value of sum of rows 4, 11, and 12)	48		8,056		48		6,618	
14	Total NPV Lifetime Electric Energy Benefits	0		7,842		0		6,225	
15	Total NPV Lifetime Electric Capacity Benefits	0		182		0		148	
16	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	0		0		0		0	
17	Total NPV Lifetime Non-Electric Benefits (Fossil Fuel, Water)	0		-1,076		0		-851	
18	Total NPV TRC Benefits <sup>[7]</sup> (Sum of rows 14 through 17)	0		6,948		0		5,521	
19	TRC Benefit-Cost Ratio <sup>[8]</sup>	0.00		0.86		0.00		0.83	

[1] Includes direct install equipment costs and costs for EE&C kits.  
 [2] Includes direct costs attributable to plan and advance the programs. Note: The design of the HERs program should be included here, while the actual development and mailing of HERs would be attributable to Program Delivery.  
 [3] Includes rebate processing, tracking system, general administration, program management, general management and legal, and technical assistance. Any common portfolio costs that are allocated across programs should be shown in this row.  
 [4] Includes the marketing CSP and marketing costs by program CSPs.  
 [5] Direct program implementation costs. Labor, fuel, and vehicle operation costs for appliance recycling and direct install programs. For behavioral programs, this includes the printing and postage of HERs.  
 [6] Total TRC Costs includes Total EDC Costs and Participant Costs.  
 [7] Total TRC Benefits equals the sum of Total Lifetime Electric and Non-Electric Benefits. Benefits include: avoided supply costs, including the reduction in costs of electric energy, generation, transmission, and distribution capacity, and natural gas valued at marginal cost for periods when there is a load reduction. Savings carried over from Phase II are not included as a part of Total TRC Benefits for Phase III.  
 [8] TRC Ratio equals Total NPV TRC Benefits divided by Total NPV TRC Costs.  
 \* Rows 1-11 are presented in nominal dollars.

### 3.7.7 Status of Recommendations

Recommendations for the nonresidential programs are listed in Section 3.5.7.



### 3.8 BEHAVIORAL DEMAND RESPONSE PROGRAM

The Behavioral Demand Response (BDR) Program is a component of the Energy Efficient Homes Program. This section lists impacts and cost effectiveness information for this program component. The impact values presented in this section are independent of the results reported in Section 3.2, but the cost effectiveness tables presented in section 3.8.5 are also included in the overall program cost effectiveness tables in Section 3.2.6.

The BDR program is administered by Oracle and is marketed as the Peak Day Alert Program. Penn Power, Met-Ed, and WPP offered BDR programs in PY12. Oracle established the program as a randomized control trial to facilitate measurement and verification. Randomly selected customers received postcards, educating them about conserving energy during peak days. Customers were then provided Peak Day Alert notifications by telephone or email, in advance of Act 129 events.

Compliance targets for demand response programs were established at the system level, which means the load reductions measured at the customer meter must be escalated to reflect transmission and distribution losses. The peak demand impacts presented in this section have been adjusted for line losses.

EDCs operated demand response programs on a voluntary basis in PY12. The Companies operated the BDR program in a similar fashion as in past years.

#### 3.8.1 Participation and Reported Savings by Customer Segment

Table 137 presents the participation counts, reported energy and demand savings, and incentive payments for the BDR Program in PY12 by EDC. This program serves only the Residential customer segment. Each separate household is counted as one participant.

**Table 137: BDR Program Participation and Reported Impacts**

Parameter	Met-Ed Residential (Non-LI)	Penn Power Residential (Non-LI)	WPP Residential (Non-LI)
PYTD # Participants	191,898	30,208	56,934
PYVTD MW/yr	8.94	1.55	2.83
PYTD Incentives (\$1000)	0.00	0.00	0.00
Evaluation Approach	Interval Meter Analysis with Randomized Control Trial		

#### 3.8.2 Gross Impact Evaluation

The gross impact evaluation for the BDR initiative is described in detail in Appendix U. The evaluation approach is similar to that of the Home Energy Reports program component, but with hourly data. Table 138 summarizes program verified impacts and realization rates for each EDC.

**Table 138: Behavioral Demand Response Program Gross Impact Evaluation Summary for PY12**

Event Date	Verified MW and Relative Precision @ 90% C.L.		
	Met-Ed	Penn Power	WPP
7/20/2020	9.88 ± 4.51	1.64 ± 1.14	2.8 ± 2.16
7/27/2020	10.74 ± 4.51	1.71 ± 1.19	3.16 ± 2.21
7/29/2020	7.28 ± 4.32	1.56 ± 1.16	2.78 ± 2.15
8/25/2020	9 ± 4.15	1.36 ± 1.1	2.85 ± 2
8/27/2020	7.8 ± 4.35	1.46 ± 1.15	2.58 ± 2.1
<b>Total</b>	<b>8.94 ± 1.95</b>	<b>1.55 ± 0.51</b>	<b>2.83 ± 0.95</b>

As with the other demand response programs offered by the Companies, ex ante impacts are not reported. Oracle did provide ex ante estimates however, which were quite similar to the verified impacts shown above.

### 3.8.2.1 Evaluation Adjustments in Response to the COVID-19 Pandemic

Gross impact evaluation for this program was not impacted by COVID in PY12 since the evaluation did not involve on-site or in-person visits. While the pandemic did cause observable changes in residential electric energy usage, the analysis held statistical significance and measured impacts that were comparable to the pre-COVID era.

### 3.8.3 Net Impact Evaluation

Net impact evaluation is not conducted for this program because the randomized control trial approach described above measures net program impacts.

### 3.8.4 Process Evaluation

Tetra Tech conducted qualitative and quantitative research for this program’s process evaluation in PY10 and again in PY12. The qualitative research included semi-structured interviews with the FirstEnergy program manager, the program implementer (Oracle), followed by a three-phase customer survey effort. Before the start of the peak season, Tetra Tech recruited a panel of customers who agreed to respond to a survey after each peak day event (event surveys). Recruiting a panel and conducting brief surveys following peak day events allows for continuity in tracking customer experiences, provides higher quality data on customer reactions to peak day events, and helps to identify if customer engagement with the program changes over time. The post-season survey captured customer experiences with the program overall, how it may have influenced their satisfaction with their EDC, and suggestions on improving from their perspective. Findings and Recommendations from the PY12 study are discussed in Section 3.8.6.

### 3.8.5 Cost-Effectiveness Reporting

A detailed breakdown of program finances and cost-effectiveness is presented in Table 139, Table 140, and Table 141 for Met-Ed, Penelec, and Penn Power respectively. TRC benefits were calculated using gross verified impacts. PYTD financials are expressed in 2019 dollars and P3TD financials are expressed in the 2016 dollars. Additional discussion of TRC inputs and alternative TRC values for Demand Response programs are provided in Section 3.10.4

**Table 139: Summary of Finances for the Behavioral Demand Response Program – Met-Ed**

Row #	Cost Category	Gross PYTD (\$1,000)		Gross P3TD (\$1,000)		Net PYTD (\$1,000)		Net P3TD (\$1,000)	
1	EDC Incentives to Participants <sup>[1]</sup>	0		0		0		0	
2	EDC Incentives to Trade Allies	0		0		0		0	
3	Participant Costs (net of incentives/rebates paid by utilities)	0		0		0		0	
4	Incremental Measure Costs (Sum of rows 1 through 3)	0		0		0		0	
		EDC	CSP	EDC	CSP	EDC	CSP	EDC	CSP
5	Design & Development <sup>[2]</sup>	2	52	3	171	2	52	3	171
6	Administration, Management, and Technical Assistance <sup>[3]</sup>	16	103	62	340	16	103	62	340
7	Marketing <sup>[4]</sup>	-5	0	8	4	-5	0	8	4
8	Program Delivery <sup>[5]</sup>	0	360	0	1,188	0	360	0	1,188
9	EDC Evaluation Costs	11		86		11		86	
10	SWE Audit Costs	4		14		4		14	
11	Program Overhead Costs (Sum of rows 5 through 10)	543		1,875		543		1,875	
12	NPV of increases in costs of natural gas (or other fuels) for fuel switching programs	0		0		0		0	
13	Total NPV TRC Costs <sup>[6]</sup> (Net present value of sum of rows 4, 11, and 12)	543		1,559		543		1,559	
14	Total NPV Lifetime Electric Energy Benefits	0		0		0		0	
15	Total NPV Lifetime Electric Capacity Benefits	617		1,558		617		1,558	
16	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	0		0		0		0	
17	Total NPV Lifetime Non-Electric Benefits (Fossil Fuel, Water)	0		0		0		0	
18	Total NPV TRC Benefits <sup>[7]</sup> (Sum of rows 14 through 17)	617		1,558		617		1,558	
19	TRC Benefit-Cost Ratio <sup>[8]</sup>	1.14		1.00		1.14		1.00	

[1] Includes direct install equipment costs and costs for EE&C kits.  
 [2] Includes direct costs attributable to plan and advance the programs. Note: The design of the HERs program should be included here, while the actual development and mailing of HERs would be attributable to Program Delivery.  
 [3] Includes rebate processing, tracking system, general administration, program management, general management and legal, and technical assistance. Any common portfolio costs that are allocated across programs should be shown in this row.  
 [4] Includes the marketing CSP and marketing costs by program CSPs.  
 [5] Direct program implementation costs. Labor, fuel, and vehicle operation costs for appliance recycling and direct install programs. For behavioral programs, this includes the printing and postage of HERs.  
 [6] Total TRC Costs includes Total EDC Costs and Participant Costs.  
 [7] Total TRC Benefits equals the sum of Total Lifetime Electric and Non-Electric Benefits. Benefits include: avoided supply costs, including the reduction in costs of electric energy, generation, transmission, and distribution capacity, and natural gas valued at marginal cost for periods when there is a load reduction. Savings carried over from Phase II are not included as a part of Total TRC Benefits for Phase III.  
 [8] TRC Ratio equals Total NPV TRC Benefits divided by Total NPV TRC Costs.  
 \* Rows 1-11 are presented in nominal dollars

**Table 140: Summary of Finances for the Behavioral Demand Response Program – Penn Power**

Row #	Cost Category	Gross PYTD (\$1,000)		Gross P3TD (\$1,000)		Net PYTD (\$1,000)		Net P3TD (\$1,000)	
1	EDC Incentives to Participants <sup>[1]</sup>	0		0		0		0	
2	EDC Incentives to Trade Allies	0		0		0		0	
3	Participant Costs (net of incentives/rebates paid by utilities)	0		0		0		0	
4	Incremental Measure Costs (Sum of rows 1 through 3)	0		0		0		0	
		EDC	CSP	EDC	CSP	EDC	CSP	EDC	CSP
5	Design & Development <sup>[2]</sup>	1	9	2	50	1	9	2	50
6	Administration, Management, and Technical Assistance <sup>[3]</sup>	11	19	63	100	11	19	63	100
7	Marketing <sup>[4]</sup>	-2	0	1	0	-2	0	1	0
8	Program Delivery <sup>[5]</sup>	0	65	0	350	0	65	0	350
9	EDC Evaluation Costs	5		55		5		55	
10	SWE Audit Costs	2		13		2		13	
11	Program Overhead Costs (Sum of rows 5 through 10)	110		634		110		634	
12	NPV of increases in costs of natural gas (or other fuels) for fuel switching programs	0		0		0		0	
13	Total NPV TRC Costs <sup>[6]</sup> (Net present value of sum of rows 4, 11, and 12)	110		556		110		556	
14	Total NPV Lifetime Electric Energy Benefits	0		0		0		0	
15	Total NPV Lifetime Electric Capacity Benefits	107		535		107		535	
16	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	0		0		0		0	
17	Total NPV Lifetime Non-Electric Benefits (Fossil Fuel, Water)	0		0		0		0	
18	Total NPV TRC Benefits <sup>[7]</sup> (Sum of rows 14 through 17)	107		535		107		535	
19	TRC Benefit-Cost Ratio <sup>[8]</sup>	0.97		0.96		0.97		0.96	

[1] Includes direct install equipment costs and costs for EE&C kits.  
 [2] Includes direct costs attributable to plan and advance the programs. Note: The design of the HERs program should be included here, while the actual development and mailing of HERs would be attributable to Program Delivery.  
 [3] Includes rebate processing, tracking system, general administration, program management, general management and legal, and technical assistance. Any common portfolio costs that are allocated across programs should be shown in this row.  
 [4] Includes the marketing CSP and marketing costs by program CSPs.  
 [5] Direct program implementation costs. Labor, fuel, and vehicle operation costs for appliance recycling and direct install programs. For behavioral programs, this includes the printing and postage of HERs.  
 [6] Total TRC Costs includes Total EDC Costs and Participant Costs.  
 [7] Total TRC Benefits equals the sum of Total Lifetime Electric and Non-Electric Benefits. Benefits include: avoided supply costs, including the reduction in costs of electric energy, generation, transmission, and distribution capacity, and natural gas valued at marginal cost for periods when there is a load reduction. Savings carried over from Phase II are not included as a part of Total TRC Benefits for Phase III.  
 [8] TRC Ratio equals Total NPV TRC Benefits divided by Total NPV TRC Costs.  
 \* Rows 1-11 are presented in nominal dollars.

**Table 141: Summary of Finances for the Behavioral Demand Response Program – WPP**

Row #	Cost Category	Gross PYTD (\$1,000)		Gross P3TD (\$1,000)		Net PYTD (\$1,000)		Net P3TD (\$1,000)	
1	EDC Incentives to Participants <sup>[1]</sup>	0		0		0		0	
2	EDC Incentives to Trade Allies	0		0		0		0	
3	Participant Costs (net of incentives/rebates paid by utilities)	0		0		0		0	
4	Incremental Measure Costs (Sum of rows 1 through 3)	0		0		0		0	
		EDC	CSP	EDC	CSP	EDC	CSP	EDC	CSP
5	Design & Development <sup>[2]</sup>	2	16	3	60	2	16	3	60
6	Administration, Management, and Technical Assistance <sup>[3]</sup>	15	32	52	120	15	32	52	120
7	Marketing <sup>[4]</sup>	-5	0	1	0	-5	0	1	0
8	Program Delivery <sup>[5]</sup>	0	111	0	418	0	111	0	418
9	EDC Evaluation Costs	10		79		10		79	
10	SWE Audit Costs	3		11		3		11	
11	Program Overhead Costs (Sum of rows 5 through 10)	184		746		184		746	
12	NPV of increases in costs of natural gas (or other fuels) for fuel switching programs	0		0		0		0	
13	Total NPV TRC Costs <sup>[6]</sup> (Net present value of sum of rows 4, 11, and 12)	184		623		184		623	
14	Total NPV Lifetime Electric Energy Benefits	0		0		0		0	
15	Total NPV Lifetime Electric Capacity Benefits	196		591		196		591	
16	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	0		0		0		0	
17	Total NPV Lifetime Non-Electric Benefits (Fossil Fuel, Water)	0		0		0		0	
18	Total NPV TRC Benefits <sup>[7]</sup> (Sum of rows 14 through 17)	196		591		196		591	
19	TRC Benefit-Cost Ratio <sup>[8]</sup>	1.06		0.95		1.06		0.95	

[1] Includes direct install equipment costs and costs for EE&C kits.  
 [2] Includes direct costs attributable to plan and advance the programs. Note: The design of the HERs program should be included here, while the actual development and mailing of HERs would be attributable to Program Delivery.  
 [3] Includes rebate processing, tracking system, general administration, program management, general management and legal, and technical assistance. Any common portfolio costs that are allocated across programs should be shown in this row.  
 [4] Includes the marketing CSP and marketing costs by program CSPs.  
 [5] Direct program implementation costs. Labor, fuel, and vehicle operation costs for appliance recycling and direct install programs. For behavioral programs, this includes the printing and postage of HERs.  
 [6] Total TRC Costs includes Total EDC Costs and Participant Costs.  
 [7] Total TRC Benefits equals the sum of Total Lifetime Electric and Non-Electric Benefits. Benefits include: avoided supply costs, including the reduction in costs of electric energy, generation, transmission, and distribution capacity, and natural gas valued at marginal cost for periods when there is a load reduction. Savings carried over from Phase II are not included as a part of Total TRC Benefits for Phase III.  
 [8] TRC Ratio equals Total NPV TRC Benefits divided by Total NPV TRC Costs.  
 \* Rows 1-11 are presented in nominal dollars

### 3.8.6 Status of Recommendations

The process evaluation resulted in several noteworthy findings and recommendations. Not all findings and recommendations have a one-to-one correspondence, therefore the findings are

disclosed first, followed by recommendations. Earlier recommendations are available in the PY10 report.

**Finding #1:** *Customers express high satisfaction with their EDC.* About 88 percent are very satisfied or extremely satisfied with the overall quality of service provided by their EDC. Roughly 54 percent reported that their opinion of the company improved as a result of their participation in the program.

**Finding #2:** *Customers find the requested level of effort to be acceptable.* About 75 to 80 percent found the number of peak day events and the peak event duration (the number of hours for which they are asked to reduce energy use) to be very reasonable. In addition, more than half of the respondents to the post-season survey were satisfied with the program the way it was implemented.

**Finding #3:** *Customer engagement with the peak day alerts and performance notifications is high among those who remember receiving them.* At least 75 percent of customers who completed the surveys recall parts of the peak day alerts (e.g., event time and duration, and tips), and remember receiving the performance notifications.

**Finding #4:** *Behavioral follow-through on peak event days is high.* All customers reported taking at least one energy-saving action during the event period. Over 60 percent generally reduced their energy use for the full, four-hour period of the events. At least 80 percent of respondents said that reducing energy use with two events in one week was about the same as trying to reduce energy use for one day.

**Finding #5:** *Customers find the peak day alerts and performance notifications useful.* About 50 to 60 percent of customers found the energy-saving tips and the information provided in the performance notifications were *extremely useful* or *very useful*. Close to one-half felt the energy-saving tips were *somewhat useful*. The comparison with similar homes was the most useful piece of information in the performance notifications (about 50 percent).

**Finding #6:** *Interactive Voice Response (IVR) messages reach more customers.* The Oracle reports show that more IVR event messages than emails are received by customers. This is reflected in the higher proportion of respondents reporting that they hear the IVR messages when a peak day event is called. This may complicate the ability to provide detailed information on the program.

Although the BDR program is not being offered in Phase IV, the following recommendations are included for consideration in case the program is considered in the future.

**Recommendation #1:** *Continue with the current approach; over half of the respondents are satisfied with the program as it is.* There were very few issues raised by survey respondents. Satisfaction was high. Respondents found the program's expectations reasonable—the number of events, what they were asked to do, for the duration of actions—and they appreciated the tips and suggestions on how to reduce energy use.

**EDC Status Report #1:** Recommendation accepted.

**Recommendation #2:** *Raise awareness about the program and understanding of peak day events with additional messaging.* Customers' suggestions for program improvement include more advance notice of peak event days and a wider variety of tips. Other customers suggested additional energy-saving suggestions in the peak day alerts. A postcard or email sent "off-event" or following an event can explain how some, but not all, hot summer days become "peak event days" and emphasize how and why the tips currently provided are the most effective response to a peak day event.

**EDC Status Report #2:** Recommendation accepted.

**Recommendation #3:** *Work with the program implementer to clean up event tracking metrics.* The pre- and post-event tracking metrics provided by Oracle are useful in understanding the proportion of customers alerted on peak days, the proportion receiving performance notifications, and the efficiency of responding to customer calls. With accurate CSS Corp data, the Companies would be able to identify patterns in call volumes and times of day that customers call with questions. Monitoring of abandon rates could improve satisfaction, as high abandon rates could result in customer frustration.

**EDC Status Report #3:** Recommendation accepted.



### 3.9 C&I DEMAND RESPONSE PROGRAM - SMALL

The C&I Demand Response Program – Small (SDR Program) is a load curtailment program that is available to all Small C&I customers. The program, for both the Large and Small C&I sectors is managed as one program by the Companies, and is implemented by Enel X in Penn Power, and by both Enel X and CPower in Met-Ed and WPP. The program offers incentives for load reductions during event hours. Most customers reduce loads by rescheduling industrial processes to off-event hours or by changing operations during event hours.

Compliance targets for demand response programs were established at the system level, which means the load reductions measured at the customer meter must be grossed up to reflect transmission and distribution losses. The peak demand impacts presented in this section have been adjusted for line losses.

EDCs operated demand response programs on a voluntary basis in PY12. The Companies operated the SDR program in a similar fashion as in past years. Event durations and incentive rates were unchanged relative to PY11. While participant counts did not appreciably change for the LDR program, the overall participant counts for the SDR program were reduced in PY12 relative to PY11, indicating that the small commercial sector was more acutely impacted by the pandemic.

#### 3.9.1 Participation and Reported Savings by Customer Segment

Table 142 presents the participation counts, reported demand savings, and incentive payments for the SDR Program in PY12 by EDC. Each separate facility is counted as one participant.

**Table 142: C&I Demand Response Program – Small, Program Participation and Impacts**

Parameter	Met-Ed Small C&I (Non-GNI)	Met-Ed GNI	Met-Ed Total	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	7	62	0	0	0	48	2	50
PYVTD MW/yr	1.73	0.05	1.78	0.00	0.00	0.00	1.19	-0.04	1.15
PYTD Incentives (\$1000)	63,609	1,720	65,329	0	0	0	20,691	0	20,691
Evaluation Approach	Apply weighted average of three lowest-RRMSE CBL algorithms, selected from 12 candidates.								

#### 3.9.2 Gross Impact Evaluation

##### 3.9.2.1 Methodology

The Demand Response Programs in both the Large and Small C&I sectors are managed as one program by the Companies. ADM conducts an impact evaluation of the combined program

each year and evaluates impacts for all participants, large and small. The process evaluation for the combined DR programs is discussed in Section 3.10.2.

### 3.9.2.2 Results

Table 143 shows verified impacts by event and EDC, as well as overall PY12 impacts with 90% confidence intervals.

**Table 143: C&I Demand Response Program – Small, Verified PY12 Impacts**

Event Date	Verified MW and Precision @ 90% C.L.		
	Met-Ed	Penn Power	WPP
7/20/2020	1.7 ± 0.3	0.0 ± 0.0	1.6 ± 0.3
7/27/2020	2.1 ± 0.3	0.0 ± 0.0	0.9 ± 0.3
7/29/2020	2.2 ± 0.3	0.0 ± 0.0	1.1 ± 0.3
8/25/2020	1.8 ± 0.3	0.0 ± 0.0	1.3 ± 0.3
8/27/2020	1.1 ± 0.3	0.0 ± 0.0	0.9 ± 0.3
<b>Total</b>	<b>1.8 +/- 0.2</b>	<b>0.0 +/- 0.0</b>	<b>1.2 +/- 0.2</b>

### 3.9.2.3 Evaluation Adjustments in Response to the COVID-19 Pandemic

Gross impact evaluation for this program was not impacted by COVID in PY12 since the evaluation did not involve on-site or in-person visits. While the pandemic did cause observable changes in electric energy usage, the analysis held statistical significance and measured impacts that were comparable to the pre-COVID era.

### 3.9.3 Process Evaluation

The Demand Response Programs in both the Large and Small C&I sectors are managed as one program by the Companies. Tetra Tech conducted a process evaluation of the combined program in PY9 and PY11. The process evaluation is discussed in Section 3.10.3.

### 3.9.4 Cost-Effectiveness Reporting

A detailed breakdown of program finances and cost-effectiveness is presented in Table 144, Table 145, and Table 146 for Met-Ed, Penn Power, and West Penn Power respectively. TRC benefits were calculated using gross verified impacts. PYTD financials are expressed in 2019 dollars and P3TD financials are expressed in the 2016 dollars. Additional discussion of TRC inputs and alternative TRC values for the C&I Demand Response programs are provided in Section 3.10.4.

**Table 144: Summary of Finances for C&I Demand Response Program – Small – Met-Ed**

Row #	Cost Category	Gross PYTD (\$1,000)		Gross P3TD (\$1,000)		Net PYTD (\$1,000)		Net P3TD (\$1,000)	
1	EDC Incentives to Participants <sup>[1]</sup>	65		134		65		134	
2	EDC Incentives to Trade Allies	0		0		0		0	
3	Participant Costs (net of incentives/rebates paid by utilities)	-16		-33		-16		-33	
4	Incremental Measure Costs (Sum of rows 1 through 3)	49		100		49		100	
		EDC	CSP	EDC	CSP	EDC	CSP	EDC	CSP
5	Design & Development <sup>[2]</sup>	1	0	2	9	1	0	2	9
6	Administration, Management, and Technical Assistance <sup>[3]</sup>	9	-1	59	36	9	-1	59	36
7	Marketing <sup>[4]</sup>	0	-1	3	54	0	-1	3	54
8	Program Delivery <sup>[5]</sup>	0	-1	3	81	0	-1	3	81
9	EDC Evaluation Costs	3		26		3		26	
10	SWE Audit Costs	2		14		2		14	
11	Program Overhead Costs (Sum of rows 5 through 10)	14		287		14		287	
12	NPV of increases in costs of natural gas (or other fuels) for fuel switching programs	0		0		0		0	
13	Total NPV TRC Costs <sup>[6]</sup> (Net present value of sum of rows 4, 11, and 12)	63		340		63		340	
14	Total NPV Lifetime Electric Energy Benefits	0		0		0		0	
15	Total NPV Lifetime Electric Capacity Benefits	123		820		123		820	
16	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	0		0		0		0	
17	Total NPV Lifetime Non-Electric Benefits (Fossil Fuel, Water)	0		0		0		0	
18	Total NPV TRC Benefits <sup>[7]</sup> (Sum of rows 14 through 17)	123		820		123		820	
19	TRC Benefit-Cost Ratio <sup>[8]</sup>	1.96		2.41		1.96		2.41	
<p>[1] Includes direct install equipment costs and costs for EE&amp;C kits.                  [2] Includes direct costs attributable to plan and advance the programs. Note: The design of the HERs program should be included here, while the actual development and mailing of HERs would be attributable to Program Delivery.                  [3] Includes rebate processing, tracking system, general administration, program management, general management and legal, and technical assistance. Any common portfolio costs that are allocated across programs should be shown in this row.                  [4] Includes the marketing CSP and marketing costs by program CSPs.                  [5] Direct program implementation costs. Labor, fuel, and vehicle operation costs for appliance recycling and direct install programs. For behavioral programs, this includes the printing and postage of HERs.                  [6] Total TRC Costs includes Total EDC Costs and Participant Costs.                  [7] Total TRC Benefits equals the sum of Total Lifetime Electric and Non-Electric Benefits. Benefits include: avoided supply costs, including the reduction in costs of electric energy, generation, transmission, and distribution capacity, and natural gas valued at marginal cost for periods when there is a load reduction. Savings carried over from Phase II are not included as a part of Total TRC Benefits for Phase III.                  [8] TRC Ratio equals Total NPV TRC Benefits divided by Total NPV TRC Costs.                  * Rows 1-11 are presented in nominal dollars</p>									

**Table 145: Summary of Finances for C&I Demand Response Program – Small – Penn Power**

Row #	Cost Category	Gross PYTD (\$1,000)		Gross P3TD (\$1,000)		Net PYTD (\$1,000)		Net P3TD (\$1,000)	
1	EDC Incentives to Participants <sup>[1]</sup>	0		0		0		0	
2	EDC Incentives to Trade Allies	0		0		0		0	
3	Participant Costs (net of incentives/rebates paid by utilities)	0		0		0		0	
4	Incremental Measure Costs (Sum of rows 1 through 3)	0		0		0		0	
		EDC	CSP	EDC	CSP	EDC	CSP	EDC	CSP
5	Design & Development <sup>[2]</sup>	0	0	1	0	0	0	1	0
6	Administration, Management, and Technical Assistance <sup>[3]</sup>	4	0	23	1	4	0	23	1
7	Marketing <sup>[4]</sup>	0	0	1	1	0	0	1	1
8	Program Delivery <sup>[5]</sup>	0	0	1	2	0	0	1	2
9	EDC Evaluation Costs	1		9		1		9	
10	SWE Audit Costs	1		5		1		5	
11	Program Overhead Costs (Sum of rows 5 through 10)	6		43		6		43	
12	NPV of increases in costs of natural gas (or other fuels) for fuel switching programs	0		0		0		0	
13	Total NPV TRC Costs <sup>[6]</sup> (Net present value of sum of rows 4, 11, and 12)	6		39		6		39	
14	Total NPV Lifetime Electric Energy Benefits	0		0		0		0	
15	Total NPV Lifetime Electric Capacity Benefits	0		15		0		15	
16	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	0		0		0		0	
17	Total NPV Lifetime Non-Electric Benefits (Fossil Fuel, Water)	0		0		0		0	
18	Total NPV TRC Benefits <sup>[7]</sup> (Sum of rows 14 through 17)	0		15		0		15	
19	TRC Benefit-Cost Ratio <sup>[8]</sup>	0.00		0.38		0.00		0.38	

[1] Includes direct install equipment costs and costs for EE&C kits.  
 [2] Includes direct costs attributable to plan and advance the programs. Note: The design of the HERs program should be included here, while the actual development and mailing of HERs would be attributable to Program Delivery.  
 [3] Includes rebate processing, tracking system, general administration, program management, general management and legal, and technical assistance. Any common portfolio costs that are allocated across programs should be shown in this row.  
 [4] Includes the marketing CSP and marketing costs by program CSPs.  
 [5] Direct program implementation costs. Labor, fuel, and vehicle operation costs for appliance recycling and direct install programs. For behavioral programs, this includes the printing and postage of HERs.  
 [6] Total TRC Costs includes Total EDC Costs and Participant Costs.  
 [7] Total TRC Benefits equals the sum of Total Lifetime Electric and Non-Electric Benefits. Benefits include: avoided supply costs, including the reduction in costs of electric energy, generation, transmission, and distribution capacity, and natural gas valued at marginal cost for periods when there is a load reduction. Savings carried over from Phase II are not included as a part of Total TRC Benefits for Phase III.  
 [8] TRC Ratio equals Total NPV TRC Benefits divided by Total NPV TRC Costs.  
 \* Rows 1-11 are presented in nominal dollars.

**Table 146: Summary of Finances for C&I Demand Response Program – Small – WPP**

Row #	Cost Category	Gross PYTD (\$1,000)		Gross P3TD (\$1,000)		Net PYTD (\$1,000)		Net P3TD (\$1,000)	
1	EDC Incentives to Participants <sup>[1]</sup>	21		39		21		39	
2	EDC Incentives to Trade Allies	0		0		0		0	
3	Participant Costs (net of incentives/rebates paid by utilities)	-5		-10		-5		-10	
4	Incremental Measure Costs (Sum of rows 1 through 3)	16		29		16		29	
		EDC	CSP	EDC	CSP	EDC	CSP	EDC	CSP
5	Design & Development <sup>[2]</sup>	2	1	2	5	2	1	2	5
6	Administration, Management, and Technical Assistance <sup>[3]</sup>	12	4	73	17	12	4	73	17
7	Marketing <sup>[4]</sup>	0	6	4	25	0	6	4	25
8	Program Delivery <sup>[5]</sup>	1	9	3	38	1	9	3	38
9	EDC Evaluation Costs	4		33		4		33	
10	SWE Audit Costs	2		16		2		16	
11	Program Overhead Costs (Sum of rows 5 through 10)	39		216		39		216	
12	NPV of increases in costs of natural gas (or other fuels) for fuel switching programs	0		0		0		0	
13	Total NPV TRC Costs <sup>[6]</sup> (Net present value of sum of rows 4, 11, and 12)	54		217		54		217	
14	Total NPV Lifetime Electric Energy Benefits	0		0		0		0	
15	Total NPV Lifetime Electric Capacity Benefits	80		424		80		424	
16	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	0		0		0		0	
17	Total NPV Lifetime Non-Electric Benefits (Fossil Fuel, Water)	0		0		0		0	
18	Total NPV TRC Benefits <sup>[7]</sup> (Sum of rows 14 through 17)	80		424		80		424	
19	TRC Benefit-Cost Ratio <sup>[8]</sup>	1.46		1.95		1.46		1.95	

[1] Includes direct install equipment costs and costs for EE&C kits.  
 [2] Includes direct costs attributable to plan and advance the programs. Note: The design of the HERs program should be included here, while the actual development and mailing of HERs would be attributable to Program Delivery.  
 [3] Includes rebate processing, tracking system, general administration, program management, general management and legal, and technical assistance. Any common portfolio costs that are allocated across programs should be shown in this row.  
 [4] Includes the marketing CSP and marketing costs by program CSPs.  
 [5] Direct program implementation costs. Labor, fuel, and vehicle operation costs for appliance recycling and direct install programs. For behavioral programs, this includes the printing and postage of HERs.  
 [6] Total TRC Costs includes Total EDC Costs and Participant Costs.  
 [7] Total TRC Benefits equals the sum of Total Lifetime Electric and Non-Electric Benefits. Benefits include: avoided supply costs, including the reduction in costs of electric energy, generation, transmission, and distribution capacity, and natural gas valued at marginal cost for periods when there is a load reduction. Savings carried over from Phase II are not included as a part of Total TRC Benefits for Phase III.  
 [8] TRC Ratio equals Total NPV TRC Benefits divided by Total NPV TRC Costs.  
 \* Rows 1-11 are presented in nominal dollars

### 3.9.5 Status of Recommendations

The Demand Response Programs in both the Large and Small C&I sectors are effectively managed as one program by the Companies. Findings and recommendations for both programs are discussed in Section 3.10.5.

### 3.10 C&I DEMAND RESPONSE PROGRAM - LARGE

The C&I Demand Response Program – Large (LDR Program) is a load curtailment program that is available to all Large C&I customers. The program for both the Large and Small C&I sectors is managed as one program by the companies, and is implemented by Enel X in Penn Power, and by both Enel X and CPower in Met-Ed and WPP. The program offers incentives for load reductions during event hours. Most customers reduce loads by rescheduling industrial processes to off-event hours or by changing operations during event hours.

Compliance targets for demand response programs were established at the system level, which means the load reductions measured at the customer meter must be grossed up to reflect transmission and distribution losses. The peak demand impacts presented in this section have been adjusted for line losses.

EDCs operated demand response programs on a voluntary basis in PY12. The Companies operated the SDR program in a similar fashion as in past years. Event durations and incentive rates were unchanged relative to PY11. The overall number of customers in the LDR program were comparable to those in PY11.

#### 3.10.1 Participation and Reported Savings by Customer Segment

Table 147 presents the participation counts, reported demand savings, and incentive payments for the LDR Program in PY12 by EDC. Each separate facility is counted as one participant.

**Table 147: C&I Demand Response Program – Large, Program Participation and Impacts**

Parameter	Met-Ed Large C&I (Non-GNI)	Met-Ed GNI	Met-Ed Total	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	72	22	94	7	2	9	27	2	29
PYVTD MW/yr	32.89	2.39	35.28	10.17	-0.08	10.09	87.38	-0.04	87.34
PYTD Incentives (\$1000)	649,914	47,320	697,234	45,371	0	45,371	861,472	0	861,472
Evaluation Approach	Apply weighted average of three lowest-RRMSE CBL algorithms, selected from 12 candidates.								

#### 3.10.2 Gross Impact Evaluation

##### 3.10.2.1 Methodology

Gross impact evaluation consisted of establishing various customer baseline loads (CBLs) for each program participant. The CBL algorithms were ranked in order of relative root mean square error (RRMSE) and the three CBLs with lowest RRMSEs were selected for each participant. A weighted average of the top three CBLs was used in creating the actual CBL for

each participant, with the inverse squares of the RMSEs used as weights. The CBLs are described below.

#### *Ten of Ten CBL*

This CBL is the average hourly whole-facility demand profile from the last ten weekdays that are (i) not holidays, (ii) not pre-specified customer-specific shutdown days, (iii) not weekends<sup>12</sup>, (iv) not Act 129 event-days, (v) not customer-specific PJM event-participation days.

#### *Ten of Ten Individual CBL*

This CBL is the average hourly whole-facility demand profile from the last ten weekdays of the matching type (e.g. Mondays, Tuesdays, etc.) that are (i) not holidays, (ii) not pre-specified customer-specific shutdown days, (iii) not weekends, (iv) not Act 129 event-days, (v) not customer-specific PJM event-participation days (vi) not customer – specific peak load shaving event days.

#### *Six of Seven CBL*

This CBL is the average hourly whole-facility demand profile from the highest load (as defined during event-hours) six of last seven weekdays that are (i) not holidays, (ii) not pre-specified customer-specific shutdown days, (iii) not weekends, (iv) not Act 129 event-days, (v) not customer-specific PJM event-participation days (vi) not customer – specific peak load shaving event days.

To be eligible for this CBL, customers must provide forward-looking weekly production schedules.

#### *Six of Seven Individual CBL*

This CBL is the average hourly whole-facility demand profile from the highest load (as defined during event-hours) six of the last seven weekdays of the matching type (e.g. Mondays, Tuesdays, etc.) that are (i) not holidays, (ii) not pre-specified customer-specific shutdown days, (iii) not weekends, (iv) not Act 129 event-days, (v) not customer-specific PJM event-participation days (vi) not customer – specific peak load shaving event days.

To be eligible for this CBL, customers must provide forward-looking weekly production schedules.

#### *PJM Three Day Type CBL*

This CBL is similar to the six of seven CBL listed above, but the basis day exclusion rules are to first select the five most recent qualifying weekdays, then, if any of the five are 75% lower than the average of the five, to replace them with the next available reference weekday, going back at most 45 days. Once there are five suitable reference weekdays, the highest four are selected to develop the CBL.

#### *PJM Seven Day Type CBL*

This CBL is similar to the Three-Day Type CBL described above, but also requires matching of individual day types.

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<sup>12</sup> This rule anticipates that all events will be called on non-holiday weekdays.

### *Twenty of Twenty CBL*

This CBL is similar to the Ten of Ten CBL described above, but adds first ten weekdays following the event that are (i) not holidays, (ii) not pre-specified customer-specific shutdown days, (iii) not weekends, (iv) not Act 129 event-days, (v) not customer-specific PJM event-participation days.

### *Twenty of Twenty Individual CBL*

This CBL is similar to the Twenty of Twenty CBL described above, but uses weekdays of the matching type.

### *Weather Sensitive Adjustment*

For each of the CBLs above, a weather-sensitive variant was constructed with the addition of a “Weather Sensitive Adjustment”, which is a linear correction term with facility demand as the dependent variable and the dry-bulb temperature as the independent variable. The regressions were run for hours ending 15-18, using weekdays with average event-window temperatures above 75 °F, that were not holidays, event days, or facility shutdown days.

### *Measurement Precision and Confidence Intervals*

Confidence intervals were calculated with the RRMSEs of the top three CBLs, with cross terms to account for correlations between the CBLs. Systematic uncertainty with respect to overall CBL selection methodology was estimated by comparing results with results from an alternate scenario where only the top CBL was selected for each participant.

## 3.10.2.2 Results

Table 148 shows verified impacts by event and EDC, as well as overall PY12 impacts with 90% confidence intervals.

**Table 148: C&I Demand Response Program – Large, Verified PY12 Impacts**

Event Date	Verified MW and Relative Precision @ 90% C.L.		
	Met-Ed	Penn Power	WPP
7/20/2020	37.0 ± 5.2	4.5 ± 4.8	105.5 ± 49.5
7/27/2020	41.5 ± 4.8	7.3 ± 5.7	116.2 ± 52.8
7/29/2020	32.9 ± 5.5	7.5 ± 6.0	85.4 ± 40.2
8/25/2020	35.9 ± 4.9	14.3 ± 11.7	66.6 ± 48.9
8/27/2020	29.2 ± 5.5	16.8 ± 12.8	62.9 ± 32.5
<b>Total</b>	<b>35.3 +/- 3.8</b>	<b>10.1 +/- 6.5</b>	<b>87.3 +/- 33.4</b>

## 3.10.2.3 Evaluation Adjustments in Response to the COVID-19 Pandemic

Gross impact evaluation for this program was not impacted by COVID in PY12 since the evaluation did not involve on-site or in-person visits. While the pandemic did cause observable changes in electric energy usage, the analysis held statistical significance and measured impacts that were comparable to the pre-COVID era.



### 3.10.3 Process Evaluation

Tetra Tech conducted a process evaluation of the Commercial and Industrial Demand Response Programs in PY9 and again in PY11. This PY11 process evaluation examined researchable questions related to participant satisfaction, response to events, and familiarity with PJM programs and rules, and other energy-related topics. The PY11 evaluation was a small, targeted study compared to the PY9 evaluation. The goal was to conduct in-depth interviews with three types of customers: full participants that curtailed load in each event, partial participants that did not participate in all events, and customers that were solicited but did not participate.

The evaluation consisted of the following activities:

- Program documentation and tracking data review, including review and preliminary analysis of actual 2019 event data;
- Interviews with Company staff (completed in late 2019 and early 2020);
- In-depth interviews with five participating customers and one nonparticipant.

Process evaluation activities were combined for the Large C&I, Small C&I programs given the combined program delivery. The Tetra Tech team interviewed the program manager to identify specific researchable issues that may help to improve program performance for PY12.

As a precursor to surveying customers, Tetra Tech identified the number unique program participants, as several participants had multiple facilities enrolled in the program. There were 60 unique participants in PY9, and all were contacted for the survey. In PY11 there were 64 unique participants, and 45 of them were attempted to be contacted for interviews, but several could not be reached, possibly due to COVID-19 related shutdowns (the interviews took place in Q2 of 2020). The stratification design and response rates for the PY9 and PY11 evaluations are shown in Table 149, and represents all C&I energy efficiency programs offered by each EDC.

**Table 149: C&I Demand Response Program Process Evaluation Sample Design**

EDC	Measure	Activity	Population Size	Achieved Sample Size	Response Rate
All	Demand Response	Customer Surveys in PY9	60	25	42%
All	Demand Response	Participant Interviews in PY11	64	6	13%
All	Demand Response	Nonparticipant Interviews in PY11	na	1	na

Key findings and recommendations are listed in Section 3.10.5.

### 3.10.4 Cost-Effectiveness Reporting

A detailed breakdown of program finances and cost-effectiveness is presented in Table 150, Table 151, and Table 152 for Met-Ed, Penelec, and Penn Power respectively. TRC benefits were calculated using gross verified impacts. PYTD financials are expressed in 2019 dollars and P3TD financials are expressed in the 2016 dollars. Customer costs are estimated considering 75% of ICSP pricing consistent with the TRC order.

The Companies believe that the TRC values for the Demand Response Programs may be overstated due to data sources and calculation methodology associated with cost effectiveness reporting of DR programs for Act 129. There are several reasons for the apparent high TRC values. One reason is that startup costs have been incurred in previous years and are not reflected in PY12. This by itself does not bias TRC results in any way, but TRC measurements in PY12 do not reflect startup costs incurred in the first two years of the Phase.

Using annual capacity prices instead of summer-only capacity prices when multiple capacity products were available, assuming 100% of the DR event savings equate to 100% avoided capacity, and including transmission and distribution avoided costs in the cost effectiveness determination of DR programs for Act 129 are several other reasons for the artificially high TRC values.

As in prior reports, the Companies present rational, alternative cost-effectiveness calculations that yield more realistic TRC ratios.

First, the 2016 TRC Order specifies, for Demand Response, that *“All peak demand reduction values would be multiplied by the avoided cost of generation capacity (\$/kW-year for the Annual Product Type) for the delivery year as set by PJM’s Base Residual Auction.”* The Companies abide by the TRC order, but note that in 2019, PJM clearing prices are available for multiple Capacity Products: a) Base DR/EE (Summer-Only) Resources; b) Base Generation Resources; and c) Annual Resources. The Summer-Only value is approximately 20% lower than other annual product values and the “most comparable” product to the Summer-Only Act 129 DR Program. The reported TRC for the Companies’ DR programs would be similarly lower if the difference in valuation between year-round and summer-only resources were considered. Note starting 2020/2021, the single Capacity Performance products replaced all previously identified Capacity Products for this issue to be resolved.

Second is that in 2017, 2018, and 2019, Act 129 DR events occurred on three of five critical peak days, as defined by PJM. It is reasonable to prorate DR program benefits by a factor of 3/5, given that the DR program had no impact on two of five PJM critical peak days. This would reduce the average DR TRC by 40%.

Third, Avoided Transmission and Distribution (T&D) prices comprise 30% to 54% of total avoided costs associated with demand response in PY12, depending on customer sector. The Companies have previously recommended, and continue to recommend the exclusion of all avoided T&D costs from cost effectiveness tests for demand response because the Phase III

Act 129 DR Program is solely targeting PJM's peak load periods for Capacity or Generation and does not provide the necessary benefits needed to avoid costs on the T&D systems. If T&D benefits were to be excluded, the average TRC for Large C&I DR programs offered by the three Companies in PY10 would decrease by 30%, while the TRC for residential and Small C&I customers would decrease by 54%.

The combination of these alternative calculations would reduce TRC by 65% to 77% for Large C&I and residential/Small C&I customers respectively.

The 2021 TRC Order recognized the suggested recommendations and incorporated in some form these changes to use more accurate pricing and appropriate assumptions.

In addition, there is some evidence that larger customers manage loads or peak shave on high load days to reduce peak load share costs in subsequent years. While ADM has not performed an assessment of net-to-gross for the program, this would further reduce TRC. The Companies formally report the higher TRC values following Commission directives for the DR programs but continue to offer these alternative scenarios for consideration.

**Table 150: Summary of Finances for C&I Demand Response Program – Large – Met-Ed**

Row #	Cost Category	Gross PYTD (\$1,000)		Gross P3TD (\$1,000)		Net PYTD (\$1,000)		Net P3TD (\$1,000)	
1	EDC Incentives to Participants <sup>[1]</sup>	697		1,580		697		1,580	
2	EDC Incentives to Trade Allies	0		0		0		0	
3	Participant Costs (net of incentives/rebates paid by utilities)	-174		-395		-174		-395	
4	Incremental Measure Costs (Sum of rows 1 through 3)	523		1,185		523		1,185	
		EDC	CSP	EDC	CSP	EDC	CSP	EDC	CSP
5	Design & Development <sup>[2]</sup>	11	4	16	132	11	4	16	132
6	Administration, Management, and Technical Assistance <sup>[3]</sup>	84	12	529	511	84	12	529	511
7	Marketing <sup>[4]</sup>	0	18	28	767	0	18	28	767
8	Program Delivery <sup>[5]</sup>	4	27	25	1,150	4	27	25	1,150
9	EDC Evaluation Costs	26		236		26		236	
10	SWE Audit Costs	19		129		19		129	
11	Program Overhead Costs (Sum of rows 5 through 10)	207		3,524		207		3,524	
12	NPV of increases in costs of natural gas (or other fuels) for fuel switching programs	0		0		0		0	
13	Total NPV TRC Costs <sup>[6]</sup> (Net present value of sum of rows 4, 11, and 12)	730		4,066		730		4,066	
14	Total NPV Lifetime Electric Energy Benefits	0		0		0		0	
15	Total NPV Lifetime Electric Capacity Benefits	1,508		8,893		1,508		8,893	
16	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	0		0		0		0	
17	Total NPV Lifetime Non-Electric Benefits (Fossil Fuel, Water)	0		0		0		0	
18	Total NPV TRC Benefits <sup>[7]</sup> (Sum of rows 14 through 17)	1,508		8,893		1,508		8,893	
19	TRC Benefit-Cost Ratio <sup>[8]</sup>	2.07		2.19		2.07		2.19	
<p>[1] Includes direct install equipment costs and costs for EE&amp;C kits.</p> <p>[2] Includes direct costs attributable to plan and advance the programs. Note: The design of the HERs program should be included here, while the actual development and mailing of HERs would be attributable to Program Delivery.</p> <p>[3] Includes rebate processing, tracking system, general administration, program management, general management and legal, and technical assistance. Any common portfolio costs that are allocated across programs should be shown in this row.</p> <p>[4] Includes the marketing CSP and marketing costs by program CSPs.</p> <p>[5] Direct program implementation costs. Labor, fuel, and vehicle operation costs for appliance recycling and direct install programs. For behavioral programs, this includes the printing and postage of HERs.</p> <p>[6] Total TRC Costs includes Total EDC Costs and Participant Costs.</p> <p>[7] Total TRC Benefits equals the sum of Total Lifetime Electric and Non-Electric Benefits. Benefits include: avoided supply costs, including the reduction in costs of electric energy, generation, transmission, and distribution capacity, and natural gas valued at marginal cost for periods when there is a load reduction. Savings carried over from Phase II are not included as a part of Total TRC Benefits for Phase III.</p> <p>[8] TRC Ratio equals Total NPV TRC Benefits divided by Total NPV TRC Costs.</p> <p>* Rows 1-11 are presented in nominal dollars</p>									

**Table 151: Summary of Finances for C&I Demand Response Program – Large – Penn Power**

Row #	Cost Category	Gross PYTD (\$1,000)		Gross P3TD (\$1,000)		Net PYTD (\$1,000)		Net P3TD (\$1,000)	
1	EDC Incentives to Participants <sup>[1]</sup>	45		905		45		905	
2	EDC Incentives to Trade Allies	0		0		0		0	
3	Participant Costs (net of incentives/rebates paid by utilities)	-11		-226		-11		-226	
4	Incremental Measure Costs (Sum of rows 1 through 3)	34		679		34		679	
		EDC	CSP	EDC	CSP	EDC	CSP	EDC	CSP
5	Design & Development <sup>[2]</sup>	4	8	6	45	4	8	6	45
6	Administration, Management, and Technical Assistance <sup>[3]</sup>	32	32	202	176	32	32	202	176
7	Marketing <sup>[4]</sup>	0	47	10	263	0	47	10	263
8	Program Delivery <sup>[5]</sup>	1	71	10	395	1	71	10	395
9	EDC Evaluation Costs	10		82		10		82	
10	SWE Audit Costs	8		48		8		48	
11	Program Overhead Costs (Sum of rows 5 through 10)	214		1,236		214		1,236	
12	NPV of increases in costs of natural gas (or other fuels) for fuel switching programs	0		0		0		0	
13	Total NPV TRC Costs <sup>[6]</sup> (Net present value of sum of rows 4, 11, and 12)	248		1,668		248		1,668	
14	Total NPV Lifetime Electric Energy Benefits	0		0		0		0	
15	Total NPV Lifetime Electric Capacity Benefits	431		6,686		431		6,686	
16	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	0		0		0		0	
17	Total NPV Lifetime Non-Electric Benefits (Fossil Fuel, Water)	0		0		0		0	
18	Total NPV TRC Benefits <sup>[7]</sup> (Sum of rows 14 through 17)	431		6,686		431		6,686	
19	TRC Benefit-Cost Ratio <sup>[8]</sup>	1.74		4.01		1.74		4.01	

[1] Includes direct install equipment costs and costs for EE&C kits.  
 [2] Includes direct costs attributable to plan and advance the programs. Note: The design of the HERs program should be included here, while the actual development and mailing of HERs would be attributable to Program Delivery.  
 [3] Includes rebate processing, tracking system, general administration, program management, general management and legal, and technical assistance. Any common portfolio costs that are allocated across programs should be shown in this row.  
 [4] Includes the marketing CSP and marketing costs by program CSPs.  
 [5] Direct program implementation costs. Labor, fuel, and vehicle operation costs for appliance recycling and direct install programs. For behavioral programs, this includes the printing and postage of HERs.  
 [6] Total TRC Costs includes Total EDC Costs and Participant Costs.  
 [7] Total TRC Benefits equals the sum of Total Lifetime Electric and Non-Electric Benefits. Benefits include: avoided supply costs, including the reduction in costs of electric energy, generation, transmission, and distribution capacity, and natural gas valued at marginal cost for periods when there is a load reduction. Savings carried over from Phase II are not included as a part of Total TRC Benefits for Phase III.  
 [8] TRC Ratio equals Total NPV TRC Benefits divided by Total NPV TRC Costs.  
 \* Rows 1-11 are presented in nominal dollars.

**Table 152: Summary of Finances for C&I Demand Response Program – Large – WPP**

Row #	Cost Category	Gross PYTD (\$1,000)		Gross P3TD (\$1,000)		Net PYTD (\$1,000)		Net P3TD (\$1,000)	
1	EDC Incentives to Participants <sup>[1]</sup>	861		3,590		861		3,590	
2	EDC Incentives to Trade Allies	0		0		0		0	
3	Participant Costs (net of incentives/rebates paid by utilities)	-215		-898		-215		-898	
4	Incremental Measure Costs (Sum of rows 1 through 3)	646		2,693		646		2,693	
		EDC	CSP	EDC	CSP	EDC	CSP	EDC	CSP
5	Design & Development <sup>[2]</sup>	14	45	19	189	14	45	19	189
6	Administration, Management, and Technical Assistance <sup>[3]</sup>	104	175	654	735	104	175	654	735
7	Marketing <sup>[4]</sup>	0	263	35	1,103	0	263	35	1,103
8	Program Delivery <sup>[5]</sup>	5	394	31	1,655	5	394	31	1,655
9	EDC Evaluation Costs	33		298		33		298	
10	SWE Audit Costs	21		148		21		148	
11	Program Overhead Costs (Sum of rows 5 through 10)	1,054		4,867		1,054		4,867	
12	NPV of increases in costs of natural gas (or other fuels) for fuel switching programs	0		0		0		0	
13	Total NPV TRC Costs <sup>[6]</sup> (Net present value of sum of rows 4, 11, and 12)	1,700		6,522		1,700		6,522	
14	Total NPV Lifetime Electric Energy Benefits	0		0		0		0	
15	Total NPV Lifetime Electric Capacity Benefits	3,733		20,736		3,733		20,736	
16	Total NPV Lifetime Operation and Maintenance (O&M) Benefits	0		0		0		0	
17	Total NPV Lifetime Non-Electric Benefits (Fossil Fuel, Water)	0		0		0		0	
18	Total NPV TRC Benefits <sup>[7]</sup> (Sum of rows 14 through 17)	3,733		20,736		3,733		20,736	
19	TRC Benefit-Cost Ratio <sup>[8]</sup>	2.20		3.18		2.20		3.18	

[1] Includes direct install equipment costs and costs for EE&C kits.  
 [2] Includes direct costs attributable to plan and advance the programs. Note: The design of the HERs program should be included here, while the actual development and mailing of HERs would be attributable to Program Delivery.  
 [3] Includes rebate processing, tracking system, general administration, program management, general management and legal, and technical assistance. Any common portfolio costs that are allocated across programs should be shown in this row.  
 [4] Includes the marketing CSP and marketing costs by program CSPs.  
 [5] Direct program implementation costs. Labor, fuel, and vehicle operation costs for appliance recycling and direct install programs. For behavioral programs, this includes the printing and postage of HERs.  
 [6] Total TRC Costs includes Total EDC Costs and Participant Costs.  
 [7] Total TRC Benefits equals the sum of Total Lifetime Electric and Non-Electric Benefits. Benefits include: avoided supply costs, including the reduction in costs of electric energy, generation, transmission, and distribution capacity, and natural gas valued at marginal cost for periods when there is a load reduction. Savings carried over from Phase II are not included as a part of Total TRC Benefits for Phase III.  
 [8] TRC Ratio equals Total NPV TRC Benefits divided by Total NPV TRC Costs.  
 \* Rows 1-11 are presented in nominal dollars

### 3.10.5 Status of Recommendations

The most recent process evaluation for this program occurred in PY11. Findings and recommendations from that process evaluation effort are available in the PY11 annual report.

## 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 PY12 are shown in Table 153, Table 154, Table 155, and Table 156 for Met-Ed, Penelec, Penn Power, and WPP. The columns in these tables Table 153 through Table 160 are adapted from the 'Direct Program Cost' categories in the Commission's EE&V Plan template<sup>13</sup> for Phase III. EDC Materials, Labor, and Administration includes costs associated with an EDC's own employees. ICSP Materials, Labor, and Administration includes 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 153 through Table 160 are based on EDC tracking of expenditures with no adjustments to account for inflation.<sup>14</sup>

**Table 153: Met-Ed PY12 Program and Portfolio total Finances (\$1,000)**

Program	Incentives to Participants and Trade Allies	EDC Materials, Labor, and Administration	ICSP Materials, Labor, and Administration	EM&V	Total Cost
Appliance Turn-in	166	33	446	39	683
Energy Efficient Homes	603	71	1,037	97	1,809
Energy Efficient Products	1,032	52	625	95	1,804
Low Income Energy Efficiency	59	204	1,533	76	1,872
C&I Energy Solutions for Business - Small	816	147	628	206	1,796
C&I Energy Solutions for Business - Large	1,632	107	890	209	2,838
Governmental & Institutional Tariff	22	8	19	10	60
C&I Demand Response Program – Small	65	11	-3	3	77
C&I Demand Response Program – Large	697	99	62	26	885
Common Portfolio Costs <sup>1</sup>				0	0
<b>Portfolio Total</b>	<b>5,093</b>	<b>732</b>	<b>5,238</b>	<b>761</b>	<b>11,823</b>
<b>SWE Costs<sup>2</sup></b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>	<b>192</b>
<b>Total</b>	<b>5,093</b>	<b>732</b>	<b>5,238</b>	<b>761</b>	<b>12,015</b>

1. Common portfolio 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.

<sup>13</sup> <http://www.puc.pa.gov/pdocs/1372426.doc> Section 10

<sup>14</sup> 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 154: Penelec PY12 Program and Portfolio total Finances (\$1,000)**

Program	Incentives to Participants and Trade Allies	EDC Materials, Labor, and Administration	ICSP Materials, Labor, and Administration	EM&V	Total Cost
Appliance Turn-in	133	38	382	42	595
Energy Efficient Homes	168	70	420	83	742
Energy Efficient Products	700	59	581	91	1,430
Low Income Energy Efficiency	61	251	1,097	78	1,487
C&I Energy Solutions for Business - Small	841	149	872	216	2,078
C&I Energy Solutions for Business - Large	941	91	561	183	1,776
Governmental & Institutional Tariff	75	12	36	14	137
<b>Common Portfolio Costs<sup>1</sup></b>				0	0
<b>Portfolio Total</b>	<b>2,919</b>	<b>669</b>	<b>3,949</b>	<b>707</b>	<b>8,245</b>
<b>SWE Costs<sup>2</sup></b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>	<b>174</b>
<b>Total</b>	<b>2,919</b>	<b>669</b>	<b>3,949</b>	<b>707</b>	<b>8,419</b>

1. Common portfolio 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 155: Penn Power PY12 Program and Portfolio total Finances (\$1,000)**

Program	Incentives to Participants and Trade Allies	EDC Materials, Labor, and Administration	ICSP Materials, Labor, and Administration	EM&V	Total Cost
Appliance Turn-in	0	-9	0	6	-3
Energy Efficient Homes	249	47	277	29	602
Energy Efficient Products	292	19	113	19	443
Low Income Energy Efficiency	6	99	158	22	285
C&I Energy Solutions for Business - Small	467	63	534	52	1,115
C&I Energy Solutions for Business - Large	80	36	131	40	287
Governmental & Institutional Tariff	0	5	9	3	18
C&I Demand Response Program – Small	0	4	0	1	5
C&I Demand Response Program – Large	45	38	159	10	251
<b>Common Portfolio Costs<sup>1</sup></b>				0	0
<b>Portfolio Total</b>	<b>1,139</b>	<b>302</b>	<b>1,381</b>	<b>182</b>	<b>3,004</b>
<b>SWE Costs<sup>2</sup></b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>	<b>54</b>
<b>Total</b>	<b>1,139</b>	<b>302</b>	<b>1,381</b>	<b>182</b>	<b>3,058</b>

1. Common portfolio 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 156: WPP PY12 Program and Portfolio total Finances (\$1,000)**

Program	Incentives to Participants and Trade Allies	EDC Materials, Labor, and Administration	ICSP Materials, Labor, and Administration	EM&V	Total Cost
Appliance Turn-in	152	30	423	38	644
Energy Efficient Homes	750	86	791	104	1,730
Energy Efficient Products	1,112	57	811	107	2,087
Low Income Energy Efficiency	46	210	1,165	74	1,496
C&I Energy Solutions for Business - Small	1,028	128	2,192	243	3,591
C&I Energy Solutions for Business - Large	1,278	62	681	168	2,189
Governmental & Institutional Tariff	0	8	26	12	46
C&I Demand Response Program – Small	21	14	19	4	57
C&I Demand Response Program – Large	861	123	877	33	1,894
<b>Common Portfolio Costs<sup>1</sup></b>				0	0
<b>Portfolio Total</b>	<b>5,249</b>	<b>718</b>	<b>6,985</b>	<b>783</b>	<b>13,735</b>
<b>SWE Costs<sup>2</sup></b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>	<b>180</b>
<b>Total</b>	<b>5,249</b>	<b>718</b>	<b>6,985</b>	<b>783</b>	<b>13,915</b>

1. Common portfolio 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 III are shown in Table 157, Table 158, Table 159, and Table 160 for Met-Ed, Penn Power, Penelec, and WPP.

**Table 157: Met-Ed P3TD Program and Portfolio total Finances (\$1,000)**

Program	Incentives to Participants and Trade Allies	EDC Materials, Labor, and Administration	ICSP Materials, Labor, and Administration	EM&V	Total Cost
Appliance Turn-in	1,148	299	2,822	151	4,420
Energy Efficient Homes	12,707	1,016	10,115	712	24,550
Energy Efficient Products	8,152	339	3,893	573	12,956
Low Income Energy Efficiency	411	1,317	11,613	508	13,849
C&I Energy Solutions for Business - Small	5,164	819	3,725	945	10,653
C&I Energy Solutions for Business - Large	8,093	557	4,526	1,021	14,198
Governmental & Institutional Tariff	127	34	149	60	370
C&I Demand Response Program – Small	134	67	179	26	406
C&I Demand Response Program – Large	1,580	597	2,561	236	4,974
<b>Common Portfolio Costs<sup>1</sup></b>				0	0
<b>Portfolio Total</b>	<b>37,515</b>	<b>5,046</b>	<b>39,583</b>	<b>4,231</b>	<b>86,376</b>
<b>SWE Costs<sup>2</sup></b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>	<b>1,408</b>
<b>Total</b>	<b>37,515</b>	<b>5,046</b>	<b>39,583</b>	<b>4,231</b>	<b>87,784</b>

1. Common portfolio 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 158: Penelec P3TD Program and Portfolio total Finances (\$1,000)**

Program	Incentives to Participants and Trade Allies	EDC Materials, Labor, and Administration	ICSP Materials, Labor, and Administration	EM&V	Total Cost
Appliance Turn-in	986	325	2,546	163	4,020
Energy Efficient Homes	11,276	949	7,967	587	20,778
Energy Efficient Products	6,893	359	3,842	550	11,645
Low Income Energy Efficiency	472	1,531	11,043	538	13,585
C&I Energy Solutions for Business - Small	6,321	883	4,114	990	12,308
C&I Energy Solutions for Business - Large	7,648	522	4,006	896	13,073
Governmental & Institutional Tariff	247	63	290	89	688
<b>Common Portfolio Costs<sup>1</sup></b>				0	0
<b>Portfolio Total</b>	<b>33,843</b>	<b>4,632</b>	<b>33,808</b>	<b>3,814</b>	<b>76,097</b>
<b>SWE Costs<sup>2</sup></b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>	<b>1,276</b>
<b>Total</b>	<b>33,843</b>	<b>4,632</b>	<b>33,808</b>	<b>3,814</b>	<b>77,373</b>

1. Common portfolio 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 159: Penn Power P3TD Program and Portfolio total Finances (\$1,000)**

Program	Incentives to Participants and Trade Allies	EDC Materials, Labor, and Administration	ICSP Materials, Labor, and Administration	EM&V	Total Cost
Appliance Turn-in	283	58	802	33	1,176
Energy Efficient Homes	3,628	382	2,694	232	6,936
Energy Efficient Products	2,484	59	999	118	3,659
Low Income Energy Efficiency	127	548	3,053	172	3,900
C&I Energy Solutions for Business - Small	3,167	299	1,842	237	5,545
C&I Energy Solutions for Business - Large	1,394	178	802	194	2,568
Governmental & Institutional Tariff	110	21	99	21	251
C&I Demand Response Program – Small	0	25	4	9	38
C&I Demand Response Program – Large	905	227	880	82	2,094
<b>Common Portfolio Costs<sup>1</sup></b>				0	0
<b>Portfolio Total</b>	<b>12,098</b>	<b>1,797</b>	<b>11,174</b>	<b>1,097</b>	<b>26,167</b>
<b>SWE Costs<sup>2</sup></b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>	<b>396</b>
<b>Total</b>	<b>12,098</b>	<b>1,797</b>	<b>11,174</b>	<b>1,097</b>	<b>26,563</b>

1. Common portfolio 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 160: WPP P3TD Program and Portfolio total Finances (\$1,000)**

Program	Incentives to Participants and Trade Allies	EDC Materials, Labor, and Administration	ICSP Materials, Labor, and Administration	EM&V	Total Cost
Appliance Turn-in	1,238	304	3,083	150	4,775
Energy Efficient Homes	8,114	1,088	9,409	677	19,288
Energy Efficient Products	8,677	464	4,833	625	14,598
Low Income Energy Efficiency	352	1,345	12,655	532	14,884
C&I Energy Solutions for Business - Small	6,659	880	6,628	1,080	15,247
C&I Energy Solutions for Business - Large	6,051	427	3,538	823	10,839
Governmental & Institutional Tariff	935	51	560	76	1,622
C&I Demand Response Program – Small	39	82	85	33	239
C&I Demand Response Program – Large	3,590	739	3,682	298	8,309
<b>Common Portfolio Costs<sup>1</sup></b>				0	0
<b>Portfolio Total</b>	<b>35,654</b>	<b>5,379</b>	<b>44,474</b>	<b>4,294</b>	<b>89,801</b>
<b>SWE Costs<sup>2</sup></b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>	<b>N/A</b>	<b>1,320</b>
<b>Total</b>	<b>35,654</b>	<b>5,379</b>	<b>44,474</b>	<b>4,294</b>	<b>91,121</b>
1. Common portfolio 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 2.4. For example, the low-income customer segments are subsets of the residential tariff(s) and therefore not listed separately. Table 161, Table 162, Table 163, and Table 164.

**Table 161: Met-Ed EE&C Expenditures by Cost-Recovery Category<sup>15</sup> (\$1,000)**

Cost Recovery Sector	Rate Classes Included	PYTD \$ Spending (\$1,000)	P3TD \$ Spending (\$1,000)
Residential (incl Low Income)	Rate RS	\$6,286	\$56,586
Small C&I	Rate GS-Small, Rate GS-Medium, and Outdoor Lighting Service	\$1,904	\$11,400
Large C&I	Rate GS-Large, Rate GP and Rate TP	\$3,764	\$19,414
Street Lighting	Street Lighting Service, LED Street Lighting Service and Ornamental Street Lighting Service	\$27	\$171
Government & Non-Profit Tariff	Rate GS - Volunteer Fire Company, and Non-Profit Ambulance Service, Rescue Squad and Senior Center Service Rate and Rate MS	\$34	\$213
<b>Portfolio Total</b>		<b>\$12,015</b>	<b>\$87,784</b>

**Table 162: Penelec EE&C Expenditures by Cost-Recovery Category<sup>16</sup> (\$1,000)**

Cost Recovery Sector	Rate Classes Included	PYTD \$ Spending (\$1,000)	P3TD \$ Spending (\$1,000)
Residential (incl Low Income)	Rate RS	\$4,373	\$50,858
Small C&I	Rate GS-Small, Rate GS-Medium, and Outdoor Lighting Service	\$2,109	\$12,603
Large C&I	Rate GS-Large, Rate GP, and Rate LP	\$1,797	\$13,207
Street Lighting	Street Lighting Service, LED Street Lighting Service, and Ornamental Street Lighting Service	\$100	\$292
Government & Non-Profit Tariff	Rate GS – Volunteer Fire Company, and Non-Profit Ambulance Service, Rescue Squad and Senior Center Service Rate and Rate H	\$40	\$414
<b>Portfolio Total</b>		<b>\$8,419</b>	<b>\$77,373</b>

<sup>15</sup> Includes SWE costs

<sup>16</sup> Includes SWE costs

**Table 163: Penn Power EE&C Expenditures by Cost-Recovery Category<sup>17</sup> (\$1,000)**

Cost Recovery Sector	Rate Classes Included	PYTD \$ Spending (\$1,000)	P3TD \$ Spending (\$1,000)
Residential (incl Low Income)	Rate RS	\$1,358	\$15,893
Small C&I	Rate GS, GS Special Rider GSDS, Rate GM, Rate GS-Large and POL	\$1,130	\$5,695
Large C&I	Rate GP, and Rate GT	\$552	\$4,718
Street Lighting	Rate Schedules SV, SVD, SM and LED	\$2	\$169
Government & Non-Profit Tariff	Rate GS – Volunteer Fire Company, and Non-Profit Ambulance Service, Rescue Squad and Senior Center Service Rate and Rate PNP	\$17	\$88
<b>Portfolio Total</b>		<b>\$3,058</b>	<b>\$26,563</b>

**Table 164: WPP EE&C Expenditures by Cost-Recovery Category<sup>18</sup> (\$1,000)**

Cost Recovery Sector	Rate Classes Included	PYTD \$ Spending (\$1,000)	P3TD \$ Spending (\$1,000)
Residential (incl Low Income)	Rate 10	\$6,067	\$54,296
Small C&I	Rate GS 20, Rate GS 30	\$3,680	\$15,823
Large C&I	Rate GS 35, 40, 44, 46, and Tariff No. 38	\$4,120	\$19,363
Street Lighting	Rate Schedules 51 through 58, 71, 72	\$3	\$1,318
Government & Non-Profit Tariff	Rate GS 20 – Volunteer Fire Company, and Non-Profit Ambulance Service, Rescue Squad and Senior Center Service Rate	\$45	\$321
<b>Portfolio Total</b>		<b>\$13,915</b>	<b>\$91,121</b>

<sup>17</sup> Includes SWE costs

<sup>18</sup> Includes SWE costs

## Appendix A Upstream Lighting Cross Sector Sales

The upstream lighting programs promote and discount efficient screw-based light bulbs at participating retail stores within the Companies' service territories. Historical M&V activities have established that a small percentage of the discounted lamps are installed in non-residential settings. This has several implications for evaluation, reporting, and program management:

1. The hours of use and coincidence factors used to calculate verified impacts must be adjusted to account for various installation settings.
2. The impacts for lamps installed in GNI facilities can be counted toward the Companies' GNI energy reduction compliance targets.
3. Program funds need to be moved between the residential and commercial sectors to ensure that there was no subsidization of commercial energy savings by the residential class.

The general approach to evaluating the impacts from cross sector sales is to conduct a random digit dial survey to determine the percentages of program lamps that are installed in various facility types. The PA TRM impact evaluation algorithms and parameters for nonresidential lighting are used to evaluate impacts for the percentage of lamps that are reported to be installed in nonresidential settings. This process is discussed in detail in Appendix I. Note that general service lamps were removed from the program in PY12. ADM did not alter cross-sector sales rates for PY12 because our previous survey efforts did not measure separate cross-sector sales rates for different lamp types, and because the reduced scope of the program in PY12, and its elimination going forward, did not warrant a new general population survey.

Note that the Companies' EE&C plans also include distribution of efficient screw-based lamps through conservation kits in their residential and nonresidential sector programs. Based on historical customer surveys, a portion of lighting products distributed to small commercial customers are subsequently redistributed to employees, members, or parishioners for use in their homes. In such cases, the TRM residential lighting protocols are used to evaluate the energy and demand impacts associated with these "reverse-crossover" lamps. The Companies did not have active conservation kit programs in the commercial sector in Phase III, therefore adjustments of this kind are not needed for Phase III.

The Companies' EE&C plans and tracking and reporting systems attribute all costs and impacts of the upstream lighting initiative to the residential sector, specifically to the *Energy Efficient Products Program*. However, post-hoc adjustments to funding are made after M&V activities establish the cross-sector rate. Data in the tracking and reporting systems are not adjusted to account for cross-sector sales. Adjustments to overall impacts are conveyed by the program realization rate (this is one of the reasons for the high realization rate for this initiative). See Appendix M for impact evaluation details.

Survey results indicate that practically all of the efficient lamps that are installed in the nonresidential sector are installed in the small commercial and industrial class. Therefore, the funds transfer needed to avoid cross-subsidization is a net transfer from the ESB-Small

Program to the EEP Program. Table 165 shows the overall incentive funding for the Upstream Lighting initiative and allocates incentives according to the fraction of sales attributed to residential and non-residential sectors. The funding amounts in the last column are transferred from ESB-Small Program to the EEP Program.

**Table 165: Upstream Lighting funding allocation between programs.**

EDC	Total Upstream Lighting Incentives	Residential EEP Program (92.9%)	SFB-Small Program (7.1%)
Met-Ed	\$ 287,212	\$ 266,708	\$ 20,504.71
Penelec	\$ 296,035	\$ 274,900	\$ 21,134.55
Penn Power	\$ 60,310	\$ 56,004	\$ 4,305.66
West Penn	\$ 334,644	\$ 310,753	\$ 23,890.99

## Appendix B Site Inspection Summary

**Table 166: PY12 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	405	0	1	The most common discrepancies are incorrect addresses, account numbers, and model numbers; less common are incomplete installations, and lingering customer services issues.
Penelec		Honeywell	296	0	3	
Penn Power		Honeywell	35	0	0	
WPP		Honeywell	286	0	1	
Met-Ed	Energy Efficient Homes Program - New Construction	PSD	43	0	Please refer to the gross realization rates in past reports as a measure of consistency between reported and verified values.	The most common are due to using REM/Rate defaults for furnace fan energy usage rating rather than looking them up by model #, and estimating the % of lamps that are efficient.
Met-Ed		ADM	0	0		
Penelec		PSD	3	0		
Penelec		ADM	0	0		
Penn Power		PSD	14	0		
Penn Power		ADM	0	0		
WPP		PSD	14	0		
WPP		ADM	0	0		
Met-Ed	Low Income Direct Install Programs	PSD, Action Housing, Pure Energy LLC	101	0	7	Measure count discrepancies involve aerators, furnace whistles, lamps, showerheads, and smart power strips.
Penelec			68	0	0	
Penn Power			56	0	0	
WPP			101	0	0	
Met-Ed	C/I Programs	ADM	55	1	Please refer to gross realization 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	62	3		
Penn Power	C/I Programs	ADM	27	0		
WPP	C/I Programs	ADM	71	0		
<b>TOTAL</b>	<b>TOTAL</b>		<b>1637</b>	<b>4</b>	<b>n/a</b>	



# Appendix C Assignments of Measures to Gross Impact Initiatives

## C.1 NONRESIDENTIAL EE PROGRAMS

Sampling for the nonresidential programs is performed on a project by project level. Each project can have multiple measures. If a project is sampled, all measures within the project are evaluated. As a first step, projects in the tracking and reporting system are assigned an evaluation initiative. Each entry in FirstEnergy’s tracking and reporting system is assigned to one of seven initiatives: Appliance Recycling, Prescriptive, Lighting, Custom, Direct Install, Conservation Kits, Behavioral, or Null. The Null Initiative is defined solely to strip away items that are not associated with energy savings. These are generally line items to track special promotional bonus incentives, and may include Energy Audits that are not associated with energy savings (if measures are installed as a result of the audit, they appear as separate entries in the tracking system). In PY12, there were no measures associated with the Behavioral, or Conservation Kits Initiatives. The Conservation Kit program component is a part of the Companies’ EE&C plans, but was not implemented in PY12. Only West Penn Power ran a pilot Behavioral program in PY11 and PY12, but the program has not demonstrated measurable energy savings yet and unfortunately, COVID-19 related economic disruption in the small commercial sector have posed substantial challenges to program implementation and evaluation. West Penn Power did not report impacts toward Act 129 compliance for this pilot program.

It is possible for projects to include multiple measures, and therefore a project may theoretically map to multiple initiatives. In practice, since rebate applications include equipment and measures that map to a single initiative as defined below, this did not occur in PY12. Measures assigned to the custom evaluation protocol are those that may potentially require custom treatment, but TRM algorithms may be applicable.

**Table 167: Assignment of measures to initiatives for Nonresidential Programs**

Measure	TRM Section	Initiative
Freezer Recycling - SCI	2.4.3	CI_Appliance_Recycling
Refrigerator Recycling - SCI	2.4.3	CI_Appliance_Recycling
Room Air Conditioner Recycling - SCI	2.2.5	CI_Appliance_Recycling
Dehumidifiers Recycling - Govt	IMP	CI_Appliance_Recycling
Freezer Recycling - Govt	2.4.3	CI_Appliance_Recycling
Refrigerator Recycling - Govt	2.4.3	CI_Appliance_Recycling
Room Air Conditioner Recycling - Govt	2.2.5	CI_Appliance_Recycling
Automatic Milker Takeoffs	4.1.1	CI_Prescriptive
Dairy Scroll Compressors	4.1.2	CI_Prescriptive
High Efficiency Ventilation Fans	4.1.3	CI_Prescriptive
High Volume Low-Speed Fans	4.1.5	CI_Prescriptive
Livestock Waterer	4.1.6	CI_Prescriptive
Heat Reclaimers	4.1.4	CI_Prescriptive
Low Pressure Irrigation System	4.1.8a	CI_Prescriptive
VFD on Dairy Vacuum Pumps	4.1.7	CI_Prescriptive
LED - Traffic Signals - Round - 12 Green	3.1.4	CI_Lighting

Measure	TRM Section	Initiative
LED - Traffic Signals - Round - 8 Green	3.1.4	CI_Lighting
LED - Traffic Signals - Round - 12 Red	3.1.4	CI_Lighting
LED - Traffic Signals - Round - 8 Red	3.1.4	CI_Lighting
LED - Traffic Signals - Round - 12 Yellow	3.1.4	CI_Lighting
LED - Traffic Signals - Turn Signals - 12 Green	3.1.4	CI_Lighting
LED - Traffic Signals - Turn Signals - 8 Green	3.1.4	CI_Lighting
LED - Traffic Signals - Turn Signals - 12 Red	3.1.4	CI_Lighting
LED - Traffic Signals - Turn Signals - 8 Red	3.1.4	CI_Lighting
LED - Traffic Signals - Turn Signals - 12 Yellow	3.1.4	CI_Lighting
LED - Traffic Signals - Turn Signals - 8 Yellow	3.1.4	CI_Lighting
LED - Traffic Signals - 12 Countdown Only	3.1.4	CI_Lighting
LED - Traffic Signals - 12 Hand Only	3.1.4	CI_Lighting
LED - Traffic Signals - 12 Pedestrian and Hand Overlay	3.1.4	CI_Lighting
LED - Traffic Signals - 12 Pedestrian Only	3.1.4	CI_Lighting
LED - Traffic Signals - 16 Hand with Countdown Side by Side	3.1.4	CI_Lighting
LED - Traffic Signals - 16 Pedestrian and Hand Overlay	3.1.4	CI_Lighting
LED - Traffic Signals - 16 Pedestrian and Hand Side by Side	3.1.4	CI_Lighting
LED - Traffic Signals - 16 Pedestrian and Hand with Countdown Overlay	3.1.4	CI_Lighting
LED - Traffic Signals - 9 Hand Only	3.1.4	CI_Lighting
LED - Traffic Signals - 9 Pedestrian Only	3.1.4	CI_Lighting
LED - Traffic Signals - Round - 8 Yellow	3.1.4	CI_Lighting
Street & Area Lighting (Tariff / Customer Owned)	3.1.1	CI_Lighting
Street & Area Lighting (Tariff / Utility Owned)	3.1.1	CI_Lighting
Anti-Sweat Heater Controls	3.5.6	CI_Prescriptive
Ice Machines GT 1000 lbs/day	3.7.1	CI_Prescriptive
Ice Machines 501 to 1000 lbs/day	3.7.1	CI_Prescriptive
Ice Machine LT 500lbs/day	3.7.1	CI_Prescriptive
Combination Oven	IMP	CI_Prescriptive
Convection Ovens	IMP	CI_Prescriptive
Fryer	IMP	CI_Prescriptive
Griddles	IMP	CI_Prescriptive
Hot Food Holding Cabinet - Half Size	IMP	CI_Prescriptive
Hot Food Holding Cabinet - Three-Quarter Size	IMP	CI_Prescriptive
Hot Food Holding Cabinets - Full size	IMP	CI_Prescriptive
Commercial Reach-In Refrigerators	3.5.1	CI_Prescriptive
Commercial Reach-In Freezers	3.5.1	CI_Prescriptive
Refrigerated Case Covers	3.5.10	CI_Prescriptive
Steam cookers - 3 Pan	3.7.4	CI_Prescriptive
Steam cookers - 4 Pan	3.7.4	CI_Prescriptive
Steam cookers - 5 Pan	3.7.4	CI_Prescriptive
Steam cookers - 6 Pan	3.7.4	CI_Prescriptive
Strip Curtains	3.5.9	CI_Prescriptive
Vending Machine Controls	3.7.2	CI_Prescriptive
Vending Machines	3.7.5	CI_Prescriptive
Pre-Rinse Spray Nozzles	3.4.2	CI_Prescriptive
Water Heater - Heat Pump	3.4.1	CI_Prescriptive
Water Heater - Solar	2.3.2	CI_Prescriptive

Measure	TRM Section	Initiative
Clothes Dryer	2.4.5	CI_Prescriptive
Clothes Washers - Tier I	3.6.1	CI_Prescriptive
Clothes Washers - Tier II	3.6.1	CI_Prescriptive
Clothes Washers - Tier III	3.6.1	CI_Prescriptive
Room Air Conditioners	3.2.7	CI_Prescriptive
Freezers	2.4.2	CI_Prescriptive
Refrigerators - Tier I	2.4.1	CI_Prescriptive
Refrigerators - Tier II	2.4.1	CI_Prescriptive
Refrigerators - Tier III	2.4.1	CI_Prescriptive
Computers	3.9.1a	CI_Prescriptive
Uninterruptable Power Supplies	IMP	CI_Prescriptive
Computer Monitors	3.9.1f	CI_Prescriptive
Heat Pump Clothes Dryer	IMP	CI_Prescriptive
Copiers	3.9.1c	CI_Prescriptive
Fax Machine	3.9.1b	CI_Prescriptive
Multifunction Devices	3.9.1e	CI_Prescriptive
Printers	3.9.1d	CI_Prescriptive
Direct Install - Non-Lighting	Various TRM Sections	CI_Direct_Install
Direct Install - Lighting	Various TRM Sections	CI_Direct_Install
Post Audit - Lighting	Various TRM Sections	CI_Direct_Install
Post Audit - Non-Lighting	Various TRM Sections	CI_Direct_Install
Combined Heat and Power	n/a	CI_Custom
Custom - Building Improvements	n/a	CI_Custom
Custom - Retro-commissioning - Large	n/a	CI_Custom
Custom - Process Improvement	n/a	CI_Custom
Custom - Compressed Air	n/a	CI_Custom
Custom - Data Centers	n/a	CI_Custom
Custom - HVAC & Chillers	n/a	CI_Custom
Custom - Motors - Three Phase	n/a	CI_Custom
Custom - Retro-commissioning Small	n/a	CI_Custom
Custom - Refrigeration	n/a	CI_Custom
Custom - VFDs < 10HP	n/a	CI_Custom
Custom - VFDs > 10 HP	n/a	CI_Custom
Facility Audits	Various TRM Sections	CI_Direct_Install
Electric Chillers - Air Cooled > 150 tons	3.2.2a	CI_Prescriptive
Electric Chillers - Air Cooled < 150 tons	3.2.2a	CI_Prescriptive
Electric Chillers - Water Cooled - Centrifugal < 150 tons	3.2.2b	CI_Prescriptive
Electric Chillers - Water Cooled - Centrifugal >= 600 tons	3.2.2b	CI_Prescriptive
Electric Chillers - Water Cooled - Centrifugal >= 150 tons and < 300 tons	3.2.2b	CI_Prescriptive

Measure	TRM Section	Initiative
Electric Chillers - Water Cooled - Centrifugal >= 300 tons and < 600 tons	3.2.2b	CI_Prescriptive
Electric Chillers - Water Cooled - Reciprocating/Positive Disp >= 150 < 300 tons	3.2.2b	CI_Prescriptive
Electric Chillers - Water Cooled - Reciprocating/Positive Disp >= 300 ton	3.2.2b	CI_Prescriptive
Electric Chillers - Water Cooled - Reciprocating/Positive Displ >= 75 < 150 tons	3.2.2b	CI_Prescriptive
Electric Chillers - Water Cooled - Reciprocating/Positive Displacement < 75 tons	3.2.2b	CI_Prescriptive
Heat Pumps - Air Source < 65,000 Btu/h (5.4 tons) 16 SEER 9.0 HSPF	3.2.1d	CI_Prescriptive
Heat Pumps - Air Source < 65,000 Btu/h (5.4 tons) 18 SEER 10.0 HSPF	3.2.1d	CI_Prescriptive
Heat Pumps - Air Source >= 135,000 (11.25 tons) and < 240,000 Btu/h (20 tons)	3.2.1d	CI_Prescriptive
Heat Pumps - Air Source >= 240,000 Btu/h (20 tons)	3.2.1d	CI_Prescriptive
Heat Pumps - Air Source >= 65,000 (5.4 tons) and < 135,000 Btu/h (11.25 tons)	3.2.1d	CI_Prescriptive
Heat Pumps - Ground Source < 135,000 Btu/h (11.25 tons)	3.2.3c	CI_Prescriptive
Heat Pumps - Ground Water Source < 135,000 Btu/h (11.25 tons)	3.2.3b	CI_Prescriptive
Heat Pumps - Single Zone Ductless Mini-Split	3.2.4b	CI_Prescriptive
Heat Pumps - Multi Zone Ductless Mini-Split	3.2.4b	CI_Prescriptive
Heat Pumps - Water Source < 17,000 Btu/h (1.42 tons)	3.2.3a	CI_Prescriptive
Heat Pumps - Water Source GTE 17,000 Btu/h (1.42 tons)	3.2.3a	CI_Prescriptive
Packaged Terminal Air Conditioner	3.2.1e	CI_Prescriptive
Packaged Terminal Heat Pump	3.2.1g	CI_Prescriptive
Packaged/Split AC - Air Cooled >= 135,000 (11.25) and < 240,000 Btu/h (20 tons)	3.2.1a	CI_Prescriptive
Packaged/Split AC - Air Cooled >= 240,000 (20) and < 760,000 Btu/h (63.33 tons)	3.2.1a	CI_Prescriptive
Packaged/Split AC - Air Cooled >= 65,000 (5.4) and < 135,000 Btu/h (11.25 tons)	3.2.1a	CI_Prescriptive
Packaged/Split AC - Air Cooled >= 760,000 Btu/h (63.33 tons)	3.2.1a	CI_Prescriptive
Packaged/Split AC - Evap Cooled GE 135,000 (11.25) and LT 240,000 Btu/h (20 tons)	3.2.1c	CI_Prescriptive
Packaged/Split AC - Evap Cooled GE 240,000 (20) and LT 760,000 Btu/h (63.33 tons)	3.2.1c	CI_Prescriptive
Packaged/Split AC - Evap Cooled GE 65,000 (5.4) and LT 125,000 Btu/h (11.25 tons)	3.2.1c	CI_Prescriptive
Packaged/Split AC - Evaporatively Cooled LT 65,000 Btu/h (5.4 tons) 16 SEER	3.2.1c	CI_Prescriptive
Packaged/Split AC - Evaporatively Cooled LT 65,000 Btu/h (5.4 tons) 18 SEER	3.2.1c	CI_Prescriptive
Packaged/Split AC - Water Cooled GE 135,000 (11.25) and < 240,00 Btu/h (20 tons)	3.2.1b	CI_Prescriptive

Measure	TRM Section	Initiative
Packaged/Split AC - Water Cooled GE 760,000 Btu/h (63.33 tons)	3.2.1b	CI_Prescriptive
Packaged/Split AC -Water Cooled >= 240,000 (20) and < 760,000 Btu/h (63.33 tons)	3.2.1b	CI_Prescriptive
Packaged/Split AC -Water Cooled >= 65,000 (5.4) and < 135,000 Btu/h (11.25 tons)	3.2.1b	CI_Prescriptive
Packaged/Split AC Units - Air Cooled LT 65,000 Btu/h (5.4 tons) 16 SEER	3.2.1a	CI_Prescriptive
Packaged/Split AC Units - Air Cooled LT 65,000 Btu/h (5.4 tons) 18 SEER	3.2.1a	CI_Prescriptive
Packaged/Split AC Units - Evaporatively Cooled GE 760,000 Btu/h (63.33 tons)	3.2.1c	CI_Prescriptive
Packaged/Split AC Units - Water Cooled < 65,000 Btu/h (5.4 tons) 16 SEER	3.2.1b	CI_Prescriptive
Packaged/Split AC Units - Water Cooled < 65,000 Btu/h (5.4 tons) 18 SEER	3.2.1b	CI_Prescriptive
CFL Fixtures	3.1.1	CI_Lighting
Lighting - Other	3.1.1	CI_Lighting
Lighting Controls	3.1.3	CI_Lighting
CFL Lamps Specialty	3.1.1	CI_Lighting
CFL Lamps	3.1.1	CI_Lighting
Linear Fluorescent T5	3.1.1	CI_Lighting
Linear Fluorescent T8	3.1.1	CI_Lighting
LED Channel Signage	3.1.6	CI_Lighting
Exit Sign	3.1.5	CI_Lighting
LED Fixtures External	3.1.1	CI_Lighting
LED Fixtures Internal	3.1.1	CI_Lighting
LED Lamps	3.1.1	CI_Lighting
LED Lamps (Post 2020)	3.1.1	CI_Lighting
LED Linear	3.1.1	CI_Lighting
LED Reach in Refrigerator / Freezer Lights	3.1.7	CI_Lighting
Street & Area Lighting (Customer Owned)	3.1.1	CI_Lighting
CFL Lamps (Post 2020)	3.1.1	CI_Lighting
LED 6-8W Standard Bulb	3.1.1	CI_Direct_Install
LED 9-13W Standard Bulb	3.1.1	CI_Direct_Install
LED Nightlights	3.1.1	CI_Direct_Install
Tier 1, Smart Power Strip 5 Outlets, one installed	2.5.3	CI_Direct_Install
Tier 2, Smart Power Strip	2.5.3	CI_Direct_Install
CFL 9-13 Watt	3.1.1	CI_Direct_Install

## C.2 RESIDENTIAL PROGRAMS

For the gross impact evaluation effort, sampling initiatives were confined to distinct programs with the exception of the New Homes component of the Low-Income Energy Efficiency Program, which was evaluated in the general residential New Homes Initiative. The table below lists (non-low-income) residential measures in the Companies' tracking and reporting system and assigns them to their respective evaluation initiatives. Note that some of the measures are denoted as disabled in the tracking system because they are not currently offered. We retain these measures for completeness – if the measures will again be offered in Act 129, they will fall

in their corresponding sampling initiatives in the table. Note that the Home Energy Report measure is not listed in the table below, but the measure constitutes its own initiative.

**Table 168: Assignment of measures to initiatives for Residential Programs**

Measure	TRM Section	Initiative
100W equivalent CFL	2.1.1	Upstream Lighting
100W equivalent LED	2.1.1	Upstream Lighting
100W equivalent LED Specialty	2.1.1	Upstream Lighting
100W equivalent LEDee	2.1.1	Upstream Lighting
150W equivalent CFL	2.1.1	Upstream Lighting
150W equivalent LED	2.1.1	Upstream Lighting
150W equivalent LED Specialty	2.1.1	Upstream Lighting
150W equivalent LEDee	2.1.1	Upstream Lighting
25-30W equivalent CFL	2.1.1	Upstream Lighting
25-30W equivalent LED	2.1.1	Upstream Lighting
25-30W equivalent LED Specialty	2.1.1	Upstream Lighting
25-30W equivalent LEDee	2.1.1	Upstream Lighting
40-45W equivalent CFL	2.1.1	Upstream Lighting
40-45W equivalent LED	2.1.1	Upstream Lighting
40-45W equivalent LED Specialty	2.1.1	Upstream Lighting
40-45W equivalent LEDee	2.1.1	Upstream Lighting
50-60W equivalent CFL	2.1.1	Upstream Lighting
50-60W equivalent LED	2.1.1	Upstream Lighting
50-60W equivalent LED Specialty	2.1.1	Upstream Lighting
50-60W equivalent LEDee	2.1.1	Upstream Lighting
65W equivalent CFL	2.1.1	Upstream Lighting
65W equivalent LED	2.1.1	Upstream Lighting
65W equivalent LED Specialty	2.1.1	Upstream Lighting
65W equivalent LEDee	2.1.1	Upstream Lighting
72-75W equivalent CFL	2.1.1	Upstream Lighting
72-75W equivalent LED	2.1.1	Upstream Lighting
72-75W equivalent LED Specialty	2.1.1	Upstream Lighting
New Construction - Multi Family Low Rise	2.6.3	New Homes
New Construction - Single Family Detached	2.6.3	New Homes
New Construction - Two-on-Two Condos	2.6.3	New Homes
New Construction -Townhouse and Duplexes	2.6.3	New Homes
New Manufactured Housing	2.6.3	New Homes
LI New Construction	2.6.3	New Homes
Dehumidifier Recycling	IMP	Res ATI
Freezer Recycling	2.4.3	Res ATI
Refrigerator Recycling	2.4.3	Res ATI
Room Air Conditioner Recycling	2.2.55	Res ATI
Low Flow Swivel Aerator	Various TRM Sections	Res EE Kits
Furnace Whistle	Various TRM Sections	Res EE Kits
LED 12w	Various TRM Sections	Res EE Kits
LED 9w	Various TRM Sections	Res EE Kits
LED nightlight	Various TRM Sections	Res EE Kits

<b>Measure</b>	<b>TRM Section</b>	<b>Initiative</b>
Low Flow Shower Head 1.6 GPM	Various TRM Sections	Res EE Kits
13/20/25 - 3 way CFL	Various TRM Sections	Res EE Kits
23w CFL	Various TRM Sections	Res EE Kits
Furnace Whistle	Various TRM Sections	Res EE Kits
LED 12w	Various TRM Sections	Res EE Kits
LED 9w	Various TRM Sections	Res EE Kits
LED nightlight	Various TRM Sections	Res EE Kits
13/20/25 - 3 way CFL	Various TRM Sections	Res EE Kits
23w CFL	Various TRM Sections	Res EE Kits
Low Flow Swivel Aerator	Various TRM Sections	Res EE Kits
Furnace Whistle	Various TRM Sections	Res EE Kits
LED 9w	Various TRM Sections	Res EE Kits
LED nightlight	Various TRM Sections	Res EE Kits
23w CFL	Various TRM Sections	Res EE Kits
Furnace Whistle	Various TRM Sections	Res EE Kits
LED 9w	Various TRM Sections	Res EE Kits
LED nightlight	Various TRM Sections	Res EE Kits
23w CFL	Various TRM Sections	Res EE Kits
72-75W equivalent LEDee	2.1.1	Upstream Lighting
Clothes Washer - Level 1	2.4.4	Res_Appliances
Clothes Dryer - (Elec w Moisture Sensor)	2.4.5	Res_Appliances
Dehumidifiers	2.4.8	Res_Appliances
Freezers	2.4.2	Res_Appliances
Refrigerators - Level 1	2.4.1	Res_Appliances
Clothes Dryer - (Elec Heat Pump)	2.4.5	Res_Appliances
Refrigerators - Level 2	2.4.1	Res_Appliances
Refrigerators - Level 3	2.4.1	Res_Appliances
Water Heater - Heat Pump	2.3.1	Res_Appliances
Water Heater - Solar	2.3.2	Res_Appliances
TVs	2.5.1	Upstream Electronics
Computers	2.5.2	Upstream Electronics
Imaging	2.5.2	Upstream Electronics
Monitors	2.5.2	Upstream Electronics
Central Air Conditioner - Level 2	2.2.1	Res HVAC
Central Air Conditioner - Level 3	2.2.1	Res HVAC
Ductless Mini-Split Heat Pump - Level 3	2.2.3	Res HVAC
Furnace Fans	2.2.1	Res HVAC
Heat Pump - Level 2	2.2.1	Res HVAC
Heat Pump - Level 3	2.2.1	Res HVAC
Heat Pump - Water & GeoT - ES Tier 3	2.2.1	Res HVAC
PTAC - Level 2 - Multi Family	2.2.10	Res HVAC
PTHP - Level 2 - Multi Family	2.2.10	Res HVAC
HVAC - Maintenance	2.2.1	Res HVAC
Programmable Thermostat - Direct Install	IMP	Res HVAC
Programmable Thermostat - Store Bought	IMP	Res HVAC
3-way CFL (12/23/33)	Various TRM Sections	Res EE Kits
11W LED	Various TRM Sections	Res EE Kits
23w CFL	Various TRM Sections	Res EE Kits

<b>Measure</b>	<b>TRM Section</b>	<b>Initiative</b>
LED Nite Lite	Various TRM Sections	Res EE Kits
9W LED	Various TRM Sections	Res EE Kits
Furnace Whistle	Various TRM Sections	Res EE Kits
Kitchen Swivel Aerator	Various TRM Sections	Res EE Kits
Over 150W equivalent CFL	2.1.1	Upstream Lighting
Over 150W equivalent LED	2.1.1	Upstream Lighting
Over 150W equivalent LED Specialty	2.1.1	Upstream Lighting
Over 150W equivalent LED Specialty	2.1.1	Upstream Lighting
Over 150W equivalent LEDee	2.1.1	Upstream Lighting
Under 25W equivalent CFL	2.1.1	Upstream Lighting
Under 25W equivalent LED	2.1.1	Upstream Lighting
Under 25W equivalent LED Specialty	2.1.1	Upstream Lighting
Under 25W equivalent LEDee	2.1.1	Upstream Lighting
Attic Insulation	2.6.1	Res DI
Air Sealing	2.6.6	Res DI
Showerhead	2.3.9	Res DI
Pipe Wrap	2.3.7	Res DI
CFL - 13W	2.1.1	Res DI
CFL - 18W	2.1.1	Res DI
CFL - 23W	2.1.1	Res DI
CFL - 9W	2.1.1	Res DI
LED - 9W	2.1.1	Res DI
Bath Aerator	2.3.8	Res DI
Kitchen Aerator	2.3.8	Res DI
CFL - 9W Specialty	2.1.1	Res DI
12/22/33 Watt 3-way CFL	2.1.1	Res DI
14W Globe CFL	2.1.1	Res DI
ENERGY STAR® Windows	2.6.2	Res DI
Wall Insulation	2.6.1	Res DI
Duct Sealing	2.2.6	Res DI
16W R30 Flood	2.1.1	Res DI
Furnace Whistle	2.2.7	Res DI
LED Night Light	2.1.4	Res DI
Smart Power Strips	2.5.3	Res DI
CFL - 19W	2.1.1	Res DI
CFL - 9W Floodlight	2.1.1	Res DI
CFL - 14W Floodlight	2.1.1	Res DI
CFL - 14W Candelabra	2.1.1	Res DI
CFL - 19W Globe	2.1.1	Res DI
CFL - 9W Candelabra	2.1.1	Res DI
CFL - 9W Globe	2.1.1	Res DI
LED -11W	2.1.1	Res DI
CFL - 23W Floodlight	2.1.1	Res DI
Handheld Showerhead	2.3.9	Res DI
LED 11/12W	2.1.1	Res DI
LED 5W Candelabra	2.1.1	Res DI
LED 6W Globe	2.1.1	Res DI
LED 14/15	2.1.1	Res DI
LED 11W R30 Flood	2.1.1	Res DI



### C.3 RESIDENTIAL LOW-INCOME PROGRAM DIRECT INSTALL

For the gross impact evaluation effort, sampling initiatives were confined to distinct programs with the exception of the New Homes component of the Low-Income Energy Efficiency Program, which was evaluated in the general residential New Homes Initiative. The table below lists low-income residential measures in the Companies' tracking and reporting system and assigns them to their respective evaluation initiatives. Note that some of the measures are denoted as disabled in the tracking system because they are not currently offered. We retain these measures for completeness – if the measures will again be offered in Act 129, they will fall in their corresponding sampling initiatives in the table. The Home Energy Report measure is not listed in the table below, but the measure constitutes its own initiative.

**Table 169 - Assignment of measures to initiatives for Low-Income Residential Programs**

Measure	TRM Section	Initiative
CREATE INT. ATTIC HATCH > 2 SQ. FT.	2.6.6	LI Direct Install
CREATE EXT. ATTIC HATCH UP TO 2 SQ. FT.	2.6.6	LI Direct Install
CREATE EXT. ATTIC HATCH > 2 SQ. FT.	2.6.6	LI Direct Install
CREATE KNEE WALL ACCESS	2.6.6	LI Direct Install
INSULATE ATTIC ACCESS-PUSH UP	2.6.6	LI Direct Install
INSULATE ATTIC ACC/FOLD. STAIRS	2.6.6	LI Direct Install
INSUL. & WXSTRIP PULL-DOWN ATTIC-PRE-FAB UNIT	2.6.6	LI Direct Install
INSUL. & WXSTRIP HORIZONTAL/PUSH-UP ATTIC HTCH-PRE-FAB UNIT	2.6.6	LI Direct Install
INSULATE & WXSTRIP WHOLE ATTIC DOOR	2.6.6	LI Direct Install
INSUL. & WXSTRIP WHOLE ATTIC DOOR (STAIRWAY)-PRE-FAB UNIT	2.6.6	LI Direct Install
ATTIC RECESSED LIGHTING BOXING	2.6.6	LI Direct Install
INSULATE ATTIC KNEE WALL	2.6.1	LI Direct Install
INSULATE ATTIC KNEE WALL PRE-FAB	2.6.1	LI Direct Install
FRAME SETS-ENERGY GUARD. OR EQUIVALENT ATTIC BOX	2.6.6	LI Direct Install
ENERGY GUARDIAN ACCESSORY PACK	2.6.6	LI Direct Install
FLOOR-FACED BAT FBGL R-11 16" ON CENTER	2.6.1	LI Direct Install
FLOOR-FACD BAT FBGL R-19 16" ON CENTER	2.6.1	LI Direct Install
FLOOR-FACD BAT FBGL R-19 24" ON CENTER	2.6.1	LI Direct Install
FLR. UNCOD. SP- VAPOR BARRIER-CRAWLSPACE	2.6.6	LI Direct Install
BREATHABLE MATERIAL-TYPAR/TYVEK -MOISTURE CONTROL	2.6.6	LI Direct Install
PERIMETER INSULATION-FACD FBGL R-11	2.6.1	LI Direct Install
PERIMETER INSULATION-FACD FBGL R-19	2.6.1	LI Direct Install
GARAGE- RIGID BOARD	2.6.6	LI Direct Install
GARAGE-FACD BAT FBGL R-19	2.6.1	LI Direct Install
MISC REPAIRS-CHIMNEY, FLUE, ETC.	2.6.6	LI Direct Install
INT. REPAIRS-FLOOR/WALL/CEILING	2.6.6	LI Direct Install
EXHAUST FANS	2.6.6	LI Direct Install
VENT AN EXISTING EXHAUST TO OUTSIDE	2.6.6	LI Direct Install
DRYER VENT REPLACEMENT	2.6.6	LI Direct Install
DRYER VENT REPAIR	2.6.6	LI Direct Install
HEAT SYST./FURN. REPR. & RETROFIT	2.2.1	LI Direct Install

DUCT SEALING & REPAIR	2.2.6	LI Direct Install
DUCT INSULATION LESS THAN 6" IN DIAMETER	2.2.6	LI Direct Install
DUCT INSULATION GREATER THAN 6" DIAMETER	2.2.6	LI Direct Install
DUCT INSULATION SQUARE DUCTS	2.2.6	LI Direct Install
FURN./HEAT. SYSTEM REPLACEMENT	2.2.1	LI Direct Install
BASEBOARD REPAIR/REPLACE	2.6.6	LI Direct Install
FURNACE MAINT./TUNE-UP	2.2.1	LI Direct Install
REPLACE FURNACE FILTER	2.2.1	LI Direct Install
HEAT PUMP FILTER CLEANING/REPLACEMENT	2.2.1	LI Direct Install
HEAT PUMP COIL CLEANING-COIL ACCESSIBLE	2.2.1	LI Direct Install
HEAT PUMP COIL CLEANING-COIL NOT ACCESSIBLE	2.2.1	LI Direct Install
INSTALL AIR COND/APPLIANCE TIMER	2.2.1	LI Direct Install
EFFICIENT LIGHTING FIXTURES/COMPACT FLUORESCENT	2.1.1	LI Direct Install
DIMMABLE COMPACT FLUORESCENT LIGHTS	2.1.1	LI Direct Install
THREE-WAY COMPACT FLUORESCENT LIGHTS	2.1.1	LI Direct Install
R-30 AND R-40 COMPACT FLUORESCENT LIGHTS	2.1.1	LI Direct Install
3W AND 7W COMPACT FLUORESCENT LIGHTS	2.1.1	LI Direct Install
LIGHT FIXTURE OR SPECIALTY BULB REPLACEMENT	2.1.1	LI Direct Install
REPLACE AIR CONDITIONING FILTER	2.2.1	LI Direct Install
WINDOW/WALL A/C FILTER CLEANING/REPLACEMENT	2.2.1	LI Direct Install
CENTRAL AIR CONDITIONING TUNE-UP	2.2.1	LI Direct Install
CENTRAL A/C COIL CLEAN-COIL NOT ACCESSIBLE	2.2.1	LI Direct Install
COOLING SYSTEM REPLACEMENT- CENTRAL A/C	2.2.1	LI Direct Install
THERMOSTAT (REG.) RECALB./RELOCT/REPLAC.	2.2.8	LI Direct Install
LINE VOLTAGE THERMOSTAT	2.2.8	LI Direct Install
INSTALL SETBACK THERMOSTAT	2.2.8	LI Direct Install
CHANGEOUT AIR CONDITIONER--5000 BTU	2.2.1	LI Direct Install
CHANGEOUT AIR CONDITIONER--8000 BTU	2.2.1	LI Direct Install
CHANGEOUT AIR CONDITIONER--10000 BTU	2.2.1	LI Direct Install
CHANGEOUT AIR CONDITIONER--12000 BTU	2.2.1	LI Direct Install
CHANGEOUT AIR CONDITIONER--14000 BTU	2.2.1	LI Direct Install
CHANGEOUT AIR CONDITIONER--18000 BTU	2.2.1	LI Direct Install
WINDOW FILM	2.6.6	LI Direct Install
GRAVITY FILM EXCHANGE (GFX)	2.6.6	LI Direct Install
5 CU FT FREEZER CHEST/MANUAL	2.4.2	LI Direct Install
7 CU FT FREEZER CHEST/MANUAL	2.4.2	LI Direct Install
9 CU FT FREEZER CHEST/MANUAL	2.4.2	LI Direct Install
15 CU FT FREEZER CHEST/MANUAL	2.4.2	LI Direct Install
20 CU FT FREEZER CHEST/MANUAL	2.4.2	LI Direct Install
12 CU FT FREEZER UPRIGHT	2.4.2	LI Direct Install
14 CU FT FREEZER UPRIGHT FROST-FREE	2.4.2	LI Direct Install
14 CU FT FREEZER UPRIGHT MANUAL	2.4.2	LI Direct Install
17 CU FT FREEZER UPRIGHT FROST-FREE	2.4.2	LI Direct Install
17 CU FT FREEZER UPRIGHT/MANUAL	2.4.2	LI Direct Install
15 CUBIC FT. TOP MOUNT REFRIGERATOR	2.4.1	LI Direct Install
15 CUBIC FT. TOP MOUNT REFRIGERATOR (ICE)	2.4.1	LI Direct Install
18 CUBIC FT. TOP MOUNT REFRIGERATOR	2.4.1	LI Direct Install
18 CU FT TOP MOUNT REFRIGERATOR (ICE)	2.4.1	LI Direct Install
21 CUBIC FT. TOP MOUNT REFRIGERATOR	2.4.1	LI Direct Install
21 CU FT. TOP MOUNT REFRIGERATOR (ICE)	2.4.1	LI Direct Install
22 CU FT. SIDE/SIDE REFRIGERATOR (ICE)	2.4.1	LI Direct Install
22 CU FT TOP MOUNT REFRIGERATOR (NO ICE)	2.4.1	LI Direct Install

25 CU FT REFRIG SIDE/SIDE ICE	2.4.1	LI Direct Install
ADDITIONAL REFRIGERATOR/FREEZER REMOVAL	2.4.3	LI Direct Install
DRYER REPLACEMENT	2.4.5	LI Direct Install
TORCHERE LAMP	2.1.1	LI Direct Install
SMART STRIP POWER PLUG	2.5.3	LI Direct Install
FAUCET AERATOR-BATH	2.3.8	LI Direct Install
FAUCET AERATOR-KITCH	2.3.8	LI Direct Install
FAUCET AERATOR-WITH SWIVEL HEAD	2.3.8	LI Direct Install
ENERGY SAVING SHOWERHEAD W/O SHUTOFF	2.3.9	LI Direct Install
ENERGY SAVING SHOWERHEAD W/SHUTOFF	2.3.9	LI Direct Install
SHOWERHEAD - HANDHELD	2.3.9	LI Direct Install
WATER HEATER JACKET R-11	2.3.5	LI Direct Install
WATER HEATER JACKET TANK GREATER THAN 52 GALLONS	2.3.5	LI Direct Install
WATER HEATER INSULATION - LOW E OR EQUIVALENT	2.3.5	LI Direct Install
PIPE INSULATION - 3/4	2.3.7	LI Direct Install
PIPE INSULATION - 1/2"	2.3.7	LI Direct Install
TANK TEMPERATURE SETBACK	2.3.6	LI Direct Install
30 GAL ELEC HOT WATER TANK REMOVE/REPLACE	Null Measure	LI Direct Install
40 GAL ELEC. HOT WATER TANK REMOVE/REPLACE	2.3.1	LI Direct Install
52 GAL ELEC HOT WATER TANK REMOVE/REPLACE	2.3.1	LI Direct Install
80 GAL ELEC HOT WATER TANK REMOVE/REPLACE	2.3.1	LI Direct Install
INFILTRATION WORK INCLUDING BLOWER DOOR	2.6.6	LI Direct Install
RIGID BOARD HOLE REPAIR/AIR SEALING	2.6.6	LI Direct Install
TWO-PART FOAM PERIMETER INSULATION	2.6.6	LI Direct Install
FIBERGLASS PERIMETER INSULATION (R19)	2.6.1	LI Direct Install
RIGID BOARD PERIMETER INSULATION (1')	2.6.6	LI Direct Install
DRYWALL PATCH W/TAPED JOINTS & TOP COAT	2.6.6	LI Direct Install
DRYWALL FULL SHEET W/TAPED JOINTS & TOP COAT	2.6.6	LI Direct Install
KITCHEN VENT COVER	2.6.6	LI Direct Install
INTERIOR ATTIC STAIR COVER	2.6.6	LI Direct Install
WHOLE HOUSE FAN COVER	2.6.6	LI Direct Install
INFILTRATION WORK EXCLUDING BLOWER DOOR	2.6.6	LI Direct Install
CAULK	2.6.6	LI Direct Install
CAULK - HIGH TEMPERATURE	2.6.6	LI Direct Install
AEROSOL FOAM SEALANT	2.6.6	LI Direct Install
AEROSOL FOAM SEALANT-HIGH TEMPERATURE	2.6.6	LI Direct Install
AIR-TIGHT INSERT KIT OR EQUIVALENT FOR RECESSED LIGHTS	2.6.6	LI Direct Install
AIR CONDITIONER COVER-RIGID	2.6.6	LI Direct Install
AIR CONDITIONER COVER-SOFT	2.6.6	LI Direct Install
WINDOW QUILT	2.6.6	LI Direct Install
BLOWN SIDEWALL INSULATION - ASBESTOS	2.6.1	LI Direct Install
BLOWN SIDEWALL INSULATION - WOOD / ASPHALT	2.6.1	LI Direct Install
BLOWN SIDEWALL INSULATION - STUCCO/BRICK	2.6.1	LI Direct Install
BLOWN SIDEWALL INSULATION - ALUMINUM SIDING	2.6.1	LI Direct Install
BLOWN SIDEWALL INSULATION - VINYL SIDING	2.6.1	LI Direct Install
FIBERGLASS UNFINISHED WALL INSULATION (R13)	2.6.1	LI Direct Install
FIBERGLASS UNFINISHED WALL INSULATION-R19	2.6.1	LI Direct Install
WET SPRAY CELLULOSE INSULATION	2.6.1	LI Direct Install
EXT. DOOR - SWEEP	2.6.6	LI Direct Install
EXT. DOOR - WEATHER-STRIP	2.6.6	LI Direct Install
EXT. DOOR - FIX LOCK	2.6.6	LI Direct Install

EXT. DOOR - REPLACE LOCK	2.6.6	LI Direct Install
EXT. DOOR - REPAIR	2.6.6	LI Direct Install
EXT. DOOR - REPLACE	2.6.6	LI Direct Install
EXTERIOR DOOR - CONSTRUCT	2.6.6	LI Direct Install
EXT. DOOR - STORM DOOR	2.6.6	LI Direct Install
INT. DOOR - WEATHER-STRIP	2.6.6	LI Direct Install
EXT./INT. DOOR - INSULATE W/RIGID BD	2.6.6	LI Direct Install
WINDOW-REPL GLASS W/ GLAZE	2.6.6	LI Direct Install
WINDOW-REGLAZE ONLY	2.6.6	LI Direct Install
WINDOW-REPAIR/REPLACE SASH	2.6.6	LI Direct Install
WINDOW WEATHER-STRIP	2.6.6	LI Direct Install
WINDOW-REPLACE SASH LOCK	2.6.6	LI Direct Install
WINDOW-ADD PULLEY SEALS	2.6.6	LI Direct Install
REPLACEMENT WINDOW	2.6.6	LI Direct Install
INTERIOR STORM WINDOW W/CLIPS	2.6.6	LI Direct Install
INTERIOR STORM WINDOW W/O CLIPS	2.6.6	LI Direct Install
EXTERIOR STORM WINDOW/DOOR REPAIR	2.6.6	LI Direct Install
INSTALL EXTERIOR STORM DOOR/WINDOW	2.6.6	LI Direct Install
MOBILE HOME-INSTALL DOOR/STORM COMBO	2.6.6	LI Direct Install
MOBILE HOME-REPL. EXT PRIME DOOR	2.6.6	LI Direct Install
MOBILE HOME--INTERIOR STORM WINDOWS	2.6.6	LI Direct Install
MOBILE HOME--REPLACE PRIME WINDOWS	2.6.6	LI Direct Install
MOBILE HOME-SKIRTING	2.6.6	LI Direct Install
REFLECTIVE ROOF COAT	2.6.6	LI Direct Install
MOB. HOME-CEILING INSULATION - CELLULOSE	2.6.1	LI Direct Install
MOB. HOME-CEILING INSULATION - FIBERGLASS	2.6.1	LI Direct Install
MOB. HOME- FLOOR INSULATION (BELLY) CELLULOSE	2.6.1	LI Direct Install
MOBILE HOME FLOOR INSULATION--FIBERGLASS	2.6.1	LI Direct Install
TYPAR/TYVEK BELLY BOARD MOBILE HOME REPAIR	2.6.6	LI Direct Install
PLYWOOD OR RIGID BOARD BELLY BOARD MOBILE HOME REPAIR	2.6.6	LI Direct Install
CLEAN/SEAL/SECURE MOBILE HOME ELECTRIC HEAT REG. RISER	2.6.6	LI Direct Install
MOBILE HOME ROOF PATCH	2.6.6	LI Direct Install
R11 ATTIC FIBERGLASS BATTS	2.6.1	LI Direct Install
R13 ATTIC FIBERGLASS BATTS	2.6.1	LI Direct Install
R-19 ATTIC-NON FACD BATT FBGLS	2.6.1	LI Direct Install
R25 ATTIC FIBERGLASS BATTS	2.6.1	LI Direct Install
R30 ATTIC FIBERGLASS BATTS	2.6.1	LI Direct Install
R38 ATTIC FIBERGLASS BATTS	2.6.1	LI Direct Install
R19 PINK PLUS	2.6.1	LI Direct Install
BLOWN CELLULOSE UNFLOORED ATTIC INSULATION R19 OR LESS	2.6.1	LI Direct Install
BLOWN CELLULOSE UNFLOORED ATTIC INSULATION R20 OR GREATER	2.6.1	LI Direct Install
BLOWN CELLULOSE FLOORED (DENSE PACKED) ATTIC INSULATION R19 OR LESS	2.6.1	LI Direct Install
BLOWN CELLULOSE FLOORED (DENSE PACKED) ATTIC INSULATION R20 OR GREATER	2.6.1	LI Direct Install
PREP OR FOLLOW-UP TO AIR SEAL OR INSULATING	2.6.6	LI Direct Install
BOXING/DAMMING OF ATTIC HATCHES	2.6.6	LI Direct Install
BOXING/DAMMING OF CHIMNEYS	2.6.6	LI Direct Install
BOXING/DAMMING OF STORAGE AREAS	2.6.6	LI Direct Install
BOXING/DAMMING OF SOFFIT VENTS	2.6.6	LI Direct Install

BOXING/DAMMING FIXTURES-SEALED-END DUCT	2.6.6	LI Direct Install
BOXING/DAMMING FIXTURES (PRE-FAB 16" DAM)	2.6.6	LI Direct Install
BOXING/DAMMING FIXTURES (PRE-FAB 24" DAM)	2.6.6	LI Direct Install
CREATE INT. ATTIC HATCH UP TO 2 SQ.FT	2.6.6	LI Direct Install
CF1 9-13 watt CFL	2.1.1	LI Direct Install
CF2 14-16 watt CFL	2.1.1	LI Direct Install
CF3 17-20 watt CFL	2.1.1	LI Direct Install
CF4 21-25 watt CFL	2.1.1	LI Direct Install
SP 1 Smart Power Strip 6-9 outlets	2.5.3	LI Direct Install
SP 2 Smart Power Strip 10+ outlets	2.5.3	LI Direct Install
FLOOD/RECESSED CFL - 10-13 WATTS	2.1.1	LI Direct Install
FLOOD/RECESSED CFL - 14-16 WATTS	2.1.1	LI Direct Install
FLOOD/RECESSED CFL - 17-20 WATTS	2.1.1	LI Direct Install
FLOOD/RECESSED CFL - 21-25 WATTS	2.1.1	LI Direct Install
SPEC CFL - 2-9 WATTS	2.1.1	LI Direct Install
SPEC CFL - 10-13 WATTS	2.1.1	LI Direct Install
SPEC CFL - 14-16 WATTS	2.1.1	LI Direct Install
SPEC CFL - 17-20 WATTS	2.1.1	LI Direct Install
SPEC CFL - 21-25 WATTS	2.1.1	LI Direct Install
Furnace Whistle	2.2.7	LI Direct Install
LED Night Light	2.1.4	LI Direct Install
12 CU FT FREEZER UPRIGHT/MANUAL	2.4.2	LI Direct Install
13 CU FT FREEZER UPRIGHT MANUAL	2.4.2	LI Direct Install
14 CU FT FREEZER CHEST/FROSTFREE	2.4.2	LI Direct Install
15 CU FT REFRIGERATOR (ICE)	2.4.1	LI Direct Install
16 CU FT FREEZER UPRIGHT/FROSTFREE	2.4.2	LI Direct Install
16 CU FT FREEZER UPRIGHT/MANUAL	2.4.2	LI Direct Install
16 CU FT REFRIGERATOR	2.4.1	LI Direct Install
16 CU FT REFRIGERATOR (ICE)	2.4.1	LI Direct Install
17 CU FT REFRIGERATOR (ICE)	2.4.1	LI Direct Install
17 CUBIC FT. REFRIGERATOR	2.4.1	LI Direct Install
21 CU FT FREEZER UPRIGHT FROST FREE	2.4.2	LI Direct Install
22 CU FT REFRIGERATOR (ICE)	2.4.1	LI Direct Install
23 CU FT SIDE/SIDE REFRIGERATOR(ICE)	2.4.1	LI Direct Install
7 CU FT UPRIGHT FREEZER	2.4.2	LI Direct Install
A/C WINDOW UNIT - NO PRIOR UNIT	2.2.4	LI Direct Install
AIR CONDITIONER WINDOW/WALL GASKET	2.6.6	LI Direct Install
ATTIC BATT FBGLS R-38	2.6.1	LI Direct Install
ATTIC-BLN INSL R-10	2.6.1	LI Direct Install
ATTIC-BLN INSL R-19	2.6.1	LI Direct Install
ATTIC-BLN INSL R-20	2.6.1	LI Direct Install
ATTIC-BLN INSL R-25	2.6.1	LI Direct Install
ATTIC-BLN INSL R-27	2.6.1	LI Direct Install
ATTIC-BLN INSL R-30	2.6.1	LI Direct Install
ATTIC-BLN INSL R-38	2.6.1	LI Direct Install
ATTIC-BLN INSL R-8	2.6.1	LI Direct Install
BLOWN SIDEWALL INSULATION-BIBS	2.6.1	LI Direct Install
BLOWN SIDEWALL INSULATION-PLASTER/DRYW.	2.6.1	LI Direct Install
BOXING/DAMMING ATTIC HATCH - FIBERGLASS	2.6.6	LI Direct Install
CLEAN/SEAL/SECURE MOBILE HOME REG. RISER	2.6.6	LI Direct Install
DEHUMIDIFIER REPLACEMENT	2.4.8	LI Direct Install
DENSE PACK CANTILEVER	2.6.1	LI Direct Install
DISPOSAL AND INSTALLTION OF NEW AIR COND	2.2.1	LI Direct Install

ENERGY SAVING SHOWERHEAD	2.3.9	LI Direct Install
FLOOR-FACED BAT FBGL R-11 24 CTR	2.6.1	LI Direct Install
FLR. UNCOD. SP-FACD FBGL R11 16	2.6.1	LI Direct Install
GARAGE RIGID BOARD - 2 INCH	2.6.6	LI Direct Install
HEAT EXCHANGER REPLACEMENT	2.2.1	LI Direct Install
HEAT REFLECTOR	2.6.6	LI Direct Install
INSTALL CEILING FAN	2.4.10	LI Direct Install
INSTALL WHOLE HOUSE FAN	2.2.9	LI Direct Install
MOB. HOME-REPLACE FLOOR REG. 8X10	2.6.6	LI Direct Install
RIGID BOARD INSULATION 2 INCH	2.6.6	LI Direct Install
SPRAY FOAM-THERMAL/IGNITION BARRIER REQ	2.6.6	LI Direct Install
WATER HEATER T-STAT. - TEST/REPLACE	2.3.6	LI Direct Install
CHANGEOUT AIR CONDITIONER-15000 BTU	2.2.4	LI Direct Install
78A - Dimmable CFL	2.1.1	LI Direct Install
78F - Specialty CFL - Flood/Recessed	2.1.1	LI Direct Install
HPW-A - Install Heat Pump Water Heater 2.0 EF	2.3.1	LI Direct Install
HPW-B - Install Heat Pump Water Heater 2.3 EF	2.3.1	LI Direct Install
22 cu. Ft. SxS fridge (no ice)	2.4.1	LI Direct Install
25 cu. Ft. freezer chest/manual	2.4.2	LI Direct Install
Install heat pump water heater 2.0 EF	2.3.1	LI Direct Install
Install heat pump water heater 2.3 EF	2.3.1	LI Direct Install
Mobile home replace floor reg 4x10	2.6.6	LI Direct Install
Mobile home replace floor reg 4x12	2.6.6	LI Direct Install
Mobile home replace floor reg. 4x8	2.6.6	LI Direct Install
Safety test - atmospheric draft	2.6.6	LI Direct Install
25 cu ft refrigerator (side by side)	2.4.1	LI Direct Install
30 Gallon - .93 EF	Null Measure	LI Direct Install
30 Gallon - .94 EF	Null Measure	LI Direct Install
30 Gallon - .95 EF	Null Measure	LI Direct Install
40 Gallon - .93 EF	Null Measure	LI Direct Install
40 Gallon - .94 EF	Null Measure	LI Direct Install
40 Gallon - .95 EF	Null Measure	LI Direct Install
50 Gallon - .93 EF	Null Measure	LI Direct Install
50 Gallon - .94 EF	Null Measure	LI Direct Install
50 Gallon - .95 EF	Null Measure	LI Direct Install
80 Gallon - .93 EF	Null Measure	LI Direct Install
80 Gallon - .94 EF	Null Measure	LI Direct Install
80 Gallon - .95 EF	Null Measure	LI Direct Install
FW1 - Met-Ed	2.2.7	LI Direct Install
FW2 - Penelec	2.2.7	LI Direct Install
FW3 - Penn Power	2.2.7	LI Direct Install
FW4 - West Penn Power	2.2.7	LI Direct Install
Met-Ed - B2A	2.2.8	LI Direct Install
Penelec - B2B	2.2.8	LI Direct Install
Penn Power - B2C	2.2.8	LI Direct Install
West Penn Power - B2D	2.2.8	LI Direct Install
Removal of Additional Freezer	2.4.3	LI Direct Install
Energy Saving Showerhead with Shut Off	2.3.9	LI Direct Install
Faucet Aerator - Bath	2.3.8	LI Direct Install
Faucet Aerator - Kitchen	2.3.8	LI Direct Install
Faucet Aerator with Swivel Head	2.3.8	LI Direct Install
Pipe Ins. 1/2 inch from EHWH	2.3.7	LI Direct Install
Pipe Ins. 3/4 inch from EHWH	2.3.7	LI Direct Install

PIPE INSULATION - 3/4"	2.3.7	LI Direct Install
50 Gal .93EF Elec HWH Replace	Null Measure	LI Direct Install
50 Gal .94EF Elec HWH Replace	Null Measure	LI Direct Install
50 Gal .95EF Elec HWH Replace	Null Measure	LI Direct Install
50 Gal Elec. Hot Water Tank Remove/Replace	2.3.1	LI Direct Install
50 Gal Elec. Hot Water Tank Remove/Replace	Null Measure	LI Direct Install
Attic-BLN INSL R14	2.6.1	LI Direct Install
Attic-BLN INSL R33	2.6.1	LI Direct Install
Attic-BLN INSL R44	2.6.1	LI Direct Install
Ductless Mini-Split Heat Pump	2.2.3	LI Direct Install
LED - 13-14 WATT Flood	2.1.1	LI Direct Install
LED - 17 WATT Flood	2.1.1	LI Direct Install
LED - 2.3 WATT Globe	2.1.1	LI Direct Install
LED - 3.5 WATT Medium Base Torpedo	2.1.1	LI Direct Install
LED - 3.7-4.8 WATT Candelabra	2.1.1	LI Direct Install
LED - 6-8 WATT Standard Bulb	2.1.1	LI Direct Install
LED - 8 WATT Flood	2.1.1	LI Direct Install
LED - 9-13 WATT Standard Bulb	2.1.1	LI Direct Install
Ground Cover	2.6.6	LI Direct Install
Heat Pump Clean and Tune	2.2.1	LI Direct Install
LI Dehumidifier Recycling	IMP	LI ATI
LI Freezer Recycling	2.4.3	LI ATI
LI Refrigerator Recycling	2.4.3	LI ATI
LI Room Air Conditioner Recycling	2.2.5	LI ATI
Low Flow Swivel Aerator	Various TRM Sections	LI Kits
Furnace Whistle	Various TRM Sections	LI Kits
LED 12w	Various TRM Sections	LI Kits
LED 6.5w	Various TRM Sections	LI Kits
LED 9w	Various TRM Sections	LI Kits
LED nightlight	Various TRM Sections	LI Kits
Low Flow Shower Head 1.6 GPM	Various TRM Sections	LI Kits
13/20/25 - 3 way CFL	Various TRM Sections	LI Kits
23w CFL	Various TRM Sections	LI Kits
LI Clothes Washers	2.4.4	LI Appliances
LI Clothes Dryer	2.4.5	LI Appliances
LI Dehumidifiers	2.4.8	LI Appliances
LI Freezers	2.4.2	LI Appliances
LI Refrigerators	2.4.1	LI Appliances
3-way CFL (12/23/33)	Various TRM Sections	LI Kits
11W LED	Various TRM Sections	LI Kits
LED Nite Lite	Various TRM Sections	LI Kits

9W LED	Various TRM Sections	LI Kits
Kitchen Swivel Aerator	Various TRM Sections	LI Kits
6W LED	Various TRM Sections	LI Kits
SILL BOX INSUL PRE CUT PRODUCT	2.6.6	LI Direct Install
LE9 - Retrofit Kit - 13-14 Watt Flood	2.1.1	LI Direct Install



# Appendix D Evaluation Detail – Residential Appliance Turn-In Initiative

## D.1 GROSS IMPACT EVALUATION

Gross impact evaluation for the Appliance Turn-In (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.

### D.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 170 lists the data sources for gross impact calculation algorithms.

**Table 170: 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	TRM Default
RAC	EER	TRM Default
RAC	RAC EFLH	TRM - Zip Code Lookup
RAC	CF	TRM Default
Dehumidifier	Capacity	IMP Default
Dehumidifier	Region (to determine kWh)	TRM - Zip Code Lookup
All Measures	Verification Rate	Participant Surveys

Both telephone and online surveys were conducted in PY8, and the two modes yielded compatible results. Since PY9, the online survey mode was used for the general ATI program, and the telephone survey mode was largely reserved for Low-Income ATI participants.

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. Although verification rates determined through surveys were approximately 100%, the realization rates are generally lower than 100% because the part-use factors are lower than the TRM default values, and the calculated unit energy consumptions were lower than what would expect from application of default parameters in the TRM.

### D.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 171, Table 172, Table 173, and Table 174. The population sizes and sample sizes represent individual appliances rather than individual customers. Note that Penn Power did not run the program in PY12.

**Table 171: ATI Initiative Gross Impact Sample Design for Met-Ed**

Stratum	Population Size	Achieved Sample Size	Evaluation Activity
Refrigerators	2,555	92	Survey (online)
Freezers	478	42	
Dehumidifiers	202	26	
RACs	356	29	
<b>Program Total</b>	<b>3,591</b>	<b>189</b>	

**Table 172: ATI Initiative Gross Impact Sample Design for Penelec**

Stratum	Population Size	Achieved Sample Size	Evaluation Activity
Refrigerators	2,096	99	Survey (online)
Freezers	338	31	
Dehumidifiers	188	25	
RACs	268	23	
<b>Program Total</b>	<b>2,890</b>	<b>178</b>	

**Table 173: ATI Initiative Gross Impact Sample Design for Penn Power**

Stratum	Population Size	Achieved Sample Size	Evaluation Activity
Refrigerators	0	0	Survey (online)
Freezers	0	0	
Dehumidifiers	0	0	
RACs	0	0	
<b>Program Total</b>	<b>0</b>	<b>0</b>	

**Table 174: ATI Initiative Gross Impact Sample Design for WPP**

Stratum	Population Size	Achieved Sample Size	Evaluation Activity
Refrigerators	2,357	104	Survey (online)
Freezers	487	44	
Dehumidifiers	199	27	
RACs	212	20	
<b>Program Total</b>	<b>3,255</b>	<b>195</b>	

**D.1.3 Results for Energy**

The gross realization rates for energy, along with relative precisions, are shown in Table 175, Table 176, Table 177, and Table 178 for Met-Ed, Penelec, Penn Power, and WPP respectively.

**Table 175: ATI Initiative Energy Gross Realization Rates for Met-Ed**

Stratum	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
Refrigerators	2,411	102.3%	0.5	7.5%
Freezers	330	79.0%	0.5	11.1%
Dehumidifiers	101	114.0%	0.5	14.1%
RACs	41	81.8%	0.5	13.4%
<b>Program Total</b>	<b>2,883</b>	<b>99.8%</b>	<b>0.5</b>	<b>6.5%</b>

**Table 176: ATI Initiative Energy Gross Realization Rates for Penelec**

Stratum	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
Refrigerators	2,221	88.3%	0.5	7.2%
Freezers	237	90.6%	0.5	12.9%
Dehumidifiers	85	115.6%	0.5	14.4%
RACs	31	71.1%	0.5	15.0%
<b>Program Total</b>	<b>2,573</b>	<b>89.2%</b>	<b>0.5</b>	<b>5.6%</b>

**Table 177: ATI Initiative Energy Gross Realization Rates for Penn Power**

Stratum	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
Refrigerators	0	100.0%	0.5	0.0%
Freezers	0	100.0%	0.5	0.0%
Dehumidifiers	0	100.0%	0.5	0.0%
RACs	0	100.0%	0.5	0.0%
<b>Program Total</b>	<b>0</b>	<b>100.0%</b>	<b>0.5</b>	<b>0.0%</b>

**Table 178: ATI Initiative Energy Gross Realization Rates for WPP**

Stratum	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
Refrigerators	2,416	88.8%	0.5	7.1%
Freezers	349	88.9%	0.5	10.9%
Dehumidifiers	93	112.4%	0.5	13.9%
RACs	24	80.5%	0.5	16.1%
<b>Program Total</b>	<b>2,883</b>	<b>89.5%</b>	<b>0.5</b>	<b>5.4%</b>

**D.1.4 Results for Demand**

The gross realization rates for demand, 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.

**Table 179: ATI Initiative Demand Gross Realization Rates for Met-Ed**

Stratum	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
Refrigerators	0.27	102.4%	0.5	7.5%
Freezers	0.04	78.9%	0.5	11.1%
Dehumidifiers	0.02	116.6%	0.5	14.1%
RACs	0.09	66.3%	0.5	13.4%
<b>Program Total</b>	<b>0.42</b>	<b>93.0%</b>	<b>0.5</b>	<b>5.4%</b>

**Table 180: ATI Initiative Demand Gross Realization Rates for Penelec**

Stratum	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
Refrigerators	0.25	88.3%	0.5	7.2%
Freezers	0.03	90.6%	0.5	12.9%
Dehumidifiers	0.02	124.2%	0.5	14.4%
RACs	0.07	70.9%	0.5	15.0%
<b>Program Total</b>	<b>0.36</b>	<b>87.0%</b>	<b>0.5</b>	<b>5.0%</b>

**Table 181: ATI Initiative Gross Realization Rates for Penn Power**

Stratum	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
Refrigerators	0.00	100.0%	0.5	0.0%
Freezers	0.00	100.0%	0.5	0.0%
Dehumidifiers	0.00	100.0%	0.5	0.0%
RACs	0.00	100.0%	0.5	0.0%
<b>Program Total</b>	<b>0.00</b>	<b>100.0%</b>	<b>0.5</b>	<b>0.0%</b>

**Table 182: ATI Initiative Demand Gross Realization Rates for WPP**

Stratum	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
Refrigerators	0.27	88.9%	0.5	7.1%
Freezers	0.04	88.9%	0.5	10.9%
Dehumidifiers	0.02	119.7%	0.5	13.9%
RACs	0.06	78.0%	0.5	16.1%
<b>Program Total</b>	<b>0.38</b>	<b>88.9%</b>	<b>0.5</b>	<b>4.9%</b>

## D.2 NET IMPACT EVALUATION

### D.2.1 Net Impact Evaluation Methodology

The net-to-gross evaluation for the Appliance Turn-in program followed the participant self-report methodology outlined in the PA Evaluation Framework. Net-to-gross was estimated for the program for each FirstEnergy EDC.

The participant self-report methodology was implemented following the common approach outlined in Appendix B of the 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 Turn-in 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.

### D.2.2 Sampling

The sample designs from the PY10 study for the four EDCs are shown in Table 183, Table 184, Table 185, and Table 186 for Met-Ed, Penelec, Penn Power, and WPP respectively. The focus of the NTG surveys was on refrigerators and freezers because these two measures accounted for 98% of reported savings.

**Table 183: ATI Initiative Net-to-Gross Sampling for Met-Ed**

Stratum	Population Size	Achieved Sample Size	Response Rate
All	6,143	815	20.0%
<b>Program Total</b>	<b>6,143</b>	<b>815</b>	<b>20.0%</b>

**Table 184: ATI Initiative Net-to-Gross Sampling for Penelec**

Stratum	Population Size	Achieved Sample Size	Response Rate
Refrigerators	5,444	693	20.0%
<b>Program Total</b>	<b>5,444</b>	<b>693</b>	<b>20.0%</b>

**Table 185: ATI Initiative Net-to-Gross Sampling for Penn Power**

Stratum	Population Size	Achieved Sample Size	Response Rate
Refrigerators	1,947	271	21.0%
<b>Program Total</b>	<b>1,947</b>	<b>271</b>	<b>21.0%</b>

**Table 186: ATI Initiative Net-to-Gross Sampling for WPP**

Stratum	Population Size	Achieved Sample Size	Response Rate
Refrigerators	6,673	850	21.0%
<b>Program Total</b>	<b>6,673</b>	<b>850</b>	<b>21.0%</b>

**D.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 187, Table 188, Table 189, and Table 190 for Met-Ed, Penelec, Penn Power, and WPP respectively.

**Table 187: ATI Initiative Net-to-Gross Results for Met-Ed**

Stratum	PYVTD MWh	Free Ridership (%)	Spillover (%)	NTG Ratio	Relative Precision (@ 85% CL)
All	2,877	55.0%	0.0%	45.0%	3.8%
<b>Program Total</b>	<b>2,877</b>	<b>55.0%</b>	<b>0.0%</b>	<b>45.0%</b>	<b>3.8%</b>

**Table 188: ATI Initiative Net-to-Gross Results for Penelec**

Stratum	PYVTD MWh	Free Ridership (%)	Spillover (%)	NTG Ratio	Relative Precision (@ 85% CL)
Refrigerators	2,295	53.0%	0.0%	47.0%	4.1%
<b>Program Total</b>	<b>2,295</b>	<b>53.0%</b>	<b>0.0%</b>	<b>47.0%</b>	<b>4.1%</b>

**Table 189: ATI Initiative Net-to-Gross Results for Penn Power**

Stratum	PYVTD MWh	Free Ridership (%)	Spillover (%)	NTG Ratio	Relative Precision (@ 85% CL)
Refrigerators	0	49.0%	0.0%	51.0%	6.6%
<b>Program Total</b>	<b>0</b>	<b>49.0%</b>	<b>0.0%</b>	<b>51.0%</b>	<b>6.6%</b>

**Table 190: ATI Initiative Net-to-Gross Results for WPP**

Stratum	PYVTD MWh	Free Ridership (%)	Spillover (%)	NTG Ratio	Relative Precision (@ 85% CL)
Refrigerators	2,581	52.0%	0.0%	48.0%	3.7%
<b>Program Total</b>	<b>2,581</b>	<b>52.0%</b>	<b>0.0%</b>	<b>48.0%</b>	<b>3.7%</b>

## Appendix E Evaluation Detail – EE Kits Initiative

The Companies did not offer Energy Conservation Kits in PY12.

## Appendix F Evaluation Detail - Home Energy Reports

### F.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.

#### F.1.1 Data Preparation and Analysis Procedure

##### F.1.1.1 Data Gathering

Monthly billing data dating back to 12 months prior to each experimental cohort's treatment start date through May 2017 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.

##### F.1.1.2 Data Preparation

Much of FirstEnergy's service territories currently rely on traditional meter reads, which require a technician to record a customer's metered usage. Due to environmental and resource restrictions, it is not feasible for actual meter data to be obtained on a monthly basis. In order to accommodate these restrictions, FirstEnergy generates an estimated metered read based on load shapes and customer's historical usage. The customer's subsequent metered bill then features an adjustment factor to accommodate for any differences between the estimated read and the actual read.



As part of the data preparation process, ADM corrected for estimated reads and adjusted actual reads by using a “true-up” process. For each metered read and all estimated reads immediately preceding it, ADM totaled the billed usage and number of days spanning those bills. The total billed usage for that cumulative period was then divided by the total number of days to generate an average usage per day value. This average usage per day value was then multiplied by the number of days in each individual bill in order to generate a corrected usage value. Because the number of estimated reads per actual read is inconsistent, the number of estimated reads prior to the first actual read in the provided dataset could not be assumed. Therefore, the first metered read and all estimated reads preceding it were excluded from the dataset. Similarly, estimated reads that did not have a corresponding actual read (generally towards the tail end of provided billing data) were also excluded from analysis. Equation 1 and Table 191 provide the algorithm and inputs for calculating the adjusted usage for billing data after the first metered read and all prior estimated reads have been excluded.

$$Adjusted\ usage = \sum_i^n Billed\ usage \times \frac{Billing\ days_m}{\sum_i^n Billing\ days}$$

**Equation 1: Adjusted usage calculation for billing usage true-up.**

**Table 191: Definition of inputs for adjusted usage calculation**

Variable	Definition
i	First estimated bill in a sequence of estimated bills leading to a metered bill.
n	A metered bill providing an adjustment factor for preceding estimated bills.
m	The billing month of interest.
Billed usage	The total kWh billed in a monthly bill.
Billing days	The total number of days in a monthly bill's billing period.

Billing periods for customers do not fall on consistent dates between participants. For example, one customer’s June bill may run from May 16th to June 17th while another’s may run from May 20th to June 20th. Furthermore, the billing periods do not correspond to calendar months. In order to make the monthly billing data consistent between participants, ADM calendarized the data. Calendarization is the process of correcting monthly billing data to match calendar dates. For example, if 15 days in a billing period belonged to June and 15 days belonged to July, 50% of the billed usage would be attributed to June and 50% attributed to July. The proportionated usage and number of days that fall under a given calendar month are then summed to generate a calendarized usage value and a number of billed days for that month. Equation 2 and Table 192 provide the algorithm for calculating the monthly usage for a given calendar month.

$$Monthly\ usage_m = \sum_i^n \left( Adjusted\ usage_i \times \frac{Month\ days_i}{Billing\ days_i} \right)$$

**Equation 2: Monthly usage calculation**

**Table 192: Definition of inputs for monthly usage calculation**

Variable	Definition
i	First bill containing the month of interest.
n	Last bill containing the month of interest.
m	Month of interest.
Monthly usage	The calendarized monthly usage for a given month.
Month days	The number of days belonging to the month of interest in a given billing period.
Billing days	The total number of days in a given billing period

In addition to calculating the monthly usage, the number of billed days per month was also calculated by summing together the number of billed days in a corresponding month. Equation 3 provides the algorithm for calculating the number of days billed in a given month.

$$Billed\ days_m = \sum_i^n Month\ days_i$$

**Equation 3: Billed days calculation**

After calendarization was completed, an average daily usage value was calculated by dividing the monthly usage by the number of billed days in a month. Customer months that had less than one billed day or exceeded the total number of days in that calendar month for that year were excluded from analysis—months that meet these criteria have overlapping bills and are unreliable for analysis. Months that were present after a customer’s move out date were also be excluded from analysis. Customer months in which average daily usage exceeded 300 kWh or was less than -300 kW were considered outliers and were excluded from analysis. Partial-month data for the most recent available billing period was be removed from the data set. Furthermore, only the billing data from the past 12 months prior to the wave enrollment start date were used for analysis.

F.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:

$$kWh_{imy} = \beta_0 + \sum_{m=1}^{12} \sum_{y=2011}^{2021} I_{my} * \beta_{mys} * (AvgPre_i + AvePreSummer_i + AvePreWinter_i) + \sum_{m=1}^{12} \sum_{y=2011}^{2021} I_{my} * \tau_{my} * treatment_{imy} + \epsilon_{imy}$$

**Equation 4: Formula specifying the lagged seasonal regression model**

The variables above are defined in Table 193 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 represent the daily kWh savings attributable to the treatment effect for that month per home.

**Table 193: 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 $y$ .
$\beta_0$	Intercept of the regression equation.
$I_{my}$	Equal to one for each monthly bill month $m$ , year $y$ , and zero otherwise.
$\beta_{mys}$	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.
$\tau_{my}$	The estimated treatment effect in kWh per day per customer; the main parameter of interest.
$\varepsilon_{imy}$	The error terms.

#### F.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.

**Adjustment for Upstream Measures**

Adjustments for upstream measures was conducted in accordance to the Phase III Evaluation Framework. The adjustment was cast as a multiplier and applied after the correction for the downstream energy efficiency programs and the initial calculation of annual savings for the program year for a given participant wave. The multiplier values depended on the number of years since program enrollment for a given participation wave and are summarized in Table 194 below.

**Table 194: Adjustment factors for dual participation in upstream programs**

Years Since Enrollment	Adjustment multiplier for upstream program
1	99.25%
2	98.5%
3	97.75%
4 or more	97%

**F.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 5 demonstrates the algorithm for calculating verified savings for the model for each month in the program year.

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

### Equation 5: kWh savings calculation

The variables in the above equation are defined in Table 195 below.

**Table 195: Definition of variables for kWh savings calculation**

Variable	Definition
$\tau_{my}$	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.
<i>upstream adjustment multiplier</i>	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 196: Dual participation correction results by EDC and participation wave**

Wave	Treat	Control	Delta	Wave	Treat	Control	Delta
ME-1	20,091	21,267	1,176	PN-1	13,588	14,171	583
ME-1-LI	4,755	4,684	-71	PN-1-LI	3,166	3,291	125
ME-2	9,011	9,544	533	PN-2	11,427	11,997	570
ME-2-LI	842	816	-26	PN-2-LI	720	692	-29
ME-3	1,183	1,212	29	PN-3	2,737	2,706	-31
WP-1	16,553	17,454	901	PN-3-LI	2,112	2,099	-13
WP-1-LI	1,978	2,105	128	PP-1	4,645	4,795	151
WP-2	1,686	1,935	249	PP-1-LI	859	853	-6
WP-2-LI	714	759	45	PP-2	1,355	1,469	114
WP-3	1,525	1,621	96	PP-2-LI	296	278	-17

#### F.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:

$$\% \text{ savings}_{my} = \frac{kWh \text{ savings}_{my}}{kWh \text{ savings}_y}$$

### Equation 6: 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:

$$\% \text{ savings}_{my} = \beta_1 \text{end use}_{\text{heat pump}} + \beta_2 \text{end use}_{\text{interior lighting}} + \beta_3 \text{end use}_{\text{flat}}$$

### Equation 7: 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.

## F.1.2 Program Participation Levels

Table 197 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 July 2012, the second wave in January 2014, and the third wave in December 2014.

**Table 197: PY12 Participation Bill Counts by Month and Cohort**

Wave	Jun-20	Jul-20	Aug-20	Sep-20	Oct-20	Nov-20	Dec-20	Jan-21	Feb-21	Mar-21	Apr-21	May-21
ME-1	65,188	65,013	64,837	64,612	64,360	67,092	66,774	66,486	66,150	65,891	65,623	65,391
ME-1-LI	8,319	8,287	8,250	8,198	8,144	8,603	8,550	8,502	8,456	8,422	8,383	8,348
ME-2	41,717	41,573	41,444	41,291	41,117	43,194	42,963	42,744	42,501	42,289	42,053	41,863
ME-2-LI	1,661	1,651	1,640	1,625	1,611	1,730	1,721	1,712	1,697	1,688	1,680	1,669
ME-3	8,852	8,815	8,780	8,729	8,664	9,304	9,243	9,172	9,092	9,039	8,974	8,904
PN-1	43,293	43,208	43,124	42,980	42,834	44,258	44,092	43,951	43,784	43,657	43,518	43,397
PN-1-LI	5,376	5,360	5,340	5,308	5,276	5,528	5,500	5,480	5,456	5,434	5,417	5,397
PN-2	54,632	54,458	54,281	54,059	53,827	56,340	56,068	55,795	55,503	55,263	55,029	54,807
PN-2-LI	1,251	1,245	1,237	1,232	1,222	1,302	1,295	1,287	1,280	1,272	1,269	1,258
PN-3	22,324	22,227	22,112	21,979	21,860	23,297	23,141	23,009	22,849	22,704	22,533	22,411
PN-3-LI	6,503	6,465	6,424	6,373	6,310	6,798	6,737	6,697	6,653	6,612	6,571	6,534
PP-1	15,239	15,194	15,159	15,102	15,032	15,664	15,585	15,525	15,456	15,388	15,330	15,276
PP-1-LI	1,698	1,695	1,694	1,682	1,670	1,760	1,748	1,740	1,732	1,719	1,708	1,704
PP-2	6,120	6,105	6,079	6,057	6,029	6,324	6,286	6,254	6,213	6,183	6,162	6,138
PP-2-LI	659	656	656	653	651	677	674	673	672	671	667	665
WP-1	102,155	101,917	101,662	101,323	101,019	104,717	104,265	103,851	103,428	103,084	102,734	102,414
WP-1-LI	9,011	8,976	8,940	8,885	8,833	9,311	9,277	9,233	9,183	9,143	9,099	9,057
WP-2	15,548	15,502	15,460	15,395	15,351	15,946	15,870	15,812	15,754	15,688	15,636	15,587
WP-2-LI	3,015	2,999	2,987	2,967	2,946	3,146	3,126	3,109	3,084	3,068	3,050	3,028
WP-3	23,133	23,042	22,976	22,865	22,753	23,921	23,762	23,645	23,526	23,414	23,308	23,218

### F.1.3 Adjustment for 2012 Low-Income vs. Standard Residential Savings

During the initial wave of participants in 2012, separate Low-Income and standard residential groups were not established as part of program implementation. As part of the Phase III implementation, Low-Income treatment and control participants were identified and treated as a separate cohort from their standard residential counterparts. In accordance with Phase III efficiency goals, a number of treatment group homes were dropped from the standard residential cohorts while fewer to no homes were dropped from the corresponding Low-Income group.

Equivalence testing done in PY8, as part of our evaluation plan development showed initial imbalances between treatment and control groups for some of the Low-Income cohorts when looking at annual pre-treatment energy usage. Simultaneously, unlike the standard residential cohorts, the Low-Income cohorts showed high levels of volatility in predicting program year savings. This volatility could be due to the imbalance in treatment vs. control groups, high level of variability in billing data due to breaking of the randomized control trial in creating the Low-Income group, or overall smaller cohort sizes for the Low-Income groups.

To compensate for this volatility, the program year savings for the 2012 Low-Income and standard residential cohorts were corrected by taking the sum of the Low-Income group savings and its corresponding standard residential cohort. For each EDC, the summed savings was

then proportioned back to the Low-Income group and the standard residential group by taking the proportion of pre-treatment annual energy consumption belonging to each group (i.e., the proportion of pre-treatment annual energy usage for all Low-Income treatment customers over the sum of the annual energy usage for all Low-Income and standard residential treatment customers). This adjustment took place after calculating cohort-level savings as modeled through the lagged seasonal model regression but prior to dual participation adjustment. Demand savings, similarly, were modeled after all adjustments to energy savings took place and therefore do not require additional adjustments.

#### **F.1.4 Results**

The reported and verified energy savings are shown in Table 198 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 199 shows the reported and verified demand reduction for each EDC and initiative.



**Table 198: 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	11,118	10,939	1.21%	0.17%
Met-Ed	ME-2	6,986	6,874	1.19%	0.28%
Met-Ed	ME-3	2,691	2,648	2.11%	0.65%
<b>Met-Ed</b>	<b>Total for EEH Program</b>	<b>20,796</b>	<b>20,461</b>	<b>1.32%</b>	<b>0.15%</b>
Met-Ed	ME-1-LI	1,496	1,844	1.54%	0.63%
Met-Ed	ME-2-LI	314	387	1.41%	1.04%
<b>Met-Ed</b>	<b>Total for U Program</b>	<b>1,810</b>	<b>2,231</b>	<b>1.52%</b>	<b>0.54%</b>
Penelec	PN-1	6,317	6,075	1.14%	0.22%
Penelec	PN-2	7,366	7,084	1.42%	0.30%
Penelec	PN-3	1,082	1,040	0.62%	0.40%
<b>Penelec</b>	<b>Total for EEH Program</b>	<b>14,765</b>	<b>14,199</b>	<b>1.24%</b>	<b>0.18%</b>
Penelec	PN-1-LI	1,189	990	1.49%	0.62%
Penelec	PN-2-LI	352	293	1.76%	1.17%
Penelec	PN-3-LI	-104	-86	-0.17%	0.69%
<b>Penelec</b>	<b>Total for U Program</b>	<b>1,438</b>	<b>1,197</b>	<b>1.67%</b>	<b>0.81%</b>
Penn Power	PP-1	2,364	2,515	1.37%	0.29%
Penn Power	PP-2	2,238	2,381	2.27%	0.41%
<b>Penn Power</b>	<b>Total for EEH Program</b>	<b>4,602</b>	<b>4,896</b>	<b>1.81%</b>	<b>0.25%</b>
Penn Power	PP-1-LI	353	389	1.93%	0.99%
Penn Power	PP-2-LI	227	250	2.15%	1.29%
<b>Penn Power</b>	<b>Total for U Program</b>	<b>580</b>	<b>639</b>	<b>2.02%</b>	<b>0.79%</b>
WPP	WP-1	12,598	10,038	0.66%	0.32%
WPP	WP-2	5,548	4,421	1.58%	0.39%
WPP	WP-3	4,237	3,376	1.06%	0.40%
<b>WPP</b>	<b>Total for EEH Program</b>	<b>22,383</b>	<b>17,835</b>	<b>0.96%</b>	<b>0.28%</b>
WPP	WP-1-LI	1,612	1,025	0.75%	1.35%
WPP	WP-2-LI	366	233	0.58%	0.89%
<b>WPP</b>	<b>Total for U Program</b>	<b>1,978</b>	<b>1,258</b>	<b>0.72%</b>	<b>1.07%</b>

**Table 199: Reported and verified demand reductions for the HER Initiative**

Operating Company	Initiative	PYRTD MW/yr	PYVTD MW/yr	Demand Realization Rate
Met-Ed	Non-LI	3.62	2.32	64%
Met-Ed	LI	0.31	0.25	80%
Penelec	Non-LI	2.03	1.61	79%
Penelec	LI	0.20	0.13	66%
Penn Power	Non-LI	0.75	0.55	73%
Penn Power	LI	0.09	0.07	77%
WPP	Non-LI	3.94	1.96	50%
WPP	LI	0.35	0.13	38%

## Appendix G Evaluation Detail – Residential Direct Install Initiative

The Residential Direct Install (Res DI) Initiative is comprised of the Home Energy Assessment program implemented by GoodCents. 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 GoodCents 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.

The initial audit costs the customer \$350. The customer can receive \$200 worth of energy savings products installed during the day of the audit. Customer can apply for a rebate of \$250 after the initial audit. The implementer and the customer also discuss major measure installation possibilities. A major measure typically requires a significant investment from the customer. Customers, who installed major measures, can receive an additional \$100 for achieving saving more than 2,000 kWh and \$150 for achieving saving more than 3,000 kWh.

## G.1 GROSS IMPACT EVALUATION

### G.1.1 Gross Impact Evaluation Methodology

Gross impact evaluation was not conducted for the Res DI Initiative in PY12. For each EDC, the gross energy and demand realization rates for each evaluation stratum were taken to be the average of respective PY10 and PY11 realization rates.

### G.1.2 Sampling

The Res DI Initiative was not evaluated in PY12. Table 200, Table 201, Table 202, and Table 203 show sample sizes of zero for Met-Ed, Penelec, Penn Power, and WPP respectively. Stratification in PY12 was conducted to align projects with similar projects from PY10 and PY11. For this purpose, each project was characterized as either a weatherization project or a non-weatherization project. While the gross realization rate is taken to be the average of PY10 and PY11 realization rates, the relative precision in PY12 is taken to be 100%.

**Table 200: Res DI Initiative Gross Impact Sample Design for Met-Ed**

Stratum	MWh Threshold	Population Size	Achieved Sample Size	Evaluation Activity
Prescriptive	na	101	0	Not Evaluated in PY12
Weatherization	na	10	0	
<b>Program Total</b>		<b>111</b>	<b>0</b>	

**Table 201: Res DI Initiative Gross Impact Sample Design for Penelec**

Stratum	MWh Threshold	Population Size	Achieved Sample Size	Evaluation Activity
Prescriptive	na	182	0	Not Evaluated in PY12
Weatherization	na	0	0	
<b>Program Total</b>		<b>182</b>	<b>0</b>	

**Table 202: Res DI Initiative Gross Impact Sample Design for Penn Power**

Stratum	MWh Threshold	Population Size	Achieved Sample Size	Evaluation Activity
Prescriptive	na	20	0	Not Evaluated in PY12
Weatherization	na	0	0	
<b>Program Total</b>		<b>20</b>	<b>0</b>	

**Table 203: Res DI Initiative Gross Impact Sample Design for WPP**

Stratum	MWh Threshold	Population Size	Achieved Sample Size	Evaluation Activity
Prescriptive	na	187	0	Not Evaluated in PY12
Weatherization	na	0	0	
<b>Program Total</b>		<b>187</b>	<b>0</b>	

### G.1.3 Results for Energy

The gross realization rates for energy, along with relative precisions, are shown in Table 204, Table 205, Table 206, and Table 207 for Met-Ed, Penelec, Penn Power, and WPP respectively.

**Table 204: 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.
Prescriptive	na	71	93.9%	0.4	100%
Weatherization	na	28	100.7%	0.4	100%
<b>Program Total</b>		<b>99</b>	<b>95.8%</b>	<b>n/a</b>	<b>100.0%</b>

**Table 205: 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.
Prescriptive	na	158	99.9%	0.4	100%
Weatherization	na	0	100.0%	0.4	100%
<b>Program Total</b>		<b>158</b>	<b>99.9%</b>	<b>n/a</b>	<b>100.0%</b>

**Table 206: 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.
Prescriptive	na	19	102.9%	0.4	100%
Weatherization	na	0	100.0%	0.4	100%
<b>Program Total</b>		<b>19</b>	<b>102.9%</b>	<b>n/a</b>	<b>100.0%</b>

**Table 207: 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.
Prescriptive	na	158	98.4%	0.4	100%
Weatherization	na	0	100.0%	0.4	100%
<b>Program Total</b>		<b>158</b>	<b>98.4%</b>	<b>n/a</b>	<b>100.0%</b>

### G.1.4 Results for Demand

The gross realization rates for demand, along with relative precisions, are shown Table 208, Table 209, Table 210, and Table 211 for Met-Ed, Penelec, Penn Power, and WPP respectively.

**Table 208: 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.
Prescriptive	na	0.01	93.1%	0.4	100%
Weatherization	na	0.00	89.5%	0.4	100%
<b>Program Total</b>		<b>0.01</b>	<b>92.4%</b>	<b>n/a</b>	<b>100.0%</b>

**Table 209: 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.
Prescriptive	na	0.02	90.8%	0.4	100%
Weatherization	na	0.00	100.0%	0.4	100%
<b>Program Total</b>		<b>0.02</b>	<b>90.8%</b>	<b>n/a</b>	<b>100.0%</b>

**Table 210: 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.
Prescriptive	na	0.00	101%	0.4	100%
Weatherization	na	0.00	100%	0.4	100%
<b>Program Total</b>		<b>0.00</b>	<b>100.5%</b>	<b>n/a</b>	<b>100.0%</b>

**Table 211: 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.
Prescriptive	na	0.02	105.9%	0.4	100%
Weatherization	na	0.00	100.0%	0.4	100%
<b>Program Total</b>		<b>0.02</b>	<b>105.9%</b>	<b>n/a</b>	<b>100.0%</b>

## G.2 NET IMPACT EVALUATION

### G.2.1 Net Impact Evaluation Methodology

The net-to-gross evaluation for the Res DI initiative was based on self-report data from program participants. This followed the self-report methodologies for free-ridership and spillover from the PA Evaluation Framework. Participants were randomly sampled since the savings for these sub-programs are relatively small and do not qualify for the higher level of rigor of high-impact measures. Individual free-ridership and spillover rates from the participant survey were weighted to adjust for sampling differences, non-response, and claimed energy savings to calculate

overall estimates. 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 212 below.

**Table 212: 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%

### G.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 213. 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 purchased from non-participating upstream lighting stores, and pipe wrap.

**Table 213: Res DI Initiative Net-to-Gross Results by EDC**

Stratum	PYVTD MWh	Free Ridership (%)	Spillover (%)	NTG Ratio	Relative Precision (@ 85% CL)
Met-Ed	94	19.0%	14.0%	95.0%	7.1%
Penelec	158	16.0%	19.0%	103.0%	5.7%
Penn Power	20	19.0%	20.0%	100.0%	6.6%
WPP	156	20.0%	24.0%	104.0%	7.3%

# Appendix H 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 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.

## H.1 GROSS IMPACT EVALUATION

### H.1.1 Gross Impact Evaluation Methodology

Gross impact evaluation was not conducted for the Residential New Construction (Res NC) Initiative in PY12. For each EDC, the gross energy and demand realization rates were taken to be the average of respective PY10 and PY11 realization rates.

### H.1.2 Sampling

The New Homes Initiative was not evaluated in PY12. Table 211, Table 215, Table 216, and Table 217 show sample sizes of zero for Met-Ed, Penelec, Penn Power, and WPP respectively. While the gross realization rate is taken to be the average of PY10 and PY11 realization rates, the relative precision in PY12 is taken to be 100%.

**Table 214: RES NC Initiative Gross Impact Sample Design for Met-Ed**

Stratum	Population Size	Achieved Sample Size	Evaluation Activity
All	758	0	Not Evaluated
<b>Program Total</b>	<b>758</b>	<b>0</b>	in PY12

**Table 215: RES NC Initiative Gross Impact Sample Design for Penelec**

Stratum	Population Size	Achieved Sample Size	Evaluation Activity
All	112	0	Not Evaluated
<b>Program Total</b>	<b>112</b>	<b>0</b>	in PY12

**Table 216: RES NC Initiative Gross Impact Sample Design for Penn Power**

Stratum	Population Size	Achieved Sample Size	Evaluation Activity
All	444	0	Not Evaluated
<b>Program Total</b>	<b>444</b>	<b>0</b>	in PY12

**Table 217: RES NC Initiative Gross Impact Sample Design for WPP**

Stratum	Population Size	Achieved Sample Size	Evaluation Activity
All	1,049	0	Not Evaluated
<b>Program Total</b>	<b>1,049</b>	<b>0</b>	<b>in PY12</b>

### H.1.3 Results for Energy

The gross realization rates for energy, along with relative precisions, are shown in Table 218, Table 219, Table 220, and Table 221 for Met-Ed, Penelec, Penn Power, and WPP respectively.

**Table 218: RES NC Initiative Energy Gross Realization Rates for Met-Ed**

Stratum	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
All	1,914	76.1%	0	100%
<b>Program Total</b>	<b>1,914</b>	<b>76.1%</b>	<b>0</b>	<b>100%</b>

**Table 219: RES NC Initiative Energy Gross Realization Rates for Penelec**

Stratum	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
All	363	81.4%	0	100%
<b>Program Total</b>	<b>363</b>	<b>81.4%</b>	<b>0</b>	<b>100%</b>

**Table 220: RES NC Initiative Energy Gross Realization Rates for Penn Power**

Stratum	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
All	785	75.9%	0	100%
<b>Program Total</b>	<b>785</b>	<b>75.9%</b>	<b>0</b>	<b>100%</b>

**Table 221: Res DI Initiative Energy Gross Realization Rates for WPP**

Stratum	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
All	2,255	77.3%	0	100%
<b>Program Total</b>	<b>2,255</b>	<b>77.3%</b>	<b>0</b>	<b>100%</b>

### H.1.4 Results for Demand

The gross realization rates for demand, along with relative precisions, are shown Table 222, Table 223, Table 224, and Table 225 for Met-Ed, Penelec, Penn Power, and WPP respectively.



**Table 222: RES NC Initiative Demand Gross Realization Rates for Met-Ed**

Stratum	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
All	0.87	87.5%	0	100%
<b>Program Total</b>	<b>0.87</b>	<b>87.5%</b>	<b>0</b>	<b>100%</b>

**Table 223: RES NC Initiative Demand Gross Realization Rates for Penelec**

Stratum	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
All	0.15	92.9%	0	100%
<b>Program Total</b>	<b>0.15</b>	<b>92.9%</b>	<b>0</b>	<b>100%</b>

**Table 224: RES NC Initiative Gross Realization Rates for Penn Power**

Stratum	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
All	0.49	81.9%	0	100%
<b>Program Total</b>	<b>0.49</b>	<b>81.9%</b>	<b>0</b>	<b>100%</b>

**Table 225: RES NC Initiative Demand Gross Realization Rates for WPP**

Stratum	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
All	1.06	83.4%	0	100%
<b>Program Total</b>	<b>1.06</b>	<b>83.4%</b>	<b>0</b>	<b>100%</b>

## H.2 NET IMPACT EVALUATION

### H.2.1 Net Impact Evaluation Methodology

For the New Homes program, 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 I Evaluation Detail – Residential Upstream Lighting Initiative

## I.1 GROSS IMPACT EVALUATION

The Upstream Lighting initiative provides point of sale incentives on energy efficient lighting products at participating retailers. The program also provides for the promotion of energy efficient lighting at retailers, including product placement, signage, and staff training. Contact information for downstream participants is not collected, as this is an upstream program. The number of participants is reported as the number of packs of lamps. The average pack size is approximately three, the lamps to participants ratio is approximately three.

### I.1.1 Gross Impact Evaluation Methodology

Gross impact evaluation for the Upstream Lighting Initiative involved a database review to reconcile invoices with tracking and reporting data and to calculate lamp-specific impacts according to the 2016 PA TRM, and a general population telephone survey to determine cross-sector sales. The impact evaluation process is described below.

#### I.1.1.1 Review of Sales Invoices and Determination of ISR

ADM conducted a review and obtained invoices for the lamps sold by participating retailers. These invoices are matched to the tracking and reporting (tracking and reporting) system to confirm proper counts and characteristics of the lamps and packages. The information regarding lamp types and quantities in the tracking and reporting system was found to be consistent with the reviewed invoices. Given this finding, the default 92% ISR is applied in the impact calculations. In the event that discrepancies are found between invoiced and tracked quantities, the realization rate is adjusted to reflect invoiced quantities in the verified savings.

#### I.1.1.2 Determination of Baseline and Efficient Lamp Watts

ADM developed an ex-ante wattage equivalency map for use by the ICSP. The wattage equivalency was not make/model specific, but was rather designed to facilitate accurate if somewhat conservative, reporting of energy and demand impacts.

To calculate verified impacts, ADM developed a make/model specific wattage equivalency map. For each unique stock keeping unit (SKU) description, ADM determined the lamp type as one of the following:

- General Service (though none were rebated in PY12)
- Reflector (with subcategories having different lumen to baseline wattage mappings)
- Globe
- Decorative
- 3-Way

For each category, the baseline wattage was determined according to the TRM as a function of the efficient lamp's lumen output. With the baseline and efficient watts determined, the impacts for all lamps are determined through TRM algorithms.

#### 1.1.1.3 Treatment of Non ENERGY STAR® LED Lamps

In PY8, approximately 21% of rebated LED lamps were not ENERGY STAR® qualified at the start of PY8. However, approximately 43% of those LED models have since qualified for ENERGY STAR®. The non-qualifying lamps have similar light output and color rendition, but often have shorter measure lives (at the beginning of PY8, the ENERGY STAR® lifetime requirement was 25,000 hours, but the requirement has since been relaxed to 15,000 hours). The non-qualifying “value” LEDs had considerable price advantages last year, and were offered as a transitional measure given the changes in ENERGY STAR® standards. The price advantage is now minimal, however, and the Companies stopped rebating non-qualifying LEDs at the end of PY8.

#### 1.1.1.4 Determination of Cross Sector Sales

Since upstream program tracking data does not contain customer information, a general population survey was conducted in PY10 to update estimates of the fraction of lamps that are installed in various nonresidential settings. The online survey targeted 1,000 residential customers combined over the four FirstEnergy PA EDCs. A total of 1,001 surveys were completed. The survey instrument included initial questions to positively identify program participants, and then asked how many lamps they purchased and where the lamps were installed.

The weight for each sector is taken to be the number of lamp that are likely to be program-rebated lamps installed in the sector (residential or commercial) by the respondent, divided by the total number of program-rebated lamps installed by all respondents. If customers reported that they installed lamps in both residences and businesses, a follow up question asked for the proportion of lamps installed in each location.

The instrument included seven facility types that have previously been identified as likely places of lamp installation, along with an open-ended response for other facility types. The responses were then mapped to TRM building types for determination of GNI status according to the assignment scheme shown in Table 226. If a precise determination of business type is not possible after a review all responses in the “Other” category (last line of Table 226), the GNI status is set to non-GNI.

**Table 226: Mapping of cross sector sales survey responses to TRM building types and GNI status.**

Nonresidential Facility Type	TRM Building Type	GNI
Office	Office	No
Retail store	Retail	No
Health care facility	Health	Yes
Hotel / motel / lodging	Lodging	No
Restaurant	Restaurant	No
School	Education	Yes
Place of worship	Institutional	Yes
Other	Determined from response	

Out of 1,001 completed survey responses, 6,082 efficient lamps were reported to be purchased and installed in the last 12 months. However, inspection of the stores where the lamps were stated to be purchased revealed that only 3,698 of these lamps were likely to be purchased at stores that participate in the FirstEnergy Companies’ Upstream Lighting programs. A significant portion of non-program lamps were determined to be purchased at electrical supply stores and online retailers.

After filtering out non-program lamps, a total of 19 customers reported installing a total of 264 lamps in businesses. The fraction of efficient lamps that are installed in non-residential settings is  $264/3,698=7.1\%$ . Of the 264 lamps, total of 100 were determined to be installed in GNI facilities, so that the GNI cross sector rate is  $100/3,698=0.65\%$ . The cross-sector rate is within the range of past efforts (the rate has been measured four times since PY4: 4.9%, 5.8%, 8.3%, and now 7.1%).

#### I.1.1.5 Determination of Hours of Use and Coincidence Factor

The daily hours of use and peak coincidence factor for lamps installed in the residential sector are taken as the corresponding values for efficient lamps as installed in the overall household in the 2016 PA TRM. Nonresidential hours of use and coincidence factors are derived from the associated Guidance Memo issued by SWE on May 7, 2019. ADM applied default values rather than building-specific values because only 19 of 1,001 respondents reported installing lamps in nonresidential settings, and this number is likely too small to warrant overriding default values.

#### I.1.1.6 Determination of HVAC Interactive Effects

Residential HVAC interactive effects factors are determined separately for each EDC in a two-step process. As a first step, we use data from the 2014 Act 129 Residential Baseline Study to estimate the fraction of lamps that are installed in conditioned space. The fraction of lamps in conditioned space is the ratio of the number of eligible interior sockets to the total number of eligible sockets for each EDC. This fraction is presented in Table 227.

**Table 227: Determination of the fraction of lamps in conditioned space by EDC.**

EDC	Number of Interior Lamps	Number of Exterior Lamps	Interior lamps as a % of total lamps
Met-Ed	45	6	88%
Penelec	35	4	90%
Penn Power	49	5	91%
West Penn	49	6	89%

As a second step the residential interactive factors from the PA TRM are adjusted through multiplication by the percentages in the last column of Table 227. The adjusted interactive effects are shown in Table 228.

Nonresidential HVAC interactive effects are derived from the Cross Sector Sales Guidance Memo issued by SWE on May 7, 2019.

**Table 228: Original and adjusted energy and demand interactive effects by EDC.**

EDC	IE kWh	ADJ IE kWh	IE kW	ADJ IE kW
Met-Ed	-8%	-7%	13%	11%
Penelec	1%	1%	10%	9%
Penn Power	0%	0%	20%	18%
WPP	-2%	-2%	30%	27%

Table 229 lists the data sources for gross impact calculation algorithms.

**Table 229: Data Sources for the ATI Initiative Gross Impact Evaluation**

Evaluation Parameter	Data Source	Value
Verification of Quantity	Invoice to SSRS comparison	Varies
Baseline Watts	Lookup based on lumens, type	Varies
Watts	Lookup from EnergyStar DB and online searches	Varies
Lumens	Lookup from EnergyStar DB and online searches	Varies
Lamp Type	Lookup from EnergyStar DB and online searches	Varies
Residential Daily Hour of Use	TRM Table 2-5 HOU for Efficient Lamps in Household	3.0
Residential Coincidence Factor	TRM Table 2-5 CF for Efficient Lamps in Household	0.106
Residential IF kWh	TRM Table 2-6, per EDC, for lamps installed indoors	Varies
Residential IF kW	TRM Table 2-6, per EDC, for lamps installed indoors	Varies
Residential % Installed Indoors	2014 Baseline Study Figure 5-12 and Table 5-50	Varies
Percent Nonresidential	Cross Sector Sales Survey*	7.14%
Percent GNI	Cross Sector Sales Survey*	2.70%
Nonresidential Hour of Use	Cross Sector Sales Survey* and SWE Guidance Memo	1,961
Nonresidential CF	Cross Sector Sales Survey* and SWE Guidance Memo	0.39
GNI Hours of Use	Cross Sector Sales Survey* and SWE Guidance Memo	1,961
GNI CF	Cross Sector Sales Survey* and SWE Guidance Memo	0.39
Nonresidential IF kWh	TRM Table 3-9, per EDC, for lamps installed indoors	0
Nonresidential IF kW	TRM Table 3-9, per EDC, for lamps installed indoors	0.192

\*Cross sector sales survey results are applied to all four EDCs

## I.1.2 Sampling

Of the three gross impact evaluation activities conducted for this initiative, only the invoice review component involved sampling. The sampling was conducted on a simple random basis. The relative precision on the cross-sector rate is estimated to be 60%, but this translates to approximately 6% at the initiative level. The sample design for this initiative is summarized in Table 230 below.

**Table 230: Gross Impact Sample Design for the Upstream Lighting Initiative**

EDC	Population Size	Achieved Sample Size	Evaluation Activity
Met-Ed	103,499	Census	Database Review
		79	Invoice Review
		233	X-Sector Sales Survey
<b>Met-Ed Total</b>	<b>103,499</b>	<b>312</b>	
Penelec	108,166	Census	Database Review
		80	Invoice Review
		276	X-Sector Sales Survey
<b>Penelec Total</b>	<b>108,166</b>	<b>356</b>	
Penn Power	21,285	Census	Database Review
		67	Invoice Review
		255	X-Sector Sales Survey
<b>Penn Power Total</b>	<b>21,285</b>	<b>322</b>	
WPP	121,256	Census	Database Review
		80	Invoice Review
		237	X-Sector Sales Survey
<b>WPP Total</b>	<b>121,256</b>	<b>317</b>	

## I.1.3 Results for Energy

The gross realization rates for energy, along with relative precisions, are shown in Table 231.

**Table 231: Upstream Lighting Initiative Energy Gross Realization Rates**

EDC	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
Met-Ed	10,367	121.2%	0.5	8.1%
Penelec	11,697	118.4%	0.5	8.0%
Penn Power	2,328	124.0%	0.5	8.8%
WPP	13,012	120.2%	0.5	8.0%

## I.1.4 Results for Demand

The gross realization rates for demand, along with relative precisions, are shown Table 232.

**Table 232: Upstream Lighting Initiative Demand Gross Realization**

EDC	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
Met-Ed	1.23	129.7%	0.5	8.1%
Penelec	1.23	130.7%	0.5	8.0%
Penn Power	0.27	133.5%	0.5	8.8%
WPP	1.67	125.8%	0.5	8.0%



## I.2 NET IMPACT EVALUATION

### I.2.1 Net Impact Evaluation Methodology

Upstream lighting net-to-gross was based on both customer and retailer survey responses. As part of the general population survey, customers who reported purchasing program-eligible bulbs from a participating retailer were asked a series of questions to assess free-ridership. Sixteen percent of customers who purchased LEDs were aware of a discount on the product they purchased. Similar to PY8, customer awareness was higher in Penelec and Penn Power territories; however, awareness in all four territories increased by three to five percent.

Regardless of awareness of a specific discount, we asked all customers what they would have done in the absence of the incentive. For customers who were not previously aware of the discount, we introduced these questions by saying they “would have received a discount of up to \$5 per bulb” at participating retailers. We modeled these questions after the common approach to free-ridership outlined in the PA Evaluation Framework, including questions to gauge customer intention and program influence. The results suggest that some customers would have modified their purchase if the discount had not been available: 25 percent would have purchased fewer bulbs (“some but not all”), 7 percent would not have purchased any bulbs for at least one year, and 6 percent would have purchased less efficient lighting. Just less than fifty percent of customers would have made the same purchase without the discount. Twenty-five percent of customers rated at least one aspect of the program at least a four on a one to five scale, where one was “not at all influential” and five was “extremely influential.” The overall free-ridership estimates from the general population survey ranged from 71 to 75 percent by EDC.

The retailer survey included several metrics to gauge the effectiveness of the program on the sales of program-eligible bulbs. The primary metric used to estimate net-to-gross from this effort was sales lift, or a series of questions that ask retailers to estimate how their sales of program-eligible bulbs would have been affected if the program incentive was not available.<sup>19</sup> The analysis calculated a mean sales lift per retail chain per EDC, and then these were weighted by the gross savings attributable to that retail chain for that EDC. Tracking data does not maintain sufficient detail to weight by each retail location’s savings.

The program’s overall net-to-gross results based on PY10 evaluation are simply an average of the general population and retailer sales lift results. Both of these estimates are more robust than the results from PY8 since both analyses include considerably more data points.

### I.2.2 Sampling

Both retailers and participants were contacted for net impact evaluation purposes. The sample designs for the four EDCs are shown in Table 233.

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<sup>19</sup> Retailer survey questions N6-N9.

**Table 233: Upstream Lighting Initiative Net-to-Gross Sampling**

EDC	Stratum	Population Size	Achieved Sample Size	Response Rate
Met-Ed	Retailers	62	32	52%
	Customers	103,499	233	19%
<b>Met-Ed Total</b>		<b>n/a</b>	<b>n/a</b>	<b>n/a</b>
Penelec	Retailers	116	67	58%
	Customers	108,166	276	22%
<b>Penelec Total</b>		<b>n/a</b>	<b>n/a</b>	<b>n/a</b>
Penn Power	Retailers	24	13	54%
	Customers	21,285	255	21%
<b>Penn Power Total</b>		<b>n/a</b>	<b>n/a</b>	<b>n/a</b>
WPP	Retailers	73	28	38%
	Customers	121,256	237	19%
<b>WPP Total</b>		<b>n/a</b>	<b>n/a</b>	<b>n/a</b>

**I.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 234.

**Table 234: Upstream Lighting Initiative Net-to-Gross Results**

EDC	PYVTD MWh	Free Ridership (%)	Spillover (%)	NTG Ratio	Relative Precision (@ 85% CL)
Met-Ed	12,565	71.0%	0.0%	29.0%	10.0%
Penelec	13,845	69.0%	0.0%	31.0%	7.2%
Penn Power	2,886	74.0%	0.0%	26.0%	14.2%
WPP	15,645	77.0%	0.0%	23.0%	11.7%

# Appendix J Evaluation Detail – Residential Upstream Electronics Initiative

## J.1 GROSS IMPACT EVALUATION

The Upstream Electronic initiative provides retailers incentives for the promotion of energy efficient computers, monitors, televisions, and imaging equipment. Each rebated item is counted as one participant for reporting purposes.

### J.1.1 Gross Impact Evaluation Methodology

Gross impact evaluation for the Upstream Electronics Initiative involved a database review to reconcile invoices with tracking and reporting data and to calculate lamp-specific impacts according to the 2016 PA TRM. The impact evaluation process is described below.

#### J.1.1.1 Review of Sales Invoices and Determination of Product Eligibility

ADM conducted a review and obtained invoices for the computers, monitors, televisions, and imaging equipment sold by participating retailers. These invoices are matched to the tracking and reporting (T&R) system to confirm proper counts and characteristics of rebated items. The information regarding item types and quantities in the T&R system was found to be consistent with the reviewed invoices. In the event that discrepancies are found between invoiced and tracked quantities, a verification rate is generated by dividing the invoiced quantity by the tracked quantity and applied to calculated energy and demand savings.

#### J.1.1.2 Determination of ENERGY STAR® Status

To calculate verified impacts, ADM developed a make/model specific equipment map. For each unique stock keeping unit (SKU) description, ADM categorized the equipment type as one of the following:

- Computer
- Monitor
- Television
- Imaging Equipment

Imaging equipment was further sub-divided based on imaging equipment technology (multifunction device, printer, or scanner) and ink-type (inkjet, laser, or thermal transfer/impact). ADM utilized ENERGY STAR® databases for the program year to determine equipment eligibility. Impacts for all equipment are determined using deemed savings tables from the TRM.

### J.1.2 Sampling

Of the two gross impact evaluation activities conducted for this initiative, only the invoice review component involved sampling. The sampling was conducted on a simple random basis. The sample design for this initiative is summarized in Table 235 below.

**Table 235: Upstream Electronics Initiative Sample Design**

EDC	Population Size	Achieved Sample Size	Evaluation Activity
Met-Ed	5,828	Census	Database Review
		Census	Invoice Review
<b>Met-Ed Total</b>	<b>5,828</b>	<b>5828</b>	
Penelec	2,691	Census	Database Review
		Census	Invoice Review
<b>Penelec Total</b>	<b>2,691</b>	<b>2691</b>	
Penn Power	2,248	Census	Database Review
		Census	Invoice Review
<b>Penn Power Total</b>	<b>2,248</b>	<b>2248</b>	
WPP	8,659	Census	Database Review
		Census	Invoice Review
<b>WPP Total</b>	<b>8,659</b>	<b>8,659</b>	

**J.1.3 Results for Energy**

The gross realization rates for energy, 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: Upstream Electronics Initiative Energy Gross Realization Rates for Met-Ed**

Stratum	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
TV	96	82.7%	0.5	0.0%
Imaging	43	226.7%	0.5	0.0%
Computer	6	100.0%	0.5	0.0%
Monitor	19	100.0%	0.5	0.0%
<b>Program Total</b>	<b>164</b>	<b>123.0%</b>	<b>0.5</b>	<b>0.0%</b>

**Table 237: Upstream Electronics Initiative Energy Gross Realization Rates for Penelec**

Stratum	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
TV	42	83.9%	0.5	0.0%
Imaging	20	269.6%	0.5	0.0%
Computer	4	100.0%	0.5	0.0%
Monitor	10	100.0%	0.5	0.0%
<b>Program Total</b>	<b>76</b>	<b>134.8%</b>	<b>0.5</b>	<b>0.0%</b>

**Table 238: Upstream Electronics Initiative Energy Gross Realization Rates for Penn Power**

Stratum	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
TV	35	83.6%	0.5	0.0%
Imaging	16	284.6%	0.5	0.0%
Computer	2	100.0%	0.5	0.0%
Monitor	9	100.0%	0.5	0.0%
<b>Program Total</b>	<b>63</b>	<b>137.4%</b>	<b>0.5</b>	<b>0.0%</b>

**Table 239: Upstream Electronics Initiative Energy Gross Realization Rates for WPP**

Stratum	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
TV	144	80.5%	0.5	0.0%
Imaging	61	275.2%	0.5	0.0%
Computer	9	100.0%	0.5	0.0%
Monitor	31	100.0%	0.5	0.0%
<b>Program Total</b>	<b>246</b>	<b>132.3%</b>	<b>0.5</b>	<b>0.0%</b>

#### J.1.4 Results for Demand

The gross realization rates for demand, along with relative precisions, are shown Table 240, Table 241, Table 242, and Table 243 for Met-Ed, Penelec, Penn Power, and WPP respectively.

**Table 240: Upstream Electronics Initiative Demand Gross Realization Rates for Met-Ed**

Stratum	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
TV	0.01	81.8%	0.5	0.0%
Imaging	0.01	149.8%	0.5	0.0%
Computer	0.00	100.0%	0.5	0.0%
Monitor	0.00	100.0%	0.5	0.0%
<b>Program Total</b>	<b>0.02</b>	<b>113.1%</b>	<b>0.5</b>	<b>0.0%</b>

**Table 241: Upstream Electronics Initiative Demand Gross Realization Rates for Penelec**

Stratum	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
TV	0.00	83.1%	0.5	0.0%
Imaging	0.00	178.3%	0.5	0.0%
Computer	0.00	100.0%	0.5	0.0%
Monitor	0.00	100.0%	0.5	0.0%
<b>Program Total</b>	<b>0.01</b>	<b>125.1%</b>	<b>0.5</b>	<b>0.0%</b>

**Table 242: Upstream Electronics Initiative Gross Realization Rates for Penn Power**

Stratum	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
TV	0.00	82.8%	0.5	0.0%
Imaging	0.00	188.2%	0.5	0.0%
Computer	0.00	100.0%	0.5	0.0%
Monitor	0.00	100.0%	0.5	0.0%
<b>Program Total</b>	<b>0.01</b>	<b>128.4%</b>	<b>0.5</b>	<b>0.0%</b>

**Table 243: Upstream Electronics Initiative Demand Gross Realization Rates for WPP**

Stratum	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
TV	0.01	79.5%	0.5	0.0%
Imaging	0.01	182.0%	0.5	0.0%
Computer	0.00	100.0%	0.5	0.0%
Monitor	0.00	100.0%	0.5	0.0%
<b>Program Total</b>	<b>0.03</b>	<b>124.0%</b>	<b>0.5</b>	<b>0.0%</b>

## J.2 NET IMPACT EVALUATION

### J.2.1 Net Impact Evaluation Methodology

Tetra Tech conducted a net impact evaluation for the upstream electronics program in PY10. Due to the small size of the program, the general population survey cannot net enough participants for a meaningful participant survey (the program component accounts for about 1% of the energy savings for its parent program, Energy Efficient Products). The program has 11 participating retailers between all four PA Companies. Of those 11 retailers, five responded to the net impact evaluation survey, but only three were able to fully complete the survey, making for a response rate of 27%. Retailers reported that the incentive did not affect their sales of

ENERGY STAR® equipment and that the program influenced their sales through marketing signage and sales staff education. The average net-to-gross ratio from the three respondents, 58%, was applied for calculation of portfolio-level net verified impacts and for net-level TRC calculations for each EDC.

# Appendix K 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 programmable thermostat, or replace an existing furnace fan with a new high-efficiency one. Enhanced rebates are provided for CEE tier 2 and tier 3 HVAC systems.

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

## K.1 GROSS IMPACT EVALUATION

### K.1.1 Gross Impact Evaluation Methodology

Each component of gross impact evaluation is described below.

#### Mini-Splits

Ductless mini-splits (ACs and heat pumps) were also looked up on AHRI similar to the other HVAC system types, 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 TRM default value was used for CF. The baseline system type was determined from participant surveys. Several response fields were taken into account 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 or ducted mini-split (both have SEER<sub>base</sub> = 14 and HSPF<sub>base</sub> = 8.2). Baseline efficiencies were taken from TRM table 2-21 according to the type of baseline system.

#### Thermostats

Programmable thermostats were classified by the features they possess according to the IMP: conventional programmable, basic smart, or advanced smart. The corresponding features are: programmable schedule, remote access, and occupancy sensing. These features were looked up on manufacturer websites and compiled into a database. For each sampled thermostat measure, the IMP classification was looked up in the database based on its features. The IMP classification was used to determine the Energy Saving Factors (ESF<sub>cool</sub> and ESF<sub>heat</sub>) used in the IMP algorithm. The baseline thermostat was determined based on the rebate application. In cases where the existing thermostat was broken or non-existing, a manual baseline was assumed.

#### Furnace Fans



High-efficiency furnace fan energy savings relied on the deemed values in the TRM. ADM used the results of participant surveys to determine the verification rate.

#### 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.

#### PTACs and PTHPs

As there were only a handful of PTACs and PTHPs reported across all four EDCs, ADM elected to pass these measures through the evaluation process with no activity.

Table 244 lists the data sources for gross impact calculation algorithms.

**Table 244: 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 # (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
Programmable Thermostats	Install Type	Application Review
Programmable Thermostats	Thermostat Type	Application Review
Programmable Thermostats	Heating System Type	Application Review
Programmable Thermostats	Cooling System Type	Application Review
Programmable Thermostats	Baseline Thermostat Type	Application Review

#### K.1.1.1 Determination of Verification Rate

ADM performed 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 HVAC measures. The verification rates are used to inform measure-level realization rates.

#### K.1.1.2 Invoice and Application Review

ADM obtained invoices and applications from Honeywell. 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. 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, straightforward manual correction of the make or model numbers results in positive identification of the involved equipment in the supporting databases.

#### K.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 were taken from TRM table 2-12 based on the reported zip code or zip code obtained through participant surveys if the reported zip code was overridden by the respondent. The TRM default value was used for CF. Baseline efficiencies were taken as TRM defaults assuming a replace on burnout scenario rather than early retirement<sup>20</sup>.

##### *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 were determined through zip code lookups as provided in the T&R data or with zip codes from survey data if overridden by respondents. The TRM default value for CF was used. 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 kBtu/h, 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 3-36. In these cases, the replace on burnout scenario assumes  $kWh_{pump}$  and  $kW_{pump}$  for the baseline ASHP are zero.

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<sup>20</sup> 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.

### *Mini-Splits*

Ductless mini-splits (ACs and heat pumps) were also looked up on AHRI similar to the other HVAC system types, 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 TRM default value was used for CF. The baseline system type was determined from participant surveys. Several response fields were taken into account 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 or *ducted* mini-split (both have  $SEER_{base} = 14$  and  $HSPF_{base} = 8.2$ ). Baseline efficiencies were taken from TRM table 2-21 according to the type of baseline system.

### *Thermostats*

Programmable thermostats were classified by the features they possess according to the IMP: conventional programmable, basic smart, or advanced smart. The corresponding features are: programmable schedule, remote access, and occupancy sensing. These features were looked up on manufacturer websites and compiled into a database. For each sampled thermostat measure, the IMP classification was looked up in the database based on its features. The IMP classification was used to determine the Energy Saving Factors ( $ESF_{cool}$  and  $ESF_{heat}$ ) used in the IMP algorithm. The baseline thermostat was determined based on the rebate application. In cases where the existing thermostat was broken or non-existing, a manual baseline was assumed.

### *Furnace Fans*

High-efficiency furnace fan energy savings relied on the deemed values in the TRM. ADM used the results of participant surveys to determine the verification rate.

### *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.

### *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.

## **K.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 245, Table 246, Table 247, and Table 248.

**Table 245: Res HVAC Initiative Gross Impact Sample Design for Met-Ed**

Stratum	Population Size	Achieved Sample Size (Survey)	Achieved Sample Size (Desk Review)
ASHP	529	23	20
Mini-Split HP	487	21	19
GSHP	56	5	6
CAC	226	13	8
Furnace Fan	966	26	20
Thermostat	1,378	24	26
HVAC Tune-Up	172	13	10
PTAC	1	0	1
PTHP	0	0	0
<b>Program Total</b>	<b>3,815</b>	<b>125</b>	<b>110</b>

**Table 246: Res HVAC Initiative Gross Impact Sample Design for Penelec**

Stratum	Population Size	Achieved Sample Size (Survey)	Achieved Sample Size (Desk Review)
ASHP	153	11	9
Mini-Split HP	684	27	19
GSHP	27	8	5
CAC	29	5	2
Furnace Fan	683	22	17
Thermostat	827	28	30
HVAC Tune-Up	212	13	9
PTAC	0	0	0
PTHP	1	0	0
<b>Program Total</b>	<b>2,615</b>	<b>114</b>	<b>91</b>

**Table 247: Res HVAC Initiative Gross Impact Sample Design for Penn Power**

Stratum	Population Size	Achieved Sample Size (Survey)	Achieved Sample Size (Desk Review)
ASHP	78	14	12
Mini-Split HP	77	8	3
GSHP	20	0	5
CAC	12	1	2
Furnace Fan	492	22	19
Thermostat	521	17	22
HVAC Tune-Up	56	6	8
PTAC	0	0	0
PTHP	1	0	0
<b>Program Total</b>	<b>1,256</b>	<b>68</b>	<b>71</b>

**Table 248: Res HVAC Initiative Gross Impact Sample Design for WPP**

Stratum	Population Size	Achieved Sample Size (Survey)	Achieved Sample Size (Desk Review)
ASHP	584	23	10
Mini-Split HP	586	22	14
GSHP	51	9	6
CAC	117	11	5
Furnace Fan	1,356	43	22
Thermostat	1,761	28	29
HVAC Tune-Up	940	17	12
PTAC	0	0	0
PTHP	0	0	0
<b>Program Total</b>	<b>5,395</b>	<b>153</b>	<b>98</b>

**K.1.3 Results for Energy**

The gross realization rates for energy, along with relative precisions, are shown in Table 249, Table 250, Table 251, and Table 252 for Met-Ed, Penelec, Penn Power, and WPP respectively.

**Table 249: Res HVAC Initiative Energy Gross Realization Rates for Met-Ed**

Stratum	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
ASHP	410	119.5%	0.5	10.5%
Mini-Split HP	406	243.8%	0.5	10.9%
GSHP	89	166.7%	0.5	19.5%
CAC	53	131.6%	0.5	15.0%
Furnace Fan	431	96.2%	0.5	10.4%
Thermostat	83	408.7%	0.5	10.0%
HVAC Tune-Up	30	101.7%	0.5	14.0%
PTAC	0	77.6%	0.5	0.0%
PTHP	0	100.0%	0.5	100.0%
<b>Program Total</b>	<b>1,500</b>	<b>165.2%</b>	<b>0.5</b>	<b>5.4%</b>

**Table 250: Res HVAC Initiative Energy Gross Realization Rates for Penelec**

Stratum	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
ASHP	136	121.1%	0.5	15.0%
Mini-Split HP	570	259.2%	0.5	10.3%
GSHP	43	177.6%	0.5	14.4%
CAC	7	93.5%	0.5	23.7%
Furnace Fan	305	100.0%	0.5	11.2%
Thermostat	50	281.3%	0.5	9.1%
HVAC Tune-Up	37	54.0%	0.5	14.5%
PTAC	0	100.0%	0.5	100.0%
PTHP	0	100.0%	0.5	100.0%
<b>Program Total</b>	<b>1,147</b>	<b>190.9%</b>	<b>0.5</b>	<b>7.2%</b>

**Table 251: Res HVAC Initiative Energy Gross Realization Rates for Penn Power**

Stratum	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
ASHP	68	143.7%	0.5	11.5%
Mini-Split HP	64	669.3%	0.5	20.1%
GSHP	32	172.2%	0.5	27.9%
CAC	3	147.8%	0.5	36.0%
Furnace Fan	219	100.0%	0.5	10.8%
Thermostat	31	283.8%	0.5	11.1%
HVAC Tune-Up	10	112.1%	0.5	16.7%
PTAC	0	100.0%	0.5	100.0%
PTHP	0	100.0%	0.5	100.0%
<b>Program Total</b>	<b>427</b>	<b>211.8%</b>	<b>0.5</b>	<b>10.2%</b>

**Table 252: Res HVAC Initiative Energy Gross Realization Rates for WPP**

Stratum	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
ASHP	480	114.5%	0.5	12.2%
Mini-Split HP	488	240.5%	0.5	11.6%
GSHP	81	180.9%	0.5	15.6%
CAC	29	91.7%	0.5	16.7%
Furnace Fan	605	100.0%	0.5	8.7%
Thermostat	106	271.3%	0.5	9.4%
HVAC Tune-Up	162	45.1%	0.5	13.2%
PTAC	0	100.0%	0.5	100.0%
PTHP	0	100.0%	0.5	100.0%
<b>Program Total</b>	<b>1,951</b>	<b>146.7%</b>	<b>0.5</b>	<b>5.8%</b>

**K.1.4 Results for Demand**

The gross realization rates for demand, 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 HVAC Initiative Demand Gross Realization Rates for Met-Ed**

Stratum	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
ASHP	0.10	171.9%	0.5	10.5%
Mini-Split HP	0.16	57.6%	0.5	10.9%
GSHP	0.01	340.3%	0.5	19.5%
CAC	0.04	232.7%	0.5	15.0%
Furnace Fan	0.10	96.2%	0.5	10.4%
Thermostat	0.00	100.0%	0.5	10.0%
HVAC Tune-Up	0.02	104.7%	0.5	14.0%
PTAC	0.00	100.0%	0.5	100.0%
PTHP	0.00	100.0%	0.5	5.4%
<b>Program Total</b>	<b>0.44</b>	<b>120.4%</b>	<b>0.5</b>	<b>5.5%</b>

**Table 254: Res HVAC Initiative Demand Gross Realization Rates for Penelec**

Stratum	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
ASHP	0.03	204.2%	0.5	15.0%
Mini-Split HP	0.23	33.6%	0.5	10.3%
GSHP	0.01	404.4%	0.5	14.4%
CAC	0.01	193.9%	0.5	23.7%
Furnace Fan	0.07	100.0%	0.5	11.2%
Thermostat	0.00	100.0%	0.5	9.1%
HVAC Tune-Up	0.02	94.8%	0.5	14.5%
PTAC	0.00	100.0%	0.5	100.0%
PTHP	0.00	100.0%	0.5	7.2%
<b>Program Total</b>	<b>0.37</b>	<b>73.6%</b>	<b>0.5</b>	<b>5.8%</b>

**Table 255: Res HVAC Initiative Gross Realization Rates for Penn Power**

Stratum	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
ASHP	0.02	239.7%	0.5	11.5%
Mini-Split HP	0.03	166.3%	0.5	20.1%
GSHP	0.00	307.3%	0.5	27.9%
CAC	0.00	297.6%	0.5	36.0%
Furnace Fan	0.05	100.0%	0.5	10.8%
Thermostat	0.00	100.0%	0.5	11.1%
HVAC Tune-Up	0.01	127.3%	0.5	16.7%
PTAC	0.00	100.0%	0.5	100.0%
PTHP	0.00	100.0%	0.5	10.2%
<b>Program Total</b>	<b>0.11</b>	<b>152.2%</b>	<b>0.5</b>	<b>7.5%</b>

**Table 256: Res HVAC Initiative Demand Gross Realization Rates for WPP**

Stratum	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
ASHP	0.12	200.8%	0.5	12.2%
Mini-Split HP	0.20	100.8%	0.5	11.6%
GSHP	0.01	350.6%	0.5	15.6%
CAC	0.02	201.6%	0.5	16.7%
Furnace Fan	0.14	100.0%	0.5	8.7%
Thermostat	0.00	100.0%	0.5	9.4%
HVAC Tune-Up	0.11	97.0%	0.5	13.2%
PTAC	0.00	100.0%	0.5	100.0%
PTHP	0.00	100.0%	0.5	5.8%
<b>Program Total</b>	<b>0.60</b>	<b>128.2%</b>	<b>0.5</b>	<b>5.5%</b>



## K.2 NET IMPACT EVALUATION

### K.2.1 Net Impact Evaluation Methodology

The net-to-gross evaluation for the downstream HVAC measures, conducted in PY8 and PY11, was based on self-report data from program participants. This followed the self-report methodologies for free-ridership and spillover from the PA Evaluation Framework. Participants were randomly sampled since the savings for these sub-programs are relatively small and do not qualify for the higher level of rigor of high-impact measures. Individual free-ridership and spillover rates from the participant survey were weighted to adjust for sampling differences, non-response, and claimed energy savings to calculate overall estimates.

Overall NTG ratios were slightly lower than those determined in the Phase II evaluation, as customers reported higher levels of free ridership.

### K.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 257, Table 258, Table 259, and Table 260 for Met-Ed, Penelec, Penn Power, and WPP respectively. The achieved sample sizes and response rates are from the PY11 NTG effort.

**Table 257: 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 258: 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 259: 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 260: 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%

### K.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 261, Table 262, Table 263, and Table 264 for Met-Ed, Penelec, Penn Power, and WPP respectively.

**Table 261: Res HVAC Initiative Net-to-Gross Results for Met-Ed**

Stratum	PYVTD MWh	Free Ridership (%)	Spillover (%)	NTG Ratio	Relative Precision (@ 85% CL)
All Rebates	2,479	50.4%	1.1%	50.7%	12.7%
<b>Program Total</b>	<b>2,479</b>	<b>50.4%</b>	<b>1.1%</b>	<b>50.7%</b>	<b>12.7%</b>

**Table 262: Res HVAC Initiative Net-to-Gross Results for Penelec**

Stratum	PYVTD MWh	Free Ridership (%)	Spillover (%)	NTG Ratio	Relative Precision (@ 85% CL)
All Rebates	2,188	48.6%	0.9%	52.3%	12.2%
<b>Program Total</b>	<b>2,188</b>	<b>48.6%</b>	<b>0.9%</b>	<b>52.3%</b>	<b>12.2%</b>

**Table 263 Res HVAC Initiative Net-to-Gross Results for Penn Power**

Stratum	PYVTD MWh	Free Ridership (%)	Spillover (%)	NTG Ratio	Relative Precision (@ 85% CL)
All Rebates	905	52.8%	7.6%	54.8%	13.0%
<b>Program Total</b>	<b>905</b>	<b>52.8%</b>	<b>7.6%</b>	<b>54.8%</b>	<b>13.0%</b>

**Table 264 Res HVAC Initiative Net-to-Gross Results for WPP**

Stratum	PYVTD MWh	Free Ridership (%)	Spillover (%)	NTG Ratio	Relative Precision (@ 85% CL)
All Rebates	2,861	48.3%	0.3%	52.0%	13.7%
<b>Program Total</b>	<b>2,861</b>	<b>48.3%</b>	<b>0.3%</b>	<b>52.0%</b>	<b>13.7%</b>

# Appendix L Evaluation Detail – Residential Appliances and LI Residential Appliances Initiatives

Residential Appliances and LI Appliances are two separate initiatives in ADM's PY8 evaluation plan. While the program process is the same between the two, the measures and rebate levels differ. Refrigerators, Freezers, Clothes Washers, Clothes Dryers, and Dehumidifiers are rebated under both initiatives, but under the LI Appliance initiative, the rebates are increased by \$25. Income eligibility is attested to by the customer on the rebate application by providing "Number of Household Residents" and "Gross Household Income". Heat Pump Water Heaters are rebated under the Residential Appliances initiative, but not under the LI Appliances initiative. Enhanced rebates are available to the Residential Appliance initiative participants for purchasing a CEE Tier 2 or Tier 3 Refrigerator.

In PY10, Midstream Appliance rebates were introduced. Only Heat Pump Water Heaters and Dehumidifiers are rebated. Dehumidifier rebate levels are the same as downstream, but Heat Pump Water Heater rebates are fixed at \$500. Rebates are paid to retailers for point-of-sale discounts on the purchase price. Residential customers do not file rebate applications; instead, retailers invoice for rebates with point-of-sale data files as supporting documentation.

Midstream Appliance measures are included in the Residential Appliances initiative by default. A channel is available, however, for residential customers to call in and apply for an additional rebate by attesting to meeting income eligibility requirements. These measures, which are naturally all Dehumidifiers in PY10, are included in the LI Residential Appliances initiative.

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.

Gross impact evaluation activities are identical for the two initiatives. Separate survey samples were maintained in PY8 to assess whether demographic differences would affect the realization rates for the measures. No significant differences were found, however. The PY8 report discussed the possibility of combining the two groups into the same initiative. We have opted to maintain separate samples for the Res LI appliance rebates. Although it is not required to evaluate this Initiative each year, we opt to maintain a small sample each year to retain the ability to provide timely feedback if evaluation issues arise.

## L.1 GROSS IMPACT EVALUATION

### L.1.1 Gross Impact Evaluation Methodology

Each component of gross impact is described below.

#### L.1.1.1 Verification Surveys

For downstream measures, 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.

Midstream appliances were not sampled for customer verification surveys. Instead, verification rates were developed using the supporting documentation for each retailer invoice. The ratio of invoiced quantities to reported quantities was calculated for each measure. In PY12, Verification Rates were 100% for all measures across all four EDCs for Midstream Appliance measures.

#### L.1.1.2 Invoice and Application Review

For downstream appliances, ADM obtained invoices and applications from Honeywell. 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, straightforward manual correction of the make or model numbers results in positive identification of the involved equipment in the supporting databases.

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.

#### L.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. 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. Both downstream and midstream measure impacts were calculated in this way.

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 following provide additional details into the calculation review procedure.

Table 265 lists the data sources for gross impact calculation algorithms.

**Table 265: Data Sources for the Res Appliances Initiative Gross Impact Evaluation**

Measure	TRM Parameter	Data Source
Downstream	Verification Rate	Participant Surveys
Midstream	Verification Rate	Retailer Invoices
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	IMEF_ee	Energy Star Database
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	CEF_ee	Energy Star Database
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	Product Class	Energy Star Database
Refrigerator	Adjusted Volume	Energy Star Database
Freezer	Product Class	Energy Star Database
Freezer	Adjusted Volume	Energy Star Database
Dehumidifier	HOU / CF	TRM Default
Dehumidifier	L/kWh_base / L/kWh_ee	TRM - Capacity Lookup
HPWH	EF_base	TRM - Capacity Lookup
HPWH	EF_ee	Energy Star Database
HPWH	F_derate	TRM Default
HPWH	HW	TRM Default
HPWH	T_hot / T_cold	TRM Default

The gross realization rates for energy savings were driven primarily by the reported energy savings in the tracking and reporting system. In general, the reported energy and demand impacts are calculated with conservative assumptions of market-average efficiencies and capacities.

### 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 266, Table 267, Table 268, and Table 269.

**Table 266: Res Appliances Initiative Gross Impact Sample Design for Met-Ed**

Stratum	Population Size	Achieved Sample Size (Survey)	Achieved Sample Size (Desk Review)
Heat Pump Water Heater	113	16	11
Heat Pump Water Heater - Midstream	455	0	455
Clothes Washer	984	22	36
Dehumidifier	356	25	9
Dehumidifier - Midstream	5,401	0	5,401
Refrigerator	1,012	35	20
Clothes Dryer	542	23	32
Freezer	87	10	7
<b>Program Total</b>	<b>8,950</b>	<b>131</b>	<b>5,971</b>

**Table 267: Res Appliances Initiative Gross Impact Sample Design for Penelec**

Stratum	Population Size	Achieved Sample Size (Survey)	Achieved Sample Size (Desk Review)
Heat Pump Water Heater	59	7	8
Heat Pump Water Heater - Midstream	241	0	241
Clothes Washer	541	20	19
Dehumidifier	425	31	6
Dehumidifier - Midstream	5,762	0	5,762
Refrigerator	702	35	27
Clothes Dryer	246	10	12
Freezer	50	4	5
<b>Program Total</b>	<b>8,026</b>	<b>107</b>	<b>6,080</b>

**Table 268: Res Appliances Initiative Gross Impact Sample Design for Penn Power**

Stratum	Population Size	Achieved Sample Size (Survey)	Achieved Sample Size (Desk Review)
Heat Pump Water Heater	3	1	0
Heat Pump Water Heater - Midstream	136	0	136
Clothes Washer	234	13	20
Dehumidifier	122	9	9
Dehumidifier - Midstream	1,866	0	1,866
Refrigerator	300	14	15
Clothes Dryer	128	7	12
Freezer	23	1	3
<b>Program Total</b>	<b>2,812</b>	<b>45</b>	<b>2,061</b>

**Table 269: Res Appliances Initiative Gross Impact Sample Design for WPP**

Stratum	Population Size	Achieved Sample Size (Survey)	Achieved Sample Size (Desk Review)
Heat Pump Water Heater	87	17	9
Heat Pump Water Heater - Midstream	322	0	322
Clothes Washer	867	29	30
Dehumidifier	482	24	16
Dehumidifier - Midstream	5,845	0	5,845
Refrigerator	1,033	28	16
Clothes Dryer	466	26	22
Freezer	110	12	12
<b>Program Total</b>	<b>9,212</b>	<b>136</b>	<b>6,272</b>

The sample designs for the Res LI Appliance Initiative are shown in Table 270, Table 271, Table 272, and Table 273.

**Table 270: Res LI Appliances Initiative Gross Impact Sample Design for Met-Ed**

Stratum	Population Size	Achieved Sample Size (Survey)	Achieved Sample Size (Desk Review)
Clothes Washer	102	10	12
Dehumidifier	22	2	6
Refrigerator	93	6	8
Clothes Dryer	48	2	6
Freezer	4	1	2
<b>Program Total</b>	<b>269</b>	<b>21</b>	<b>34</b>

**Table 271: Res LI Appliances Initiative Gross Impact Sample Design for Penelec**

Stratum	Population Size	Achieved Sample Size (Survey)	Achieved Sample Size (Desk Review)
Clothes Washer	111	8	11
Dehumidifier	47	9	6
Refrigerator	100	12	10
Clothes Dryer	62	6	5
Freezer	14	2	4
<b>Program Total</b>	<b>334</b>	<b>37</b>	<b>36</b>

**Table 272: Res LI Appliances Initiative Gross Impact Sample Design for Penn Power**

Stratum	Population Size	Achieved Sample Size (Survey)	Achieved Sample Size (Desk Review)
Clothes Washer	30	8	3
Dehumidifier	17	7	2
Refrigerator	34	11	6
Clothes Dryer	18	5	4
Freezer	4	0	1
<b>Program Total</b>	<b>103</b>	<b>31</b>	<b>16</b>

**Table 273: Res LI Appliances Initiative Gross Impact Sample Design for WPP**

Stratum	Population Size	Achieved Sample Size (Survey)	Achieved Sample Size (Desk Review)
Clothes Washer	101	8	10
Dehumidifier	40	7	10
Refrigerator	109	8	9
Clothes Dryer	47	3	6
Freezer	8	1	1
<b>Program Total</b>	<b>305</b>	<b>27</b>	<b>36</b>

### L.1.3 Results for Energy

The gross realization rates for energy, along with relative precisions, are shown in Table 274, Table 275, Table 276, and Table 277 for Met-Ed, Penelec, Penn Power, and WPP respectively. In general, gross realization rates were far above 100% for both energy and demand. The primary reason for the high realization rates are generally conservative ex ante values for clothes washers (93 kWh per unit) and heat pump water heaters (1,389 kWh per unit).

**Table 274: Res Appliances Initiative Energy Gross Realization Rates for Met-Ed**

Stratum	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
Heat Pump Water Heater	157	144.4%	0.5	20.6%
Heat Pump Water Heater - Midstream	632	150.5%	0.5	0.0%
Clothes Washer	91	173.6%	0.5	11.8%
Dehumidifier	50	111.7%	0.5	23.7%
Dehumidifier - Midstream	753	141.7%	0.5	0.0%
Refrigerator	67	91.0%	0.5	15.9%
Clothes Dryer	14	109.8%	0.5	12.3%
Freezer	2	170.4%	0.5	26.1%
<b>Program Total</b>	<b>1,766</b>	<b>143.8%</b>	<b>0.5</b>	<b>2.1%</b>



**Table 275: Res Appliances Initiative Energy Gross Realization Rates for Penelec**

Stratum	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
Heat Pump Water Heater	82	149.6%	0.5	23.7%
Heat Pump Water Heater - Midstream	335	149.2%	0.5	0.0%
Clothes Washer	50	174.5%	0.5	16.2%
Dehumidifier	59	101.4%	0.5	29.2%
Dehumidifier - Midstream	803	146.0%	0.5	0.0%
Refrigerator	47	89.8%	0.5	13.6%
Clothes Dryer	6	112.8%	0.5	20.3%
Freezer	1	148.7%	0.5	30.5%
<b>Program Total</b>	<b>1,383</b>	<b>144.1%</b>	<b>0.5</b>	<b>1.9%</b>

**Table 276: Res Appliances Initiative Energy Gross Realization Rates for Penn Power**

Stratum	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
Heat Pump Water Heater	4	100.0%	0.5	100.0%
Heat Pump Water Heater - Midstream	189	151.4%	0.5	0.0%
Clothes Washer	22	180.0%	0.5	15.4%
Dehumidifier	17	105.9%	0.5	23.1%
Dehumidifier - Midstream	260	142.3%	0.5	0.0%
Refrigerator	20	100.0%	0.5	18.1%
Clothes Dryer	3	102.4%	0.5	19.8%
Freezer	1	0.0%	0.5	38.8%
<b>Program Total</b>	<b>516</b>	<b>143.6%</b>	<b>0.5</b>	<b>1.2%</b>

**Table 277: Res Appliances Initiative Energy Gross Realization Rates for WPP**

Stratum	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
Heat Pump Water Heater	121	147.9%	0.5	22.7%
Heat Pump Water Heater - Midstream	447	150.0%	0.5	0.0%
Clothes Washer	80	179.3%	0.5	12.9%
Dehumidifier	67	113.0%	0.5	17.7%
Dehumidifier - Midstream	815	146.0%	0.5	0.0%
Refrigerator	69	93.3%	0.5	17.9%
Clothes Dryer	12	112.1%	0.5	15.0%
Freezer	3	160.7%	0.5	19.6%
<b>Program Total</b>	<b>1,614</b>	<b>145.1%</b>	<b>0.5</b>	<b>2.1%</b>

The gross realization rates for energy and relative precisions for the Res LI Appliances Initiative are shown in Table 278, Table 279, Table 280, and Table 281 for Met-Ed, Penelec, Penn Power, and WPP respectively.

**Table 278: Res LI Appliances Initiative Energy Gross Realization Rates for Met-Ed**

Stratum	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
Clothes Washer	9.5	157.0%	0.5	19.5%
Dehumidifier	3.1	110.7%	0.5	25.1%
Refrigerator	6.1	94.9%	0.5	24.3%
Clothes Dryer	1.2	92.0%	0.5	27.5%
Freezer	0.1	146.6%	0.5	36.0%
<b>Program Total</b>	<b>20</b>	<b>127.0%</b>	<b>0.5</b>	<b>13.2%</b>

**Table 279: Res LI Appliances Initiative Energy Gross Realization Rates for Penelec**

Stratum	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
Clothes Washer	10	151.5%	0.5	20.6%
Dehumidifier	7	132.7%	0.5	27.5%
Refrigerator	7	94.4%	0.5	21.6%
Clothes Dryer	2	111.4%	0.5	30.9%
Freezer	0	158.8%	0.5	30.4%
<b>Program Total</b>	<b>25</b>	<b>129.5%</b>	<b>0.5</b>	<b>13.0%</b>

**Table 280: Res LI Appliances Initiative Energy Gross Realization Rates for Penn Power**

Stratum	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
Clothes Washer	3	190.1%	0.5	39.4%
Dehumidifier	2	118.4%	0.5	47.8%
Refrigerator	2	92.0%	0.5	26.7%
Clothes Dryer	0	113.2%	0.5	31.7%
Freezer	0	103.9%	0.5	62.4%
<b>Program Total</b>	<b>8</b>	<b>135.8%</b>	<b>0.5</b>	<b>23.7%</b>

**Table 281: Res LI Appliances Initiative Energy Gross Realization Rates for WPP**

Stratum	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
Clothes Washer	9	170.3%	0.5	21.6%
Dehumidifier	6	98.8%	0.5	19.7%
Refrigerator	7	91.6%	0.5	23.0%
Clothes Dryer	1	111.9%	0.5	27.5%
Freezer	0	209.9%	0.5	67.3%
<b>Program Total</b>	<b>23</b>	<b>126.8%</b>	<b>0.5</b>	<b>13.3%</b>

**L.1.4 Results for Demand**

The gross realization rates for demand, along with relative precisions, are shown in Table 282, Table 283, Table 284, and Table 285 for Met-Ed, Penelec, Penn Power, and WPP respectively.

**Table 282: Res Appliances Initiative Demand Gross Realization Rates for Met-Ed**

Stratum	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
Heat Pump Water Heater	0.01	167.0%	0.5	20.6%
Heat Pump Water Heater - Midstream	0.04	174.0%	0.5	0.0%
Clothes Washer	0.01	167.2%	0.5	11.8%
Dehumidifier	0.01	111.7%	0.5	23.7%
Dehumidifier - Midstream	0.19	141.7%	0.5	0.0%
Refrigerator	0.01	85.5%	0.5	15.9%
Clothes Dryer	0.00	102.2%	0.5	12.3%
Freezer	0.00	168.5%	0.5	26.1%
<b>Program Total</b>	<b>0.28</b>	<b>145.5%</b>	<b>0.5</b>	<b>1.4%</b>

**Table 283: Res Appliances Initiative Demand Gross Realization Rates for Penelec**

Stratum	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
Heat Pump Water Heater	0.01	173.0%	0.5	23.7%
Heat Pump Water Heater - Midstream	0.02	172.4%	0.5	0.0%
Clothes Washer	0.01	168.0%	0.5	16.2%
Dehumidifier	0.01	101.4%	0.5	29.2%
Dehumidifier - Midstream	0.20	146.0%	0.5	0.0%
Refrigerator	0.01	84.5%	0.5	13.6%
Clothes Dryer	0.00	104.1%	0.5	20.3%
Freezer	0.00	147.0%	0.5	30.5%
<b>Program Total</b>	<b>0.26</b>	<b>145.4%</b>	<b>0.5</b>	<b>1.4%</b>

**Table 284: Res Appliances Initiative Gross Realization Rates for Penn Power**

Stratum	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
Heat Pump Water Heater	0.00	100.0%	0.5	100.0%
Heat Pump Water Heater - Midstream	0.01	175.1%	0.5	0.0%
Clothes Washer	0.00	173.3%	0.5	15.4%
Dehumidifier	0.00	105.9%	0.5	23.1%
Dehumidifier - Midstream	0.06	142.3%	0.5	0.0%
Refrigerator	0.00	94.1%	0.5	18.1%
Clothes Dryer	0.00	94.5%	0.5	19.8%
Freezer	0.00	0.0%	0.5	38.8%
<b>Program Total</b>	<b>0.09</b>	<b>144.4%</b>	<b>0.5</b>	<b>1.0%</b>

**Table 285: Res Appliances Initiative Demand Gross Realization Rates for WPP**

Stratum	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
Heat Pump Water Heater	0.01	171.0%	0.5	22.7%
Heat Pump Water Heater - Midstream	0.03	173.4%	0.5	0.0%
Clothes Washer	0.01	172.7%	0.5	12.9%
Dehumidifier	0.02	113.0%	0.5	17.7%
Dehumidifier - Midstream	0.20	146.1%	0.5	0.0%
Refrigerator	0.01	87.7%	0.5	17.9%
Clothes Dryer	0.00	103.5%	0.5	15.0%
Freezer	0.00	158.9%	0.5	19.6%
<b>Program Total</b>	<b>0.28</b>	<b>146.7%</b>	<b>0.5</b>	<b>1.3%</b>

The gross realization rates for demand and relative precisions for the Res LI Appliances Initiative are shown in Table 282, Table 283, Table 284, and Table 285 for Met-Ed, Penelec, Penn Power, and WPP respectively.

**Table 286: Res LI Appliances Initiative Demand Gross Realization Rates for Met-Ed**

Stratum	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
Clothes Washer	0.00	151.2%	0.5	19.5%
Dehumidifier	0.00	110.7%	0.5	25.1%
Refrigerator	0.00	89.2%	0.5	24.3%
Clothes Dryer	0.00	84.9%	0.5	27.5%
Freezer	0.00	144.9%	0.5	36.0%
<b>Program Total</b>	<b>0.00</b>	<b>118.5%</b>	<b>0.5</b>	<b>12.5%</b>

**Table 287: Res LI Appliances Initiative Demand Gross Realization Rates for Penelec**

Stratum	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
Clothes Washer	0.00	145.9%	0.5	20.6%
Dehumidifier	0.00	132.7%	0.5	27.5%
Refrigerator	0.00	88.8%	0.5	21.6%
Clothes Dryer	0.00	102.8%	0.5	30.9%
Freezer	0.00	157.0%	0.5	30.4%
<b>Program Total</b>	<b>0.00</b>	<b>125.8%</b>	<b>0.5</b>	<b>14.5%</b>

**Table 288: Res LI Appliances Initiative Gross Realization Rates for Penn Power**

Stratum	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
Clothes Washer	0.00	183.0%	0.5	39.4%
Dehumidifier	0.00	118.4%	0.5	47.8%
Refrigerator	0.00	86.5%	0.5	26.7%
Clothes Dryer	0.00	104.5%	0.5	31.7%
Freezer	0.00	102.8%	0.5	62.4%
<b>Program Total</b>	<b>0.00</b>	<b>126.5%</b>	<b>0.5</b>	<b>25.5%</b>

**Table 289: Res LI Appliances Initiative Demand Gross Realization Rates for WPP**

Stratum	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
Clothes Washer	0.00	163.9%	0.5	21.6%
Dehumidifier	0.00	98.8%	0.5	19.7%
Refrigerator	0.00	86.2%	0.5	23.0%
Clothes Dryer	0.00	103.3%	0.5	27.5%
Freezer	0.00	207.5%	0.5	67.3%
<b>Program Total</b>	<b>0.00</b>	<b>116.0%</b>	<b>0.5</b>	<b>12.1%</b>

## L.2 NET IMPACT EVALUATION

### L.2.1 Net Impact Evaluation Methodology

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. This followed the self-report methodologies for free-ridership and spillover from the PA Evaluation Framework. Participants were randomly sampled since the savings for these sub-programs are relatively small and do not qualify for the higher level of rigor of high-impact measures. Individual free-ridership and spillover rates from the participant survey were weighted to adjust for sampling differences, non-response, and claimed energy savings to calculate overall estimates.

Overall NTG ratios were slightly lower than those found in the Phase II evaluation, as customers reported lower amounts of spillover. A net impact evaluation was not conducted for the Low-Income Appliances Initiative. An NTG ratio of 100% is used for reporting of net impacts and for cost effectiveness testing for the Low-Income Appliances Initiative.

### L.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 290, Table 291, Table 292, and Table 293 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 290: 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%
<b>Program Total</b>	<b>5,858</b>	<b>72</b>	<b>26.6%</b>

**Table 291: Res Appliances Initiative Net-to-Gross Sampling for Penelec**

Stratum	Population Size	Achieved Sample Size	Response Rate
All Rebates	4,207	70	26.3%
<b>Program Total</b>	<b>4,207</b>	<b>70</b>	<b>26.3%</b>

**Table 292: 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%
<b>Program Total</b>	<b>2,103</b>	<b>76</b>	<b>29.1%</b>

**Table 293: Res Appliances Initiative Net-to-Gross Sampling for WPP**

Stratum	Population Size	Achieved Sample Size	Response Rate
All Rebates	5,997	74	26.9%
<b>Program Total</b>	<b>5,997</b>	<b>74</b>	<b>26.9%</b>

**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 294, Table 295, Table 296, and Table 297 for Met-Ed, Penelec, Penn Power, and WPP.

**Table 294: Res Appliances Initiative Net-to-Gross Results for Met-Ed**

Stratum	PYVTD MWh	Free Ridership (%)	Spillover (%)	NTG Ratio	Relative Precision (@ 85% CL)
All Rebates	2,539	52.8%	3.0%	50.2%	12.7%
<b>Program Total</b>	<b>2,539</b>	<b>52.8%</b>	<b>3.0%</b>	<b>50.2%</b>	<b>12.7%</b>

**Table 295: Res Appliances Initiative Net-to-Gross Results for Penelec**

Stratum	PYVTD MWh	Free Ridership (%)	Spillover (%)	NTG Ratio	Relative Precision (@ 85% CL)
All Rebates	1,993	46.9%	6.9%	60.0%	12.9%
<b>Program Total</b>	<b>1,993</b>	<b>46.9%</b>	<b>6.9%</b>	<b>60.0%</b>	<b>12.9%</b>

**Table 296: Res Appliances Initiative Net-to-Gross Results for Penn Power**

Stratum	PYVTD MWh	Free Ridership (%)	Spillover (%)	NTG Ratio	Relative Precision (@ 85% CL)
All Rebates	741	56.0%	12.2%	56.2%	12.4%
<b>Program Total</b>	<b>741</b>	<b>56.0%</b>	<b>12.2%</b>	<b>56.2%</b>	<b>12.4%</b>

**Table 297: Res Appliances Initiative Net-to-Gross Results for WPP**

Stratum	PYVTD MWh	Free Ridership (%)	Spillover (%)	NTG Ratio	Relative Precision (@ 85% CL)
All Rebates	2,342	49.2%	13.9%	64.7%	12.6%
<b>Program Total</b>	<b>2,342</b>	<b>49.2%</b>	<b>13.9%</b>	<b>64.7%</b>	<b>12.6%</b>

# Appendix M Evaluation Detail – Low-Income Residential Appliance Turn-In Initiative

## M.1 GROSS IMPACT EVALUATION

Gross impact evaluation for the Low-Income Appliance Turn-In (LI ATI) 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.

### M.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 298 lists the data sources for gross impact calculation algorithms.

**Table 298: 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	TRM Default
RAC	EER	TRM Default
RAC	RAC EFLH	TRM - Zip Code Lookup
RAC	CF	TRM Default
Dehumidifier	Capacity	IMP Default
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. Although verification rates determined through surveys were approximately 100%, the realization rates are generally lower than 100% because the part-use factors are lower than the TRM default values, and the calculated unit energy consumptions were lower than what would expect from application of default parameters in the TRM.

### 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 299, Table 300, Table 301, and Table 302. 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 Penn Power did not run this program in PY12.

**Table 299: LI ATI Initiative Gross Impact Sample Design for Met-Ed**

Stratum	Population Size	Achieved Sample Size	Evaluation Activity
Refrigerators	382	67	Survey (phone + online)
Freezers	51	6	
Dehumidifiers	19	1	
RACs	64	9	
<b>Program Total</b>	<b>516</b>	<b>83</b>	

**Table 300: LI ATI Initiative Gross Impact Sample Design for Penelec**

Stratum	Population Size	Achieved Sample Size	Evaluation Activity
Refrigerators	476	52	Survey (phone + online)
Freezers	68	11	
Dehumidifiers	22	4	
RACs	72	7	
<b>Program Total</b>	<b>638</b>	<b>74</b>	

**Table 301: LI ATI Initiative Gross Impact Sample Design for Penn Power**

Stratum	Population Size	Achieved Sample Size	Evaluation Activity
Refrigerators	0	0	Survey (phone + online)
Freezers	0	0	
Dehumidifiers	0	0	
RACs	0	0	
<b>Program Total</b>	<b>0</b>	<b>0</b>	

**Table 302: LI ATI Initiative Gross Impact Sample Design for WPP**

Stratum	Population Size	Achieved Sample Size	Evaluation Activity
Refrigerators	328	61	Survey (phone + online)
Freezers	59	13	
Dehumidifiers	10	2	
RACs	45	4	
<b>Program Total</b>	<b>442</b>	<b>80</b>	

**M.1.3 Results for Energy**

The gross realization rates for energy, along with relative precisions, are shown in Table 303, Table 304, Table 305, and Table 306 for Met-Ed, Penelec, Penn Power, and WPP respectively.

**Table 303: LI ATI Initiative Energy Gross Realization Rates for Met-Ed**

Stratum	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
Refrigerators	361	99.9%	0.5	8.8%
Freezers	35	63.3%	0.5	29.4%
Dehumidifiers	10	137.8%	0.5	72.0%
RACs	7	57.1%	0.5	24.0%
<b>Program Total</b>	<b>413</b>	<b>96.9%</b>	<b>0.5</b>	<b>8.2%</b>

**Table 304: LI ATI Initiative Energy Gross Realization Rates for Penelec**

Stratum	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
Refrigerators	504	96.6%	0.5	10.0%
Freezers	48	81.0%	0.5	21.7%
Dehumidifiers	10	111.9%	0.5	36.0%
RACs	8	70.6%	0.5	27.2%
<b>Program Total</b>	<b>570</b>	<b>95.2%</b>	<b>0.5</b>	<b>8.7%</b>

**Table 305: LI ATI Initiative Energy Gross Realization Rates for Penn Power**

Stratum	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
Refrigerators	0	100.0%	0.5	0.0%
Freezers	0	100.0%	0.5	0.0%
Dehumidifiers	0	100.0%	0.5	0.0%
RACs	0	100.0%	0.5	0.0%
<b>Program Total</b>	<b>0</b>	<b>100.0%</b>	<b>0.5</b>	<b>0.0%</b>

**Table 306: LI ATI Initiative Energy Gross Realization Rates for WPP**

Stratum	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
Refrigerators	336	93.8%	0.5	9.2%
Freezers	42	91.0%	0.5	20.0%
Dehumidifiers	5	74.2%	0.5	50.9%
RACs	5	63.9%	0.5	36.0%
<b>Program Total</b>	<b>388</b>	<b>92.8%</b>	<b>0.5</b>	<b>7.8%</b>

**M.1.4 Results for Demand**

The gross realization rates for demand, along with relative precisions, are shown in Table 307, Table 308, Table 309, and Table 310 for Met-Ed, Penelec, Penn Power, and WPP respectively.

**Table 307: LI ATI Initiative Demand Gross Realization Rates for Met-Ed**

Stratum	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
Refrigerators	0.04	99.9%	0.5	8.8%
Freezers	0.00	63.2%	0.5	29.4%
Dehumidifiers	0.00	143.1%	0.5	72.0%
RACs	0.02	47.7%	0.5	24.0%
<b>Program Total</b>	<b>0.06</b>	<b>85.1%</b>	<b>0.5</b>	<b>7.2%</b>

**Table 308: LI ATI Initiative Demand Gross Realization Rates for Penelec**

Stratum	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
Refrigerators	0.06	96.6%	0.5	10.0%
Freezers	0.01	81.0%	0.5	21.7%
Dehumidifiers	0.00	122.6%	0.5	36.0%
RACs	0.02	70.6%	0.5	27.2%
<b>Program Total</b>	<b>0.08</b>	<b>90.4%</b>	<b>0.5</b>	<b>8.1%</b>

**Table 309: LI ATI Initiative Gross Realization Rates for Penn Power**

Stratum	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
Refrigerators	0.00	100.0%	0.5	0.0%
Freezers	0.00	100.0%	0.5	0.0%
Dehumidifiers	0.00	100.0%	0.5	0.0%
RACs	0.00	100.0%	0.5	0.0%
<b>Program Total</b>	<b>0.00</b>	<b>100.0%</b>	<b>0.5</b>	<b>0.0%</b>

**Table 310: LI ATI Initiative Demand Gross Realization Rates for WPP**

Stratum	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
Refrigerators	0.04	93.8%	0.5	9.2%
Freezers	0.00	91.0%	0.5	20.0%
Dehumidifiers	0.00	81.9%	0.5	50.9%
RACs	0.01	62.2%	0.5	36.0%
<b>Program Total</b>	<b>0.06</b>	<b>86.6%</b>	<b>0.5</b>	<b>7.8%</b>

## M.2 NET IMPACT EVALUATION

### M.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 N 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.

## N.1 GROSS IMPACT EVALUATION

### N.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 2016 PA TRM for each measure type. The impact evaluation process is described below.

#### N.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.

#### N.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 turn-in 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 percentage of residences with a clothes washer stated in the 2014 SWE PA residential baseline study is used in the water heater temperature setback measure calculation. 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 2016 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 EFLHcool were found using the zip code lookup table to the projects reference city.

Residential air sealing measures used CFM50post and CFM50pre 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 2.2.4 of the 2016 PA TRM. The capacity of the RAC is given the measures equipment name. All RACs were assumed to have louvered sides. The CEERbase and CEERee 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<sup>21</sup>.

### N.1.1.3 Billing Based Verification of Electric Space Heat

The customer tracking data often times 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.

### N.1.2 Sampling

The sampling strategy for gross impact evaluation is summarized in Table 311, Table 312, Table 313, and Table 314 for Met-Ed, Penelec, Penn Power, and WPP respectively.

**Table 311: LI DI Initiative Gross Impact Sample Design for Met-Ed**

Stratum	MWh Threshold	Population Size	Achieved Sample Size	Evaluation Activity
High Savings	Appliances	414	55	TRM Analysis + On-Site Verification
Medium Savings	Lighting	596	16	
Low Savings	Other	805	30	
<b>Program Total</b>		<b>1,815</b>	<b>101</b>	

**Table 312: LI DI Initiative Gross Impact Sample Design for Penelec**

Stratum	MWh Threshold	Population Size	Achieved Sample Size	Evaluation Activity
High Savings	Appliances	340	35	TRM Analysis + On-Site Verification
Medium Savings	Lighting	460	13	
Low Savings	Other	657	20	
<b>Program Total</b>		<b>1,457</b>	<b>68</b>	

<sup>21</sup> 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 313: LI DI Initiative Gross Impact Sample Design for Penn Power**

Stratum	MWh Threshold	Population Size	Achieved Sample Size	Evaluation Activity
High Savings	Appliances	17	9	TRM Analysis + On-Site Verification
Medium Savings	Lighting	17	12	
Low Savings	Other	288	35	
<b>Program Total</b>		<b>322</b>	<b>56</b>	

**Table 314: LI DI Initiative Gross Impact Sample Design for WPP**

Stratum	MWh Threshold	Population Size	Achieved Sample Size	Evaluation Activity
High Savings	Appliances	302	46	TRM Analysis + On-Site Verification
Medium Savings	Lighting	425	34	
Low Savings	Other	819	21	
<b>Program Total</b>		<b>1,546</b>	<b>101</b>	

### N.1.3 Results for Energy

The gross realization rates for energy, along with relative precisions, are shown in Table 315, Table 316, Table 317, and Table 318 for Met-Ed, Penelec, Penn Power, and WPP respectively.

**Table 315: 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	Appliances	307	100.7%	0.5	9%
Medium Savings	Lighting	326	95.6%	0.5	18%
Low Savings	Other	371	105.3%	0.5	13%
<b>Program Total</b>		<b>1,005</b>	<b>100.7%</b>	<b>0.5</b>	<b>7.9%</b>

**Table 316: 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	Appliances	264	93.9%	0.5	12%
Medium Savings	Lighting	261	101.2%	0.5	20%
Low Savings	Other	233	100.7%	0.5	16%
<b>Program Total</b>		<b>758</b>	<b>98.5%</b>	<b>0.5</b>	<b>9.4%</b>



**Table 317: 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	Appliances	12	90.9%	0.5	16%
Medium Savings	Lighting	10	104.0%	0.5	11%
Low Savings	Other	79	103.1%	0.5	11%
<b>Program Total</b>		<b>101</b>	<b>101.8%</b>	<b>0.5</b>	<b>9.3%</b>

**Table 318: 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	Appliances	229	93.7%	0.5	10%
Medium Savings	Lighting	251	103.0%	0.5	12%
Low Savings	Other	294	96.5%	0.5	16%
<b>Program Total</b>		<b>774</b>	<b>97.7%</b>	<b>0.5</b>	<b>7.6%</b>

#### N.1.4 Results for Demand

The gross realization rates for demand, along with relative precisions, are shown Table 319, Table 320, Table 321, and Table 322 for Met-Ed, Penelec, Penn Power, and WPP respectively.

**Table 319: 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	Appliances	0.03	100.7%	0.5	9%
Medium Savings	Lighting	0.04	96.6%	0.5	18%
Low Savings	Other	0.03	106.7%	0.5	13%
<b>Program Total</b>		<b>0.11</b>	<b>101.2%</b>	<b>0.5</b>	<b>8.0%</b>

**Table 320: 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	Appliances	0.03	93.9%	0.5	12%
Medium Savings	Lighting	0.03	100.4%	0.5	20%
Low Savings	Other	0.02	100.3%	0.5	16%
<b>Program Total</b>		<b>0.08</b>	<b>97.9%</b>	<b>0.5</b>	<b>9.2%</b>

**Table 321: 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	Appliances	0.00	90.9%	0.5	16%
Medium Savings	Lighting	0.00	102.1%	0.5	11%
Low Savings	Other	0.01	105.4%	0.5	11%
<b>Program Total</b>		<b>0.01</b>	<b>103.2%</b>	<b>0.5</b>	<b>9.1%</b>

**Table 322: 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	Appliances	0.03	93.7%	0.5	10%
Medium Savings	Lighting	0.03	100.2%	0.5	12%
Low Savings	Other	0.02	107.8%	0.5	16%
<b>Program Total</b>		<b>0.08</b>	<b>100.4%</b>	<b>0.5</b>	<b>7.3%</b>

## N.2 NET IMPACT EVALUATION

### N.2.1 Net Impact Evaluation Methodology

An independent net impact evaluation was not conducted for this initiative.

## **Appendix O   Evaluation Detail – LI EE Kits Initiative**

The Companies did not offer Energy Conservation Kits in PY12.

# Appendix P Evaluation Detail – Commercial and Industrial Lighting Initiative

## P.1 GROSS IMPACT EVALUATION

Gross impact evaluation for the Commercial and Industrial Lighting (C&I Lighting) Initiative involved stratified sampling, on-site verifications, and 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.

### P.1.1 Gross Impact Evaluation Methodology

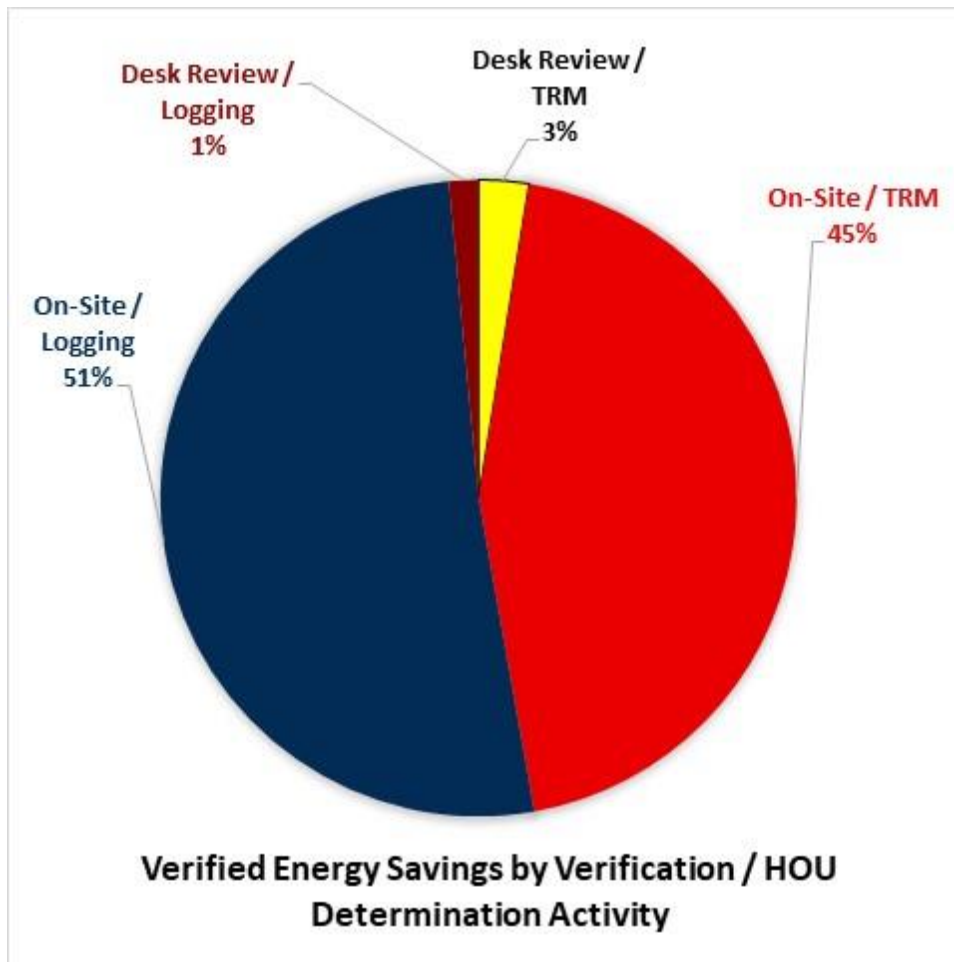
As a first step, projects are placed into one of four sampling strata as described in the next section. Each sampled lighting project first undergoes a desk review. The desk review includes reconciliation of invoices, fixture specification sheets (cut sheets), and re-calculating reported savings using 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 the TRM's Appendix C style calculator (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 2016 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 25 MWh are evaluated with TRM hours of use, without exception. Although there can be considerable variation in project-specific impacts as calculated by the TRM and by primary data collection, the two methodologies produce compatible results at the aggregate level.

In rare cases, 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. Figure 30 shows the fraction of verified energy savings, as averaged over the four PA Companies, by primary

evaluation activities. Details regarding gross impact evaluation activities for each sampled project can be found in Appendix B.



**Figure 30: 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.

### P.1.2 Sampling

Projects are placed into four 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 three 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. The sample designs for the four EDCs are shown in Table 323, Table 324, Table 325, and Table 326.

**Table 323: CI Lighting Initiative Gross Impact Sample Design for Met-Ed**

Stratum	MWh Threshold	Population Size	Achieved Sample Size	Evaluation Activity
Lighting-Certainty	750	16	16	Desk Review, On-Site Verification, Logging HOU
Lighting-3	250	40	9	
Lighting-2	25	93	5	
Lighting-1	0	101	4	
<b>Program Total</b>	<b>n/a</b>	<b>250</b>	<b>34</b>	

**Table 324: CI Lighting Initiative Gross Impact Sample Design for Penelec**

Stratum	MWh Threshold	Population Size	Achieved Sample Size	Evaluation Activity
Lighting-Certainty	750	14	14	Desk Review, On-Site Verification, Logging HOU
Lighting-3	250	35	9	
Lighting-2	25	122	11	
Lighting-1	0	163	2	
<b>Program Total</b>	<b>n/a</b>	<b>334</b>	<b>36</b>	

**Table 325: CI Lighting Initiative Gross Impact Sample Design for Penn Power**

Stratum	MWh Threshold	Population Size	Achieved Sample Size	Evaluation Activity
Lighting-Certainty	750	4	4	Desk Review, On-Site Verification, Logging HOU
Lighting-3	250	4	2	
Lighting-2	25	40	7	
Lighting-1	0	23	5	
<b>Program Total</b>	<b>n/a</b>	<b>71</b>	<b>18</b>	

**Table 326: CI Lighting Initiative Gross Impact Sample Design for WPP**

Stratum	MWh Threshold	Population Size	Achieved Sample Size	Evaluation Activity
Lighting-Certainty	750	14	14	Desk Review, On-Site Verification, Logging HOU
Lighting-3	250	24	7	
Lighting-2	25	143	10	
Lighting-1	0	122	2	
<b>Program Total</b>	<b>n/a</b>	<b>303</b>	<b>33</b>	

### P.1.3 Results for Energy

The gross realization rates for energy, along with relative precisions, are shown in Table 327, Table 328, Table 329, and Table 330 for Met-Ed, Penelec, Penn Power, and WPP respectively. Figure 31 plots the verified energy savings against the reported energy savings for all evaluated lighting 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, but the actual error ratios tend to be somewhat lower than 0.5.

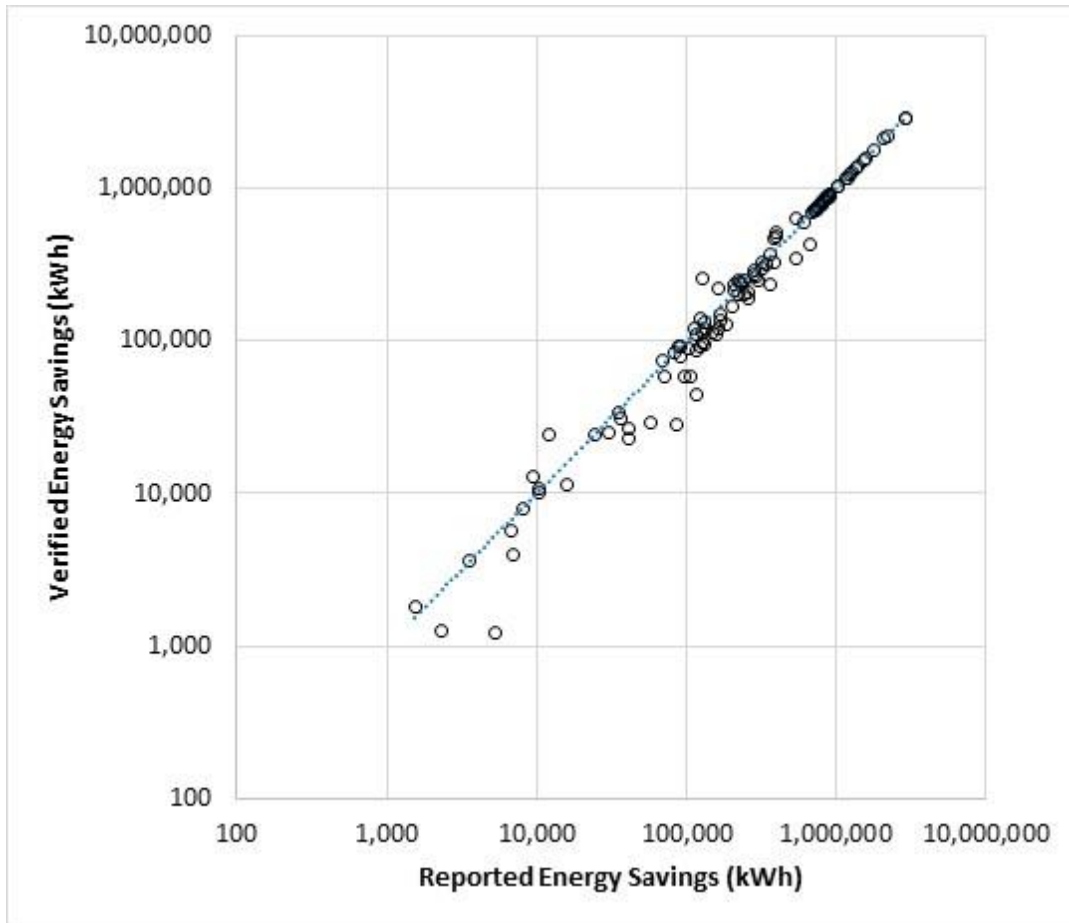


Figure 31: Verified vs. Reported Energy Savings for Sampled Lighting Projects.

Table 327: CI Lighting Initiative Energy Gross Realization Rates for Met-Ed

Stratum	MWh Threshold	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
Lighting-Certainty	750	19,673	100.0%	0.5	0%
Lighting-3	250	14,607	94.4%	0.5	21%
Lighting-2	25	6,784	82.2%	0.5	31%
Lighting-1	0	1,139	79.8%	0.5	35%
Program Total	n/a	42,203	94.7%	0.5	8.1%

**Table 328: CI Lighting Initiative Energy Gross Realization Rates for Penelec**

Stratum	MWh Threshold	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
Lighting-Certainty	750	12,278	100.0%	0.5	0%
Lighting-3	250	11,474	83.7%	0.5	21%
Lighting-2	25	9,038	92.8%	0.5	21%
Lighting-1	0	1,538	96.0%	0.5	51%
Program Total	n/a	34,328	92.5%	0.5	8.0%

**Table 329: CI Lighting Initiative Energy Gross Realization Rates for Penn Power**

Stratum	MWh Threshold	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
Lighting-Certainty	750	3,451	100.6%	0.5	0%
Lighting-3	250	1,366	108.0%	0.5	36%
Lighting-2	25	2,786	81.1%	0.5	25%
Lighting-1	0	319	113.8%	0.5	28%
Program Total	n/a	7,923	95.5%	0.5	9.8%

**Table 330: CI Lighting Initiative Energy Gross Realization Rates for WPP**

Stratum	MWh Threshold	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
Lighting-Certainty	750	14,776	100.0%	0.5	0%
Lighting-3	250	8,974	106.5%	0.5	23%
Lighting-2	25	10,168	80.8%	0.5	22%
Lighting-1	0	1,541	100.4%	0.5	50%
Program Total	n/a	35,459	96.2%	0.5	8.3%

#### P.1.4 Results for Demand

The gross realization rates for demand, along with relative precisions, are shown in Table 331, Table 332, Table 333, and Table 334 for Met-Ed, Penelec, Penn Power, and WPP respectively.



**Table 331: CI Lighting Initiative Demand Gross Realization Rates for Met-Ed**

Stratum	MWh Threshold	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
Lighting-Certainty	750	2.81	101.9%	0.5	0%
Lighting-3	250	2.22	86.1%	0.5	21%
Lighting-2	25	1.02	76.1%	0.5	31%
Lighting-1	0	0.16	71.4%	0.5	35%
Program Total	n/a	6.22	91.2%	0.5	7.6%

**Table 332: CI Lighting Initiative Demand Gross Realization Rates for Penelec**

Stratum	MWh Threshold	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
Lighting-Certainty	750	1.74	100.0%	0.5	0%
Lighting-3	250	1.65	96.9%	0.5	21%
Lighting-2	25	1.55	129.5%	0.5	21%
Lighting-1	0	0.21	69.9%	0.5	51%
Program Total	n/a	5.14	106.7%	0.5	10.4%

**Table 333: CI Lighting Initiative Gross Realization Rates for Penn Power**

Stratum	MWh Threshold	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
Lighting-Certainty	750	0.45	100.7%	0.5	0%
Lighting-3	250	0.20	92.9%	0.5	36%
Lighting-2	25	0.36	86.1%	0.5	25%
Lighting-1	0	0.06	102.9%	0.5	28%
Program Total	n/a	1.07	94.4%	0.5	9.6%

**Table 334: CI Lighting Initiative Demand Gross Realization Rates for WPP**

Stratum	MWh Threshold	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
Lighting-Certainty	750	1.92	99.8%	0.5	0%
Lighting-3	250	1.38	100.4%	0.5	23%
Lighting-2	25	1.64	86.8%	0.5	22%
Lighting-1	0	0.24	100.5%	0.5	50%
Program Total	n/a	5.17	95.9%	0.5	8.9%

## P.2 NET IMPACT EVALUATION

### P.2.1 Net Impact Evaluation Methodology

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.

Free ridership was assessed through the participant customer self-reports following the standardized self-report methodology for downstream programs, enhanced with influential vendor reports. Customer-identified influential vendors were asked a series of questions assessing the program's influence on their recommendations to the customer(s) who identified them as being influential in their decision-making process to support the free-ridership assessment. Similar to the participant customer self-report methodology, an "Influence Component" score was calculated for each influential vendor specific to each project. If the vendor's influence score is greater than the customer's score from the participant survey, the vendor score replaced the customer score in the self-report free-ridership scoring algorithm, under the rationale that the vendor's recommendation was a program-attributable factor.

In addition to free-ridership, the NTG evaluation also assessed both participant spillover and nonparticipant spillover. Participant spillover was assessed through participant customer self-reports. Nonparticipant spillover was estimated from vendor self-reports at the measure-category level (i.e., lighting, HVAC, and food service). Following the Evaluation Framework, total spillover was calculated by summing the participant and vendor-reported nonparticipant spillover rates, as vendors on average reported that their sales of program-qualifying equipment accounted for less than 90 percent of their total sales of high-efficiency products.

Individual free-ridership and spillover rates from the customer and vendor surveys were weighted to adjust for proportional sampling differences, non-response, and claimed energy savings to calculate overall estimates.

### P.2.2 Sampling

Net impact evaluation used a similar sampling scheme as gross impact evaluation. Stratification by MWh was necessary because commercial and industrial programs tend to concentrate impacts among a relatively small number of high-savings projects. The high fraction of program verified impacts in the certainty strata means that attainment of relative precision targets hinge on achieving a census or near-census of those strata Tetra Tech attempted to reach all customers in the "Certainty" strata, but not all decision makers for these customers responded to the survey. For net impact analysis, the "Lighting-Certainty" strata are combined with the "Lighting-3" strata to ensure that these high-saving strata will have adequate sample sizes, given realistic expectations of response rates. The sample designs for the four EDCs are shown in Table 335, Table 336, Table 337, and Table 338 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 335: CI Lighting Initiative Net-to-Gross Sampling for Met-Ed**

Stratum	Population Size	Achieved Sample Size	Response Rate
Lighting-3	59	24	41%
Lighting-2	290	78	27%
Lighting-1	333	44	13%
<b>Program Total</b>	<b>682</b>	<b>146</b>	<b>21.4%</b>

**Table 336: CI Lighting Initiative Net-to-Gross Sampling for Penelec**

Stratum	Population Size	Achieved Sample Size	Response Rate
Lighting-3	52	21	40%
Lighting-2	383	94	25%
Lighting-1	618	65	11%
<b>Program Total</b>	<b>1,053</b>	<b>180</b>	<b>17.1%</b>

**Table 337: CI Lighting Initiative Net-to-Gross Sampling for Penn Power**

Stratum	Population Size	Achieved Sample Size	Response Rate
Lighting-3	21	13	62%
Lighting-2	140	47	34%
Lighting-1	159	26	16%
<b>Program Total</b>	<b>320</b>	<b>86</b>	<b>26.9%</b>

**Table 338: CI Lighting Initiative Net-to-Gross Sampling for WPP**

Stratum	Population Size	Achieved Sample Size	Response Rate
Lighting-3	61	21	34%
Lighting-2	344	75	22%
Lighting-1	582	56	10%
<b>Program Total</b>	<b>987</b>	<b>152</b>	<b>15.4%</b>

### **P.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 339, Table 340, Table 341, and Table 342 for Met-Ed, Penelec, Penn Power, and WPP respectively. The net-to-gross results show that overall net-to-gross for the commercial lighting is relatively high, with an average of 77% across the four EDCs.

**Table 339: CI Lighting Initiative Net-to-Gross Results for Met-Ed**

Stratum	PYVTD MWh	Free Ridership (%)	Spillover (%)	NTG Ratio	Relative Precision (@ 85% CL)
Lighting-3	33,464	40.5%	1.1%	60.6%	11.3%
Lighting-2	5,574	28.4%	0.1%	71.7%	7.0%
Lighting-1	909	48.0%	0.1%	52.1%	10.1%
<b>Program Total</b>	<b>39,947</b>	<b>38.9%</b>	<b>0.9%</b>	<b>62.0%</b>	<b>9.3%</b>

**Table 340: CI Lighting Initiative Net-to-Gross Results for Penelec**

Stratum	PYVTD MWh	Free Ridership (%)	Spillover (%)	NTG Ratio	Relative Precision (@ 85% CL)
Lighting-3	21,881	15.5%	3.6%	88.0%	12.1%
Lighting-2	8,388	35.7%	3.2%	67.5%	6.5%
Lighting-1	1,477	39.9%	2.6%	62.7%	8.4%
<b>Program Total</b>	<b>31,746</b>	<b>22.0%</b>	<b>3.4%</b>	<b>81.4%</b>	<b>9.2%</b>

**Table 341 CI Lighting Initiative Net-to-Gross Results for Penn Power**

Stratum	PYVTD MWh	Free Ridership (%)	Spillover (%)	NTG Ratio	Relative Precision (@ 85% CL)
Lighting-3	4,946	11.4%	0.0%	88.6%	12.3%
Lighting-2	2,259	35.0%	1.9%	66.9%	8.6%
Lighting-1	363	42.7%	2.4%	59.7%	12.9%
<b>Program Total</b>	<b>7,569</b>	<b>19.9%</b>	<b>0.7%</b>	<b>80.8%</b>	<b>9.1%</b>

**Table 342 CI Lighting Initiative Net-to-Gross Results for WPP**

Stratum	PYVTD MWh	Free Ridership (%)	Spillover (%)	NTG Ratio	Relative Precision (@ 85% CL)
Lighting-3	24,336	35.5%	0.0%	64.5%	12.7%
Lighting-2	8,219	32.8%	1.4%	68.7%	7.4%
Lighting-1	1,548	30.2%	0.0%	69.9%	9.1%
<b>Program Total</b>	<b>34,103</b>	<b>34.6%</b>	<b>0.3%</b>	<b>65.7%</b>	<b>9.1%</b>

# Appendix Q Evaluation Detail – Commercial and Industrial Custom Initiative

## Q.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.

### Q.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.

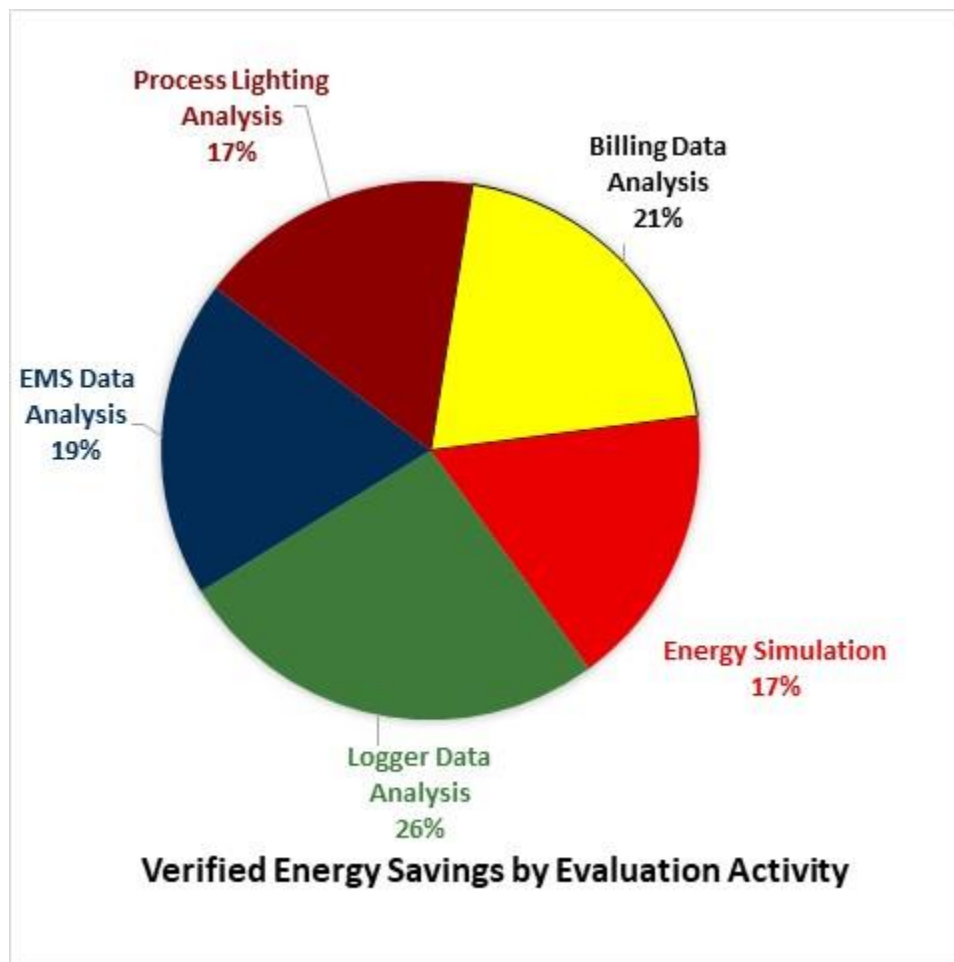
Water Pumping Projects: Pumping projects are typically evaluated through billing analysis, using water throughput as the normalizing variable.

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.

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.

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 32 shows the fraction of verified energy savings, as averaged over the four PA Companies, by primary evaluation activities. Details regarding gross impact evaluation activities for each sampled project can be found in Appendix B.



**Figure 32:** 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.

### Q.1.2 Sampling

Projects are placed into three 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 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, the certainty stratum is evaluated with the highest level of rigor, and are evaluated in advance of rebate approval to ensure that customers’ incentives are determined from verified energy savings. The next largest projects, those with expected impacts above 250 MWh, are placed in a separate stratum and evaluated with primary data collection and a high level of rigor. Projects with impacts below 250 MWh are assigned a level of rigor assigned on a case by case basis. In this stratum, if the weighted MWh uncertainty (as determined from the sample scheme and a review of project documentation) is low, then basic rigor is preferred. The sample designs for the four EDCs are shown in Table 343, Table 344, Table 345, and Table 346.

**Table 343: CI Custom Initiative Gross Impact Sample Design for Met-Ed**

Stratum	MWh Threshold	Population Size	Achieved Sample Size	Evaluation Activity
Custom-Certainty	500	8	8	On-Site Verification, Metering
Custom-2	250	0	0	
Custom-1	0	38	1	
<b>Program Total</b>	<b>n/a</b>	<b>46</b>	<b>9</b>	

**Table 344: CI Custom Initiative Gross Impact Sample Design for Penelec**

Stratum	MWh Threshold	Population Size	Achieved Sample Size	Evaluation Activity
Custom-Certainty	500	7	7	On-Site Verification, Metering
Custom-2	250	0	0	
Custom-1	0	61	5	
<b>Program Total</b>	<b>n/a</b>	<b>68</b>	<b>12</b>	

**Table 345: CI Custom Initiative Gross Impact Sample Design for Penn Power**

Stratum	MWh Threshold	Population Size	Achieved Sample Size	Evaluation Activity
Custom-Certainty	500	2	2	On-Site Verification, Metering
Custom-2	250	0	0	
Custom-1	0	6	1	
<b>Program Total</b>	<b>n/a</b>	<b>8</b>	<b>3</b>	

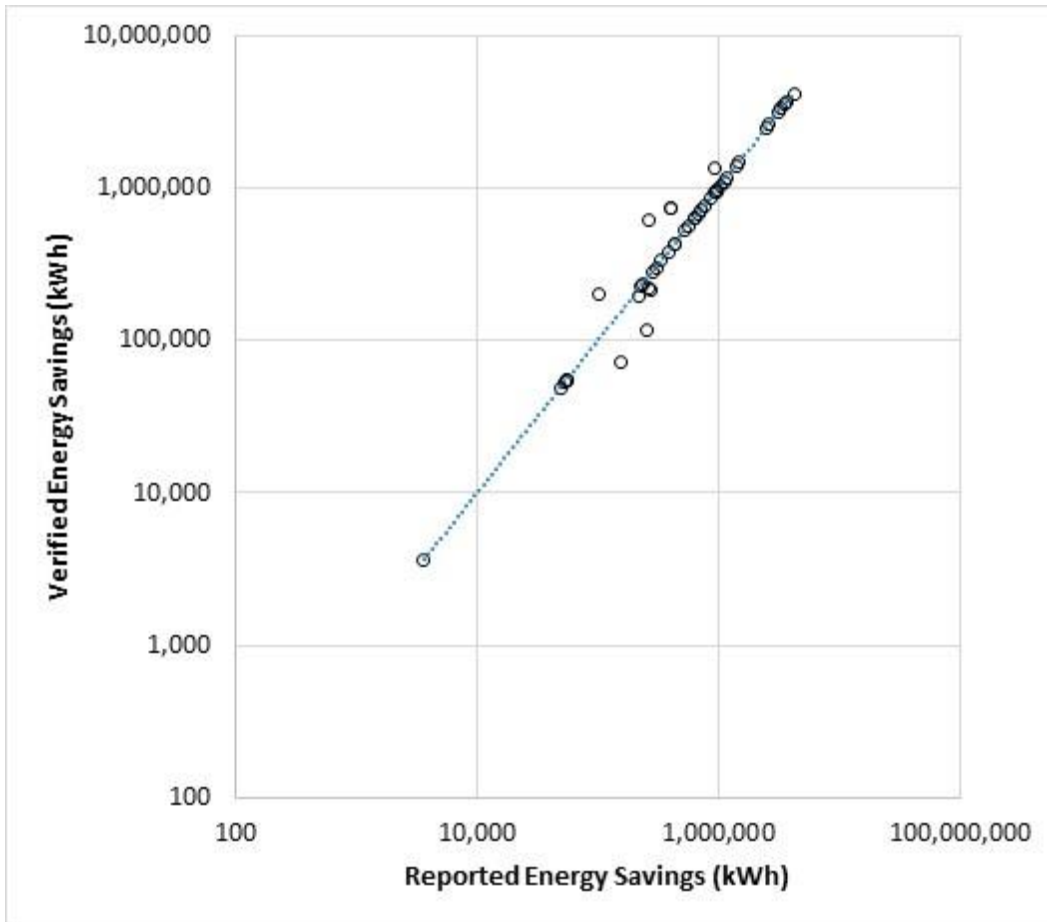
**Table 346: CI Custom Initiative Gross Impact Sample Design for WPP**

Stratum	MWh Threshold	Population Size	Achieved Sample Size	Evaluation Activity
Custom-Certainty	500	12	12	On-Site Verification, Metering
Custom-2	250	0	0	
Custom-1	0	61	11	
<b>Program Total</b>	<b>n/a</b>	<b>73</b>	<b>23</b>	

### Q.1.3 Results for Energy

The gross realization rates for energy, along with relative precisions, are shown in Table 347, Table 348, Table 349, and Table 350 for Met-Ed, Penelec, Penn Power, and WPP respectively. Figure 33 plots the verified energy savings against the reported energy savings for all evaluated lighting projects for all in 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 33: Verified vs. Reported Energy Savings for Sampled Custom Projects.**

**Table 347: 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-Certainty	500	13,248	100.0%	0.5	0%
Custom-2	250	0	0.0%	0.5	0%
Custom-1	0	2,981	100.0%	0.5	71%
<b>Program Total</b>	<b>n/a</b>	<b>16,229</b>	<b>100.0%</b>		<b>13.0%</b>

**Table 348: 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-Certainty	500	7,693	100.0%	0.5	0%
Custom-2	250	0	0.0%	0.5	0%
Custom-1	0	3,881	93.5%	0.5	31%
<b>Program Total</b>	<b>n/a</b>	<b>11,574</b>	<b>97.8%</b>		<b>9.7%</b>

**Table 349: 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-Certainty	500	3,930	100.0%	0.5	0%
Custom-2	250	0	0.0%	0.5	0%
Custom-1	0	686	88.8%	0.5	66%
<b>Program Total</b>	<b>n/a</b>	<b>4,616</b>	<b>98.3%</b>		<b>8.7%</b>

**Table 350: 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-Certainty	500	14,990	102.9%	0.5	0%
Custom-2	250	0	0.0%	0.5	0%
Custom-1	0	5,172	133.1%	0.5	20%
<b>Program Total</b>	<b>n/a</b>	<b>20,162</b>	<b>110.6%</b>		<b>6.7%</b>

#### Q.1.4 Results for Demand

The gross realization rates for demand, along with relative precisions, are shown in Table 351, Table 352, Table 353, and Table 354 for Met-Ed, Penelec, Penn Power, and WPP respectively.

**Table 351: 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-Certainty	500	1.89	88.6%	0.5	0%
Custom-2	250	0.00	0.0%	0.5	0%
Custom-1	0	0.30	100.0%	0.5	71%
<b>Program Total</b>	<b>n/a</b>	<b>2.19</b>	<b>90.1%</b>		<b>9.8%</b>

**Table 352: 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-Certainty	500	1.19	100.0%	0.5	0%
Custom-2	250	0.00	0.0%	0.5	0%
Custom-1	0	0.41	101.4%	0.5	31%
<b>Program Total</b>	<b>n/a</b>	<b>1.61</b>	<b>100.4%</b>		<b>8.1%</b>

**Table 353: 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-Certainty	500	0.46	102.5%	0.5	0%
Custom-2	250	0.00	0.0%	0.5	0%
Custom-1	0	0.08	88.5%	0.5	66%
<b>Program Total</b>	<b>n/a</b>	<b>0.53</b>	<b>100.5%</b>		<b>8.3%</b>

**Table 354: 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-Certainty	500	2.22	102.5%	0.5	0%
Custom-2	250	0.00	0.0%	0.5	0%
Custom-1	0	0.79	121.4%	0.5	20%
<b>Program Total</b>	<b>n/a</b>	<b>3.01</b>	<b>107.5%</b>		<b>6.3%</b>

## Q.2 NET IMPACT EVALUATION

### Q.2.1 Net Impact Evaluation Methodology

Tetra Tech conducted a net-to-gross (NTG) evaluation in PY8. 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.

Free ridership was assessed through the participant customer self-reports following the standardized self-report methodology for downstream programs, enhanced with influential vendor reports. Customer-identified influential vendors were asked a series of questions assessing the program's influence on their recommendations to the customer(s) who identified them as being influential in their decision-making process to support the free-ridership assessment. Similar to the participant customer self-report methodology, an "Influence Component" score was calculated for each influential vendor specific to each project. If the vendor's influence score is greater than the customer's score from the participant survey, the vendor score replaced the customer score in the self-report free-ridership scoring algorithm, under the rationale that the vendor's recommendation was a program-attributable factor.

In addition to free-ridership, the NTG evaluation also assessed both participant spillover and nonparticipant spillover. Participant spillover was assessed through participant customer self-reports. Nonparticipant spillover was estimated from vendor self-reports at the measure-category level (i.e., lighting, HVAC, and food service). Following the Evaluation Framework, total spillover was calculated by summing the participant and vendor-reported nonparticipant spillover rates, as vendors on average reported that their sales of program-qualifying equipment accounted for less than 90 percent of their total sales of high-efficiency products.

Individual free-ridership and spillover rates from the customer and vendor surveys were weighted to adjust for proportional sampling differences, non-response, and claimed energy savings to calculate overall estimates.

### Q.2.2 Sampling

Net impact evaluation used a similar sampling scheme as gross impact evaluation. Stratification by MWh was necessary because commercial and industrial programs tend to concentrate impacts among a relatively small number of high-savings projects. The high fraction of program verified impacts in the certainty strata means that attainment of relative precision targets hinge on achieving a census or near-census of those strata. Tetra Tech attempted to reach all customers in the "Certainty" strata, but not all decision makers for these customers responded to the survey. For net impact analysis, the "Custom-Certainty" strata are combined with the "Custom-2" strata to ensure that these high-saving strata will have adequate sample sizes, given realistic expectations of response rates.

The sample designs for the four EDCs are shown in Table 355, Table 356, Table 357, and Table 358 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 355: CI Custom Initiative Net-to-Gross Sampling for Met-Ed**

Stratum	Population Size	Achieved Sample Size	Response Rate
Custom-2	9	8	89%
Custom-1	41	18	44%
<b>Program Total</b>	<b>50</b>	<b>26</b>	<b>52.0%</b>

**Table 356: CI Custom Initiative Net-to-Gross Sampling for Penelec**

Stratum	Population Size	Achieved Sample Size	Response Rate
Custom-2	11	9	82%
Custom-1	108	25	23%
<b>Program Total</b>	<b>119</b>	<b>34</b>	<b>28.6%</b>

**Table 357: CI Custom Initiative Net-to-Gross Sampling for Penn Power**

Stratum	Population Size	Achieved Sample Size	Response Rate
Custom-2	4	4	100%
Custom-1	18	7	39%
<b>Program Total</b>	<b>22</b>	<b>11</b>	<b>50.0%</b>

**Table 358: CI Custom Initiative Net-to-Gross Sampling for WPP**

Stratum	Population Size	Achieved Sample Size	Response Rate
Custom-2	5	2	40%
Custom-1	47	19	40%
<b>Program Total</b>	<b>52</b>	<b>21</b>	<b>40.4%</b>

### Q.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 359, Table 360, Table 361, and Table 362 for Met-Ed, Penelec, Penn Power, and WPP respectively. Despite the difficulty of achieving a census of the largest customers, overall net-to-gross ratios for the custom initiatives were in a reasonably tight range around 50%. Inspection of stratum-level NTG ratios for all four EDCs suggests that NTG ratios are lower for custom projects than for lighting projects, and this is particularly true for large custom projects.

**Table 359: CI Custom Initiative Net-to-Gross Results for Met-Ed**

Stratum	PYVTD MWh	Free Ridership (%)	Spillover (%)	NTG Ratio	Relative Precision (@ 85% CL)
Custom-2	13,248	43.6%	0.0%	56.4%	8.5%
Custom-1	2,981	48.3%	0.0%	51.7%	12.7%
<b>Program Total</b>	<b>16,229</b>	<b>44.5%</b>	<b>0.0%</b>	<b>55.5%</b>	<b>7.4%</b>

**Table 360: CI Custom Initiative Net-to-Gross Results for Penelec**

Stratum	PYVTD MWh	Free Ridership (%)	Spillover (%)	NTG Ratio	Relative Precision (@ 85% CL)
Custom-2	7,693	8.4%	0.5%	92.1%	10.2%
Custom-1	3,628	42.2%	0.0%	57.8%	12.6%
<b>Program Total</b>	<b>11,322</b>	<b>19.2%</b>	<b>0.3%</b>	<b>81.1%</b>	<b>8.4%</b>

**Table 361: CI Custom Initiative Net-to-Gross Results for Penn Power**

Stratum	PYVTD MWh	Free Ridership (%)	Spillover (%)	NTG Ratio	Relative Precision (@ 85% CL)
Custom-2	3,930	36.5%	0.0%	63.5%	0.0%
Custom-1	609	53.1%	0.0%	46.9%	21.3%
<b>Program Total</b>	<b>4,539</b>	<b>38.8%</b>	<b>0.0%</b>	<b>61.2%</b>	<b>2.2%</b>

**Table 362: CI Custom Initiative Net-to-Gross Results for WPP**

Stratum	PYVTD MWh	Free Ridership (%)	Spillover (%)	NTG Ratio	Relative Precision (@ 85% CL)
Custom-2	15,418	50.0%	0.0%	50.0%	39.4%
Custom-1	6,884	40.4%	0.0%	59.6%	12.7%
<b>Program Total</b>	<b>22,303</b>	<b>47.0%</b>	<b>0.0%</b>	<b>52.95%</b>	<b>26.1%</b>

# Appendix R Evaluation Detail – Commercial and Industrial Prescriptive Initiative

## R.1 GROSS IMPACT EVALUATION

Gross impact evaluation for the Commercial and Industrial Prescriptive (C&I Prescriptive) Initiative involved stratified sampling, on-site verifications, and project-specific data collection and calculations.

### R.1.1 Gross Impact Evaluation Methodology

As a first step, projects are spaced into one of three sampling strata as described in the next section. 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, but most projects can be evaluated with a combination of verification of measure installation and a TRM-based calculation. The first step in the M&V planning process is to check that the project is sufficiently documented and that sufficient data exist to identify the proper TRM protocol (or IMP) and the values of key input parameters as required by the protocol. Details regarding gross impact evaluation activities for each sampled project can be found in Appendix B. For PY12, we limited gross impact evaluation activities to desk reviews. This was done after a risk and cost assessment determined that the Prescriptive Initiative has accounted for less than 0.5% of total impacts to date in Phase IV, while at the same time the main source of discrepancy between reported and verified impacts is not lack of verification, but calculational or data input differences that are adequately addressed in the desk review process.

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.

### R.1.2 Sampling

Projects are placed into two strata. The impact evaluation activities are similar for both strata. The sample designs for the four EDCs are shown in Table 363, Table 364, Table 365, and Table 366.

**Table 363: CI Prescriptive Initiative Gross Impact Sample Design for Met-Ed**

Stratum	MWh Threshold	Population Size	Achieved Sample Size	Evaluation Activity
Prescriptive-2	20	0	0	Desk Review, On-Site Verification
Prescriptive-1	0	20	13	
<b>Program Total</b>	n/a	20	13	

**Table 364: CI Prescriptive Initiative Gross Impact Sample Design for Penelec**

Stratum	MWh Threshold	Population Size	Achieved Sample Size	Evaluation Activity
Prescriptive-2	20	0	0	Desk Review, On-Site Verification
Prescriptive-1	0	22	17	
Program Total	n/a	22	17	

**Table 365: CI Prescriptive Initiative Gross Impact Sample Design for Penn Power**

Stratum	MWh Threshold	Population Size	Achieved Sample Size	Evaluation Activity
Prescriptive-2	20	0	0	Desk Review, On-Site Verification
Prescriptive-1	0	6	6	
Program Total	n/a	6	6	

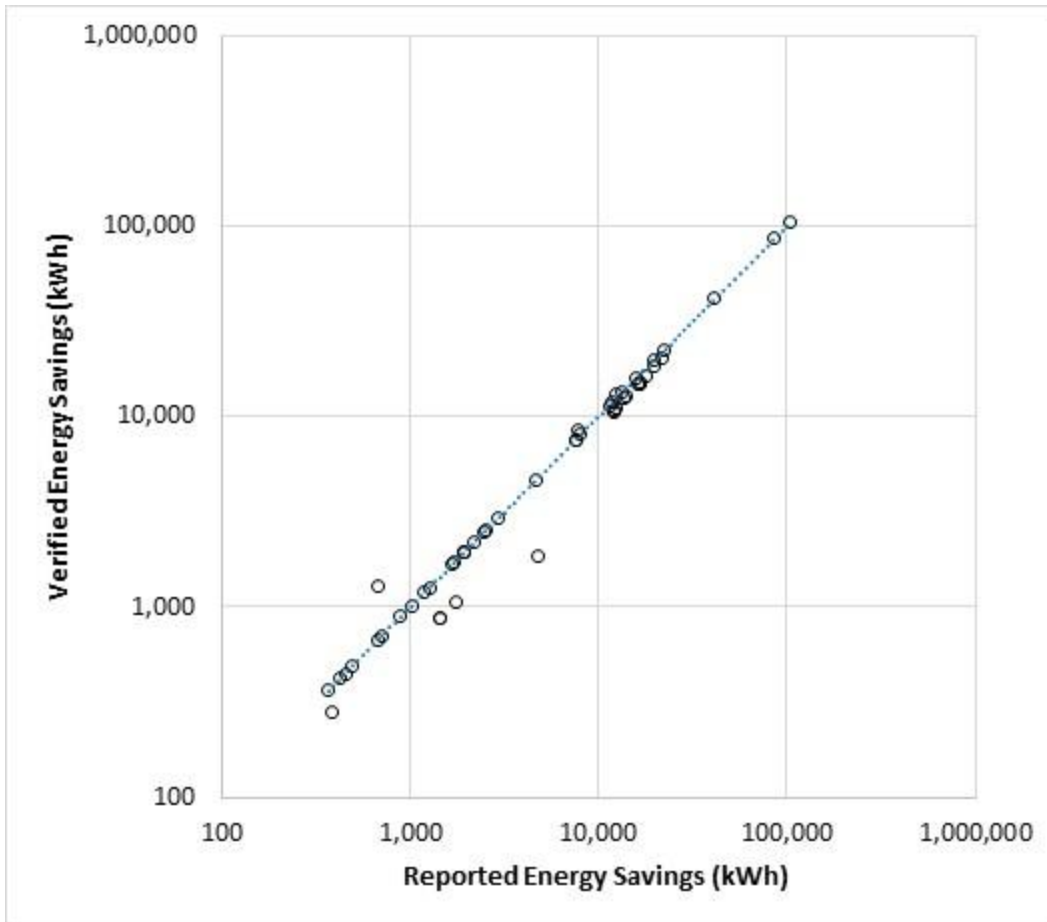
**Table 366: CI Prescriptive Initiative Gross Impact Sample Design for WPP**

Stratum	MWh Threshold	Population Size	Achieved Sample Size	Evaluation Activity
Prescriptive-2	20	0	0	Desk Review, On-Site Verification
Prescriptive-1	0	20	15	
Program Total	n/a	20	15	

### R.1.3 Results for Energy

The gross realization rates for energy, along with relative precisions, are shown in Table 367, Table 368, Table 369, and Table 370 for Met-Ed, Penelec, Penn Power, and WPP respectively. Figure 34 plots the verified energy savings against the reported energy savings for all evaluated lighting 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 34: Verified vs. Reported Energy Savings for Sampled Prescriptive Projects.**

**Table 367: 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.
Prescriptive-2	20	0	0.0%	0.4	0%
Prescriptive-1	0	131	93.5%	0.4	9%
<b>Program Total</b>	<b>n/a</b>	<b>131</b>	<b>93.5%</b>		<b>8.8%</b>

**Table 368: 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.
Prescriptive-2	20	0	0.0%	0.4	0%
Prescriptive-1	0	216	94.8%	0.4	7%
<b>Program Total</b>	<b>n/a</b>	<b>216</b>	<b>94.8%</b>		<b>6.3%</b>

**Table 369: 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.
Prescriptive-2	20	0	0.0%	0.4	0%
Prescriptive-1	0	151	98.1%	0.4	0%
<b>Program Total</b>	<b>n/a</b>	<b>151</b>	<b>98.1%</b>		<b>0.0%</b>

**Table 370: 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.
Prescriptive-2	20	0	0.0%	0.4	0%
Prescriptive-1	0	474	98.5%	0.4	7%
<b>Program Total</b>	<b>n/a</b>	<b>474</b>	<b>98.5%</b>		<b>7.3%</b>

#### R.1.4 Results for Demand

The gross realization rates for demand, along with relative precisions, are shown in Table 371, Table 372, Table 373, and Table 374 for Met-Ed, Penelec, Penn Power, and WPP respectively.

**Table 371: 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.
Prescriptive-2	20	0.00	0.0%	0.4	0%
Prescriptive-1	0	0.02	83.5%	0.4	9%
<b>Program Total</b>	<b>n/a</b>	<b>0.02</b>	<b>83.5%</b>		<b>7.9%</b>

**Table 372: 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.
Prescriptive-2	20	0.00	0.0%	0.4	0%
Prescriptive-1	0	0.03	85.2%	0.4	7%
<b>Program Total</b>	<b>n/a</b>	<b>0.03</b>	<b>85.2%</b>		<b>5.7%</b>

**Table 373: 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.
Prescriptive-2	20	0.00	0.0%	0.4	0%
Prescriptive-1	0	0.03	87.1%	0.4	0%
<b>Program Total</b>	<b>n/a</b>	<b>0.03</b>	<b>87.1%</b>		<b>0.0%</b>

**Table 374: 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.
Prescriptive-2	20	0.00	0.0%	0.4	0%
Prescriptive-1	0	0.10	88.8%	0.4	7%
<b>Program Total</b>	<b>n/a</b>	<b>0.10</b>	<b>88.8%</b>		<b>6.6%</b>

## R.2 NET IMPACT EVALUATION

### R.2.1 Net Impact Evaluation Methodology

The Net-to-Gross evaluation methodology for the prescriptive measures performed for PY10 was identical to the methodology used for lighting and custom measures.

### R.2.2 Sampling

Sample sizes for prescriptive measures were relatively small, as the initiative accounted for less than 1% of gross and net impacts. The sample designs for the four EDCs are shown in Table 375, Table 376, Table 377, and Table 378 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 375: CI Prescriptive Initiative Net-to-Gross Sampling for Met-Ed**

Stratum	Population Size	Achieved Sample Size	Response Rate
Prescriptive-2	7	4	57%
Prescriptive-1	36	11	31%
<b>Program Total</b>	<b>43</b>	<b>15</b>	<b>34.9%</b>

**Table 376: CI Prescriptive Initiative Net-to-Gross Sampling for Penelec**

Stratum	Population Size	Achieved Sample Size	Response Rate
Prescriptive-2	8	7	88%
Prescriptive-1	53	33	62%
<b>Program Total</b>	<b>61</b>	<b>40</b>	<b>65.6%</b>

**Table 377: CI Prescriptive Initiative Net-to-Gross Sampling for Penn Power**

Stratum	Population Size	Achieved Sample Size	Response Rate
Prescriptive-2	1	1	100%
Prescriptive-1	14	9	64%
<b>Program Total</b>	<b>15</b>	<b>10</b>	<b>66.7%</b>

**Table 378: CI Prescriptive Initiative Net-to-Gross Sampling for WPP**

Stratum	Population Size	Achieved Sample Size	Response Rate
Prescriptive-2	5	4	80%
Prescriptive-1	52	26	50%
<b>Program Total</b>	<b>57</b>	<b>30</b>	<b>52.6%</b>

### 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 359, Table 360, Table 361, and Table 362 for Met-Ed, Penelec, Penn Power, and WPP respectively.

**Table 379: CI Prescriptive Initiative Net-to-Gross Results for Met-Ed**

Stratum	PYVTD MWh	Free Ridership (%)	Spillover (%)	NTG Ratio	Relative Precision (@ 85% CL)
Prescriptive-2	0	50.0%	0.0%	50.0%	23.6%
Prescriptive-1	122	26.3%	0.0%	73.7%	18.1%
<b>Program Total</b>	<b>122</b>	<b>26.3%</b>	<b>0.0%</b>	<b>73.7%</b>	<b>18.1%</b>

**Table 380: CI Prescriptive Initiative Net-to-Gross Results for Penelec**

Stratum	PYVTD MWh	Free Ridership (%)	Spillover (%)	NTG Ratio	Relative Precision (@ 85% CL)
Prescriptive-2	0	44.8%	0.0%	55.2%	9.6%
Prescriptive-1	204	58.1%	0.0%	41.9%	7.7%
<b>Program Total</b>	<b>204</b>	<b>58.1%</b>	<b>0.0%</b>	<b>41.9%</b>	<b>7.7%</b>

**Table 381 CI Prescriptive Initiative Net-to-Gross Results for Penn Power**

Stratum	PYVTD MWh	Free Ridership (%)	Spillover (%)	NTG Ratio	Relative Precision (@ 85% CL)
Prescriptive-2	0	62.5%	0.0%	37.5%	0.0%
Prescriptive-1	149	53.8%	0.0%	46.2%	14.3%
<b>Program Total</b>	<b>149</b>	<b>53.8%</b>	<b>0.0%</b>	<b>46.2%</b>	<b>14.3%</b>

**Table 382 CI Prescriptive Initiative Net-to-Gross Results for WPP**

Stratum	PYVTD MWh	Free Ridership (%)	Spillover (%)	NTG Ratio	Relative Precision (@ 85% CL)
Prescriptive-2	0	50.8%	0.0%	49.2%	16.1%
Prescriptive-1	467	58.8%	0.0%	41.2%	10.0%
<b>Program Total</b>	<b>467</b>	<b>58.8%</b>	<b>0.0%</b>	<b>41.2%</b>	<b>10.0%</b>

# Appendix S Evaluation Detail – C&I Appliance Turn-In Initiative

## S.1 GROSS IMPACT EVALUATION

Gross impact evaluation was not conducted for the C&I ATI Initiative in PY12. For each EDC, the gross energy and demand realization rates for each evaluation stratum were taken to be the average of respective PY10 and PY11 realization rates.

### S.1.1 Sampling

The CI ATI Initiative was not evaluated in PY12. Table 383, Table 384, Table 385, and Table 386 show sample sizes of zero for Met-Ed, Penelec, Penn Power, and WPP respectively. While the gross realization rate is taken to be the average of PY10 and PY11 realization rates, the relative precision for each stratum in PY12 is taken to be 100%.

**Table 383: C&I ATI Initiative Gross Impact Sample Design for Met-Ed**

Stratum	Population Size	Achieved Sample Size	Evaluation Activity
Refrigerators	58	0	Not Evaluated for PY12
Freezers	2	0	
Dehumidifiers	0	0	
RACs	19	0	
<b>Program Total</b>	<b>79</b>	<b>0</b>	

**Table 384: C&I ATI Initiative Gross Impact Sample Design for Penelec**

Stratum	Population Size	Achieved Sample Size	Evaluation Activity
Refrigerators	45	0	Not Evaluated for PY12
Freezers	5	0	
Dehumidifiers	0	0	
RACs	8	0	
<b>Program Total</b>	<b>58</b>	<b>0</b>	

**Table 385: C&I ATI Initiative Gross Impact Sample Design for Penn Power**

Stratum	Population Size	Achieved Sample Size	Evaluation Activity
Refrigerators	0	0	Not Evaluated for PY12
Freezers	0	0	
Dehumidifiers	0	0	
RACs	0	0	
<b>Program Total</b>	<b>0</b>	<b>0</b>	

**Table 386: C&I ATI Initiative Gross Impact Sample Design for WPP**

Stratum	Population Size	Achieved Sample Size	Evaluation Activity
Refrigerators	36	0	Not Evaluated for PY12
Freezers	3	0	
Dehumidifiers	0	0	
RACs	5	0	
<b>Program Total</b>	<b>44</b>	<b>0</b>	

**S.1.2 Results for Energy**

The gross realization rates for energy, along with relative precisions, are shown in Table 387, Table 388, Table 389, Table 390, and for Met-Ed, Penelec, Penn Power, and WPP respectively.

**Table 387: 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.
Refrigerators	55	111.3%	0.5	100.0%
Freezers	1	107.6%	0.5	100.0%
Dehumidifiers	0	0.0%	0.5	0.0%
RACs	2	112.4%	0.5	100.0%
<b>Program Total</b>	<b>58</b>	<b>111.3%</b>	<b>0.5</b>	<b>100.0%</b>

**Table 388: C&I ATI Initiative Energy Gross Realization Rates for Penelec**

Stratum	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
Refrigerators	48	82.4%	0.5	100.0%
Freezers	4	120.8%	0.5	100.0%
Dehumidifiers	0	0.0%	0.5	0.0%
RACs	1	91.3%	0.5	100.0%
<b>Program Total</b>	<b>52</b>	<b>85.1%</b>	<b>0.5</b>	<b>100.0%</b>

**Table 389: 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.
Refrigerators	0	97.1%	0.5	100.0%
Freezers	0	111.1%	0.5	100.0%
Dehumidifiers	0	0.0%	0.5	0.0%
RACs	0	90.4%	0.5	100.0%
<b>Program Total</b>	<b>0</b>	<b>100.0%</b>	<b>0.5</b>	<b>100.0%</b>

**Table 390: C&I ATI Initiative Energy Gross Realization Rates for WPP**

Stratum	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
Refrigerators	37	94.3%	0.5	100.0%
Freezers	2	119.7%	0.5	100.0%
Dehumidifiers	0	0.0%	0.5	0.0%
RACs	1	96.2%	0.5	100.0%
<b>Program Total</b>	<b>40</b>	<b>95.7%</b>	<b>0.5</b>	<b>100.0%</b>

**S.1.3 Results for Demand**

The gross realization rates for demand, along with relative precisions, are shown in Table 391, Table 392, Table 393, and Table 394 for Met-Ed, Penelec, Penn Power, and WPP respectively.

**Table 391: 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.
Refrigerators	0.01	111.4%	0.5	100.0%
Freezers	0.00	107.6%	0.5	100.0%
Dehumidifiers	0.00	0.0%	0.5	0.0%
RACs	0.00	43.5%	0.5	100.0%
<b>Program Total</b>	<b>0.01</b>	<b>81.4%</b>	<b>0.5</b>	<b>100.0%</b>

**Table 392: C&I ATI Initiative Demand Gross Realization Rates for Penelec**

Stratum	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
Refrigerators	0.01	82.3%	0.5	100.0%
Freezers	0.00	120.8%	0.5	100.0%
Dehumidifiers	0.00	0.0%	0.5	0.0%
RACs	0.00	46.5%	0.5	100.0%
<b>Program Total</b>	<b>0.01</b>	<b>74.7%</b>	<b>0.5</b>	<b>100.0%</b>



**Table 393: C&I ATI Initiative Gross Realization Rates for Penn Power**

Stratum	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
Refrigerators	0.00	97.1%	0.5	100.0%
Freezers	0.00	111.1%	0.5	100.0%
Dehumidifiers	0.00	0.0%	0.5	0.0%
RACs	0.00	42.5%	0.5	100.0%
<b>Program Total</b>	<b>0.00</b>	<b>100.0%</b>	<b>0.5</b>	<b>100.0%</b>

**Table 394: C&I ATI Initiative Demand Gross Realization Rates for WPP**

Stratum	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
Refrigerators	0.00	94.3%	0.5	100.0%
Freezers	0.00	119.7%	0.5	100.0%
Dehumidifiers	0.00	0.0%	0.5	0.0%
RACs	0.00	49.2%	0.5	100.0%
<b>Program Total</b>	<b>0.01</b>	<b>85.0%</b>	<b>0.5</b>	<b>100.0%</b>

## S.2 NET IMPACT EVALUATION

### S.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 Turn-In program were taken to be the same as the Net-to-Gross ratios for the Residential Appliance Turn-In program.

## Appendix T Evaluation Detail – Commercial and Industrial Direct Install Initiative

### T.1 GROSS IMPACT EVALUATION

Gross impact evaluation was not conducted for the CI Direct Install Initiative in PY12. For each EDC, the gross energy and demand realization rates were taken to be the PY11 realization rates, as the program had no participation in PY10.

#### T.1.1 Sampling

The CI Direct Install Initiative was not evaluated in PY12. Table 363, Table 364, Table 365, and Table 366 show sample sizes of zero for Met-Ed, Penelec, Penn Power, and WPP respectively. While the gross realization rate is taken to be the average of PY10 and PY11 realization rates, the relative precision in PY12 is taken to be 100%.

**Table 395: CI Direct Install Initiative Gross Impact Sample Design for Met-Ed**

Stratum	MWh Threshold	Population Size	Achieved Sample Size	Evaluation Activity
Direct_Install-2	20	3	0	Not Evaluated in PY12
Direct_Install-1	0	1	0	
Program Total	n/a	4	0	

**Table 396: CI Direct Install Initiative Gross Impact Sample Design for Penelec**

Stratum	MWh Threshold	Population Size	Achieved Sample Size	Evaluation Activity
Direct_Install-2	20	10	0	Not Evaluated in PY12
Direct_Install-1	0	7	0	
Program Total	n/a	17	0	

**Table 397: CI Direct Install Initiative Gross Impact Sample Design for Penn Power**

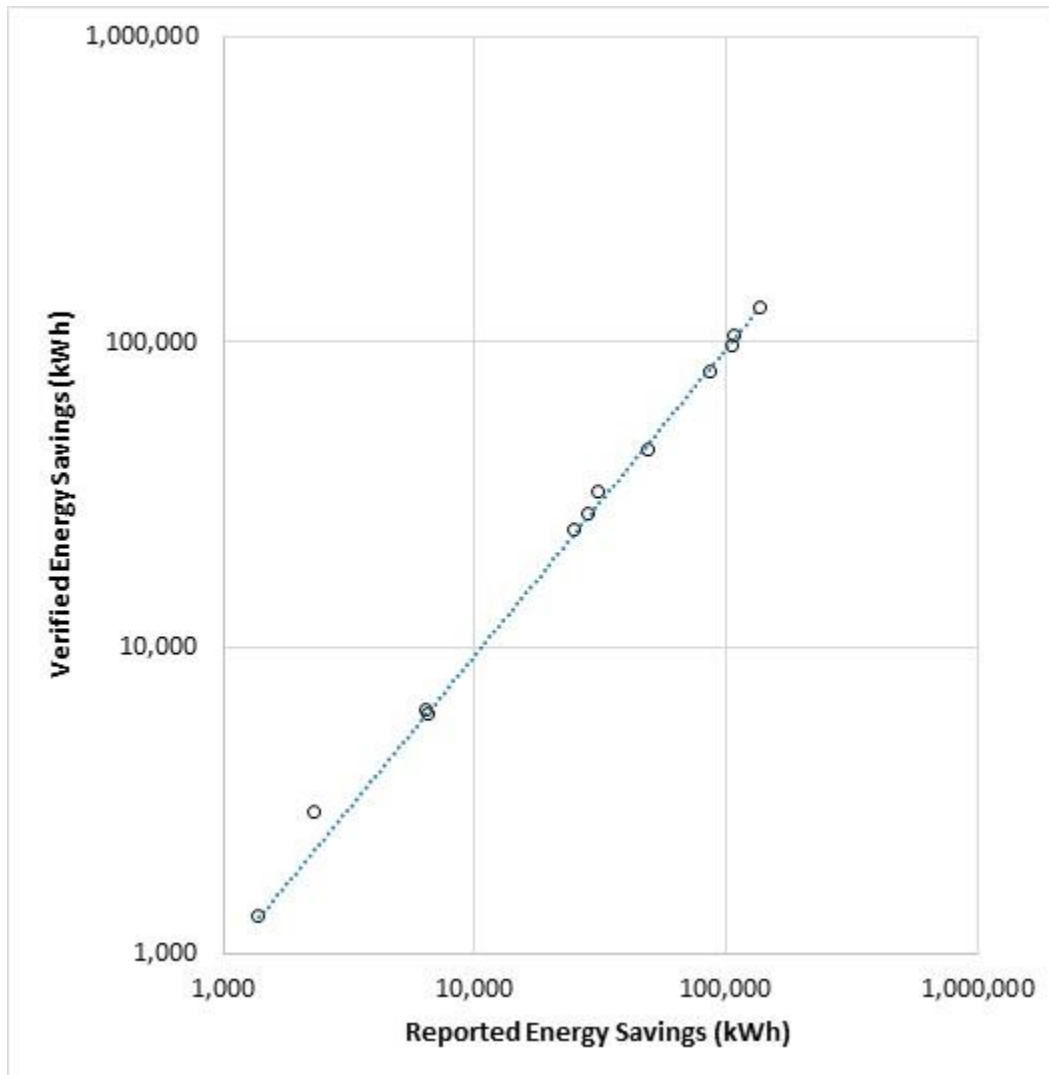
Stratum	MWh Threshold	Population Size	Achieved Sample Size	Evaluation Activity
Direct_Install-2	20	8	0	Not Evaluated in PY12
Direct_Install-1	0	1	0	
Program Total	n/a	9	0	

**Table 398: CI Direct Install Initiative Gross Impact Sample Design for WPP**

Stratum	MWh Threshold	Population Size	Achieved Sample Size	Evaluation Activity
Direct_Install-2	20	33	0	Not Evaluated in PY12
Direct_Install-1	0	13	0	
Program Total	n/a	46	0	

### T.1.2 Results for Energy

The gross realization rates for energy, along with relative precisions, are shown in Table 399, Table 400, Table 401, and Table 402 for Met-Ed, Penelec, Penn Power, and WPP respectively. Figure 35 plots the verified energy savings against the reported energy savings for all evaluated lighting projects for PY11, the last year that the program was evaluated. The figure includes data points from all four EDCs and is designed to show the reader the correspondence between reported and verified impacts.



**Figure 35: Verified vs. Reported Energy Savings for Sampled Direct Install Projects.**

**Table 399: CI Direct Install Initiative Energy Gross Realization Rates for Met-Ed**

Stratum	MWh Threshold	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
Direct_Install-2	20	225	108.7%	0.4	100%
Direct_Install-1	0	9	108.7%	0.4	100%
Program Total	n/a	234	108.7%	0.4	100.0%

**Table 400: CI Direct Install Initiative Energy Gross Realization Rates for Penelec**

Stratum	MWh Threshold	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
Direct_Install-2	20	606	104.0%	0.4	100%
Direct_Install-1	0	79	104.3%	0.4	100%
Program Total	n/a	685	104.0%	0.4	100.0%

**Table 401: CI Direct Install Initiative Energy Gross Realization Rates for Penn Power**

Stratum	MWh Threshold	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
Direct_Install-2	20	472	94.6%	0.4	100%
Direct_Install-1	0	16	94.6%	0.4	100%
Program Total	n/a	487	94.6%	0.4	100.0%

**Table 402: CI Direct Install Initiative Energy Gross Realization Rates for WPP**

Stratum	MWh Threshold	PYRTD MWh/yr	Energy Realization Rate	CV	Relative Precision at 85% C.L.
Direct_Install-2	20	2,395	86.5%	0.4	100%
Direct_Install-1	0	134	86.5%	0.4	100%
Program Total	n/a	2,529	86.5%	0.4	100.0%

### T.1.3 Results for Demand

The gross realization rates for demand, along with relative precisions, are shown in Table 403, Table 404, Table 405, and Table 406 for Met-Ed, Penelec, Penn Power, and WPP respectively.

**Table 403: CI Direct Install Initiative Demand Gross Realization Rates for Met-Ed**

Stratum	MWh Threshold	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
Direct_Install-2	20	0.03	108.7%	0.4	100%
Direct_Install-1	0	0.00	108.7%	0.4	100%
Program Total	n/a	0.03	108.7%	0.4	100.0%

**Table 404: CI Direct Install Initiative Demand Gross Realization Rates for Penelec**

Stratum	MWh Threshold	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
Direct_Install-2	20	0.06	104.0%	0.4	100%
Direct_Install-1	0	0.01	104.3%	0.4	100%
Program Total	n/a	0.07	104.0%	0.4	100.0%

**Table 405: CI Direct Install Initiative Gross Realization Rates for Penn Power**

Stratum	MWh Threshold	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
Direct_Install-2	20	0.04	94.6%	0.4	100%
Direct_Install-1	0	0.00	94.6%	0.4	100%
Program Total	n/a	0.04	94.6%	0.4	100.0%

**Table 406: CI Direct Install Initiative Demand Gross Realization Rates for WPP**

Stratum	MWh Threshold	PYRTD MW/yr	Demand Realization Rate	CV	Relative Precision at 85% C.L.
Direct_Install-2	20	0.20	93.9%	0.4	100%
Direct_Install-1	0	0.01	93.9%	0.4	100%
Program Total	n/a	0.21	93.9%	0.4	100.0%

## T.2 NET IMPACT EVALUATION

An independent net impact evaluation was not conducted for this initiative because the initiative had very low participation throughout Phase III. The NTG of the Direct Install Initiative is taken to be the same as for the Lighting Initiative, as all rebated projects to date were found to be lighting retrofits.

# Appendix U Evaluation Detail – Behavioral Demand Response Initiative

## U.1 DATA GATHERING

Interval meter data dating back to January of 2017 through August of 2017 was requested from FirstEnergy for all treatment and control group participants. A map of customer account numbers to treatment v. control group assignment was provided by Oracle. Furthermore, historical weather data for 2017 was obtained from DegreeDays.net for the Allegheny County Airport.

## U.2 DATA PREPARATION

Per the guidance set forth by the Act 129 Evaluation Framework and the 2016 TRM, ADM utilized a post-only model with lagged customer-specific control variables to conduct our analysis. We first isolated the data set into event and baseline data sets to reduce the computing resources necessary to conduct our analysis. Because the treatment effect is isolated at the hourly level per event day, limiting the post-only data to solely the hours of the events has no bearing on the result. The event day data was defined as 2 p.m. to 6 p.m. on the three event days

The experimental cohort for Penn Power began participation in the summer of 2017 (PY9), with AMI data available beginning February of 2017; while the experimental cohorts began participation in the summer of 2018 (PY10), with verified AMI data available beginning January of 2018. Hourly interval meter data dating back to February of 2017 was provided for all control and treatment group customers. Hourly weather data was obtained from the KAGC airport weather station for Penn Power and West Penn Power customers, while Met-Ed utilized weather data from the KRDG weather station. An event-hour indicator was generated with a value of 1 for all hours falling under the event-period and a 0 otherwise.

Baseline control variables were created for all participants in a similar fashion to the three control variables used in the lagged seasonal model. ADM created three customer-specific control variables that represented average energy demand during typical periods of “no cooling,” “medium cooling,” and “high cooling.” Periods of “no cooling” were defined as non-holiday weekday hours between 2 p.m. and 6 p.m. in May of 2017 with a temperature above or equal to 60 degrees Fahrenheit and below 70 degrees. “Medium cooling” was defined similarly to “no cooling” except for referring to periods in which the temperature was equal to or above 70 degrees and below 80 degrees. “High cooling” was defined in the same with the exception to referring to temperatures above 80 degrees.

### U.3 REGRESSION ANALYSIS

Similar to the evaluation of the Residential Behavioral Modification subprogram, ADM utilized a post-only model which made use of customer-specific baseline control variables generated in the month immediately prior to the first event day (i.e., May of 2017). ADM restricted the baseline period to the month immediately prior to the first event day as it is believed that most of the demand reduction is due to reductions in cooling load during the event period. Therefore, restricting the baseline period to May of 2017 provides the closest match in temperature available during the pre-treatment period. Furthermore, ADM generated three baseline variables for each customer (“no cooling,” “medium cooling,” and “high cooling”) to capture the variability in each customer’s energy demand during periods that can typically be attributed to different levels of cooling demand based on the temperature.

The post-only model is specified in the equation below:

$$kW_{ieh} = \beta_0 + \beta_1 * (NoCooling_i + MediumCooling_i + HighCooling_i) + \beta_2 * datetime_{eh} + \tau_{eh} * datetime_{eh} * treatment_i + \varepsilon$$

The variables above are defined in Table 407 below. The regression coefficient of the interaction between the date/time of each event hour and the treatment indicator variable represents the average treatment effect per home for each hour of each event. A negative regression coefficient represents demand savings per household. Multiplying each coefficient by the number of treatment homes represents the total demand savings for each event-hour.

**Table 407: Definition of variables in the lagged seasonal regression model.**

Variable	Definition
$kW_{ieh}$	Customer i’s energy demand during each event hour.
$\beta_0$	Intercept of the regression equation.
$\beta_1$	A matrix of regression coefficients representing the impact of the pre-treatment baseline variables on the regression equation.
$\beta_1$	A matrix of regression coefficients representing the main effect of time.
$NoCooling_i$	A customer’s average baseline usage during periods of no cooling, as defined in the previous section.
$MediumCooling_i$	A customer’s average baseline usage during periods of medium cooling, as defined in the previous section.
$HighCooling_i$	A customer’s average baseline usage during periods of high cooling, as defined in the previous section.
$treatment_i$	The treatment indicator variable. Equal to one for the treatment group and zero for the control group.
$datetime_{eh}$	A matrix of indicator variables representing each hour of each event period.
$\tau_{eh}$	A matrix of regression coefficients representing the treatment effect in each of hour of each event day.
$\varepsilon$	The error term.

# Appendix V PYTD and P3TD Summary by Customer Segment and Carveout

## V.1 VERIFIED IMPACT SUMMARY TABLES

Table 408 and Table 409 present the verified energy savings and demand reduction respectively by program, customer sector, and carveout for PY12. Table 410 and Table 411 present the verified energy savings and demand reduction respectively by program, customer sector, and carveout for Phase III. The residential, Small C&I, Large C&I sectors are defined by EDC tariff and the residential low-income and governmental/educational/non-profit sector carveouts were defined by statute (66 Pa. C.S. § 2806.1).



**Table 408: PYTD Verified Energy Savings by Program, Customer Sector, and Carveout**

Utility	Program	Residential (Non-LI)	Residential LI	Small C&I (Non-GNI)	Large C&I (Non-GNI)	GNI
Met-Ed	Appliance Turn-in	2,877	0	0	0	0
	Energy Efficient Homes	21,991	0	0	0	0
	Energy Efficient Products	16,043	0	1,082	0	660
	Low Income Energy Efficiency	0	3,688	0	0	0
	C&I Energy Solutions for Business - Small	0	0	13,637	0	1,315
	C&I Demand Response - Small	0	0	0	0	0
	C&I Energy Solutions for Business - Large	0	0	0	34,799	6,387
	C&I Demand Response - Large	0	0	0	0	0
	Governmental & Institutional Tariff	0	0	0	0	478
<b>Portfolio Total</b>	<b>40,911</b>	<b>3,688</b>	<b>14,719</b>	<b>34,799</b>	<b>8,840</b>	
Penelec	Appliance Turn-in	2,295	0	0	0	0
	Energy Efficient Homes	14,653	0	0	0	0
	Energy Efficient Products	16,341	0	1,110	0	677
	Low Income Energy Efficiency	0	2,520	0	0	0
	C&I Energy Solutions for Business - Small	0	0	13,852	0	2,638
	C&I Demand Response - Small	0	0	0	0	0
	C&I Energy Solutions for Business - Large	0	0	0	22,360	3,783
	C&I Demand Response - Large	0	0	0	0	0
	Governmental & Institutional Tariff	0	0	0	0	1,396
<b>Portfolio Total</b>	<b>33,288</b>	<b>2,520</b>	<b>14,963</b>	<b>22,360</b>	<b>8,493</b>	
Penn Power	Appliance Turn-in	0	0	0	0	0
	Energy Efficient Homes	5,509	0	0	0	0
	Energy Efficient Products	4,243	0	233	0	142
	Low Income Energy Efficiency	0	755	0	0	0
	C&I Energy Solutions for Business - Small	0	0	10,272	0	653
	C&I Demand Response - Small	0	0	0	0	0
	C&I Energy Solutions for Business - Large	0	0	0	1,594	199
	C&I Demand Response - Large	0	0	0	0	0
	Governmental & Institutional Tariff	0	0	0	0	0
<b>Portfolio Total</b>	<b>9,752</b>	<b>755</b>	<b>10,505</b>	<b>1,594</b>	<b>994</b>	
West Penn Power	Appliance Turn-in	2,581	0	0	0	0
	Energy Efficient Homes	19,734	0	0	0	0
	Energy Efficient Products	19,106	0	1,284	0	783
	Low Income Energy Efficiency	0	2,405	0	0	0
	C&I Energy Solutions for Business - Small	0	0	20,367	0	2,518
	C&I Demand Response - Small	0	0	0	0	0
	C&I Energy Solutions for Business - Large	0	0	0	27,890	8,322
	C&I Demand Response - Large	0	0	0	0	0
	Governmental & Institutional Tariff	0	0	0	0	1
<b>Portfolio Total</b>	<b>41,421</b>	<b>2,405</b>	<b>21,651</b>	<b>27,890</b>	<b>11,623</b>	

**Table 409: PYTD Demand Reductions by Program, Customer Sector, and Carveout**

Utility	Program	Residential (Non-LI)	Residential LI	Small C&I (Non-GNI)	Large C&I (Non-GNI)	GNI
Met-Ed	Appliance Turn-in	0.39	0.00	0.00	0.00	0.00
	Energy Efficient Homes	3.08	0.00	0.00	0.00	0.00
	EEH: Behavioral Demand Response	8.94	0.00	0.00	0.00	0.00
	Energy Efficient Products	2.21	0.00	0.21	0.00	0.13
	Low Income Energy Efficiency	0.00	0.42	0.00	0.00	0.00
	C&I Energy Solutions for Business - Small	0.00	0.00	1.93	0.00	0.21
	C&I Demand Response - Small	0.00	0.00	1.73	0.00	0.05
	C&I Energy Solutions for Business - Large	0.00	0.00	0.00	4.36	1.20
	C&I Demand Response - Large	0.00	0.00	0.00	32.89	2.39
	Governmental & Institutional Tariff	0.00	0.00	0.00	0.00	0.00
	Portfolio Total	14.63	0.42	3.88	37.25	3.98
Penelec	Appliance Turn-in	0.32	0.00	0.00	0.00	0.00
	Energy Efficient Homes	1.76	0.00	0.00	0.00	0.00
	EEH: Behavioral Demand Response	0.00	0.00	0.00	0.00	0.00
	Energy Efficient Products	1.91	0.00	0.22	0.00	0.13
	Low Income Energy Efficiency	0.00	0.29	0.00	0.00	0.00
	C&I Energy Solutions for Business - Small	0.00	0.00	2.19	0.00	0.57
	C&I Demand Response - Small	0.00	0.00	0.00	0.00	0.00
	C&I Energy Solutions for Business - Large	0.00	0.00	0.00	3.61	0.83
	C&I Demand Response - Large	0.00	0.00	0.00	0.00	0.00
	Governmental & Institutional Tariff	0.00	0.00	0.00	0.00	0.00
	Portfolio Total	3.99	0.29	2.41	3.61	1.53
Penn Power	Appliance Turn-in	0.00	0.00	0.00	0.00	0.00
	Energy Efficient Homes	0.95	0.00	0.00	0.00	0.00
	EEH: Behavioral Demand Response	1.55	0.00	0.00	0.00	0.00
	Energy Efficient Products	0.59	0.00	0.05	0.00	0.03
	Low Income Energy Efficiency	0.00	0.09	0.00	0.00	0.00
	C&I Energy Solutions for Business - Small	0.00	0.00	1.24	0.00	0.10
	C&I Demand Response - Small	0.00	0.00	0.00	0.00	0.00
	C&I Energy Solutions for Business - Large	0.00	0.00	0.00	0.25	0.02
	C&I Demand Response - Large	0.00	0.00	0.00	10.17	-0.08
	Governmental & Institutional Tariff	0.00	0.00	0.00	0.00	0.00
	Portfolio Total	3.08	0.09	1.28	10.42	0.07
West Penn Power	Appliance Turn-in	0.34	0.00	0.00	0.00	0.00
	Energy Efficient Homes	2.86	0.00	0.00	0.00	0.00
	EEH: Behavioral Demand Response	2.83	0.00	0.00	0.00	0.00
	Energy Efficient Products	2.91	0.00	0.25	0.00	0.15
	Low Income Energy Efficiency	0.00	0.26	0.00	0.00	0.00
	C&I Energy Solutions for Business - Small	0.00	0.00	3.00	0.00	0.48
	C&I Demand Response - Small	0.00	0.00	1.19	0.00	-0.04
	C&I Energy Solutions for Business - Large	0.00	0.00	0.00	3.77	1.24
	C&I Demand Response - Large	0.00	0.00	0.00	87.38	-0.04
	Governmental & Institutional Tariff	0.00	0.00	0.00	0.00	0.00
	Portfolio Total	8.95	0.26	4.44	91.15	1.79

**Table 410: VTD Verified Energy Savings by Program, Customer Sector, and Carveout**

Utility	Program	Residential (Non-LI)	Residential LI	Small C&I (Non-GNI)	Large C&I (Non-GNI)	GNI
Met-Ed	Appliance Turn-in	19,786	0	0	0	0
	Energy Efficient Homes	230,887	183	0	0	0
	Energy Efficient Products	140,278	0	14,390	0	5,146
	Low Income Energy Efficiency	0	42,563	0	0	0
	C&I Energy Solutions for Business - Small	0	0	108,270	0	7,518
	C&I Demand Response - Small	0	0	0	0	0
	C&I Energy Solutions for Business - Large	0	0	0	157,644	22,491
	C&I Demand Response - Large	0	0	0	0	0
	Governmental & Institutional Tariff	0	0	0	0	2,498
<b>Portfolio Total</b>	<b>390,952</b>	<b>42,746</b>	<b>117,660</b>	<b>157,644</b>	<b>37,654</b>	
Penelec	Appliance Turn-in	17,792	0	0	0	0
	Energy Efficient Homes	175,590	355	0	0	0
	Energy Efficient Products	150,448	0	14,970	0	5,099
	Low Income Energy Efficiency	0	41,250	0	0	0
	C&I Energy Solutions for Business - Small	0	0	97,750	0	20,770
	C&I Demand Response - Small	0	0	0	0	0
	C&I Energy Solutions for Business - Large	0	0	0	135,921	31,563
	C&I Demand Response - Large	0	0	0	0	0
	Governmental & Institutional Tariff	0	0	0	0	4,687
<b>Portfolio Total</b>	<b>343,830</b>	<b>41,605</b>	<b>112,720</b>	<b>135,921</b>	<b>62,117</b>	
Penn Power	Appliance Turn-in	4,890	0	0	0	0
	Energy Efficient Homes	52,582	206	0	0	0
	Energy Efficient Products	53,231	0	5,153	0	1,961
	Low Income Energy Efficiency	0	11,953	0	0	0
	C&I Energy Solutions for Business - Small	0	0	56,116	0	6,069
	C&I Demand Response - Small	0	0	0	0	0
	C&I Energy Solutions for Business - Large	0	0	0	28,603	1,236
	C&I Demand Response - Large	0	0	0	0	0
	Governmental & Institutional Tariff	0	0	0	0	1,948
<b>Portfolio Total</b>	<b>110,704</b>	<b>12,159</b>	<b>61,269</b>	<b>28,603</b>	<b>11,214</b>	
West Penn Power	Appliance Turn-in	22,769	0	0	0	0
	Energy Efficient Homes	173,559	577	0	0	0
	Energy Efficient Products	160,837	0	15,492	0	5,567
	Low Income Energy Efficiency	0	37,447	0	0	0
	C&I Energy Solutions for Business - Small	0	0	113,308	0	19,876
	C&I Demand Response - Small	0	0	0	0	0
	C&I Energy Solutions for Business - Large	0	0	0	99,721	38,690
	C&I Demand Response - Large	0	0	0	0	0
	Governmental & Institutional Tariff	0	0	0	0	21,624
<b>Portfolio Total</b>	<b>357,165</b>	<b>38,024</b>	<b>128,800</b>	<b>99,721</b>	<b>85,757</b>	

**Table 411: VTD Demand Reductions by Program, Customer Sector, and Carveout**

Utility	Program	Residential (Non-LI)	Residential LI	Small C&I (Non-GNI)	Large C&I (Non-GNI)	GNI
Met-Ed	Appliance Turn-in	2.72	0.00	0.00	0.00	0.00
	Energy Efficient Homes	28.45	0.03	0.00	0.00	0.00
	EEH: Behavioral Demand Response	6.68	0.00	0.00	0.00	0.00
	Energy Efficient Products	17.77	0.00	2.95	0.00	0.99
	Low Income Energy Efficiency	0.00	4.92	0.00	0.00	0.00
	C&I Energy Solutions for Business - Small	0.00	0.00	15.45	0.00	1.07
	C&I Demand Response - Small	0.00	0.00	0.83	0.00	2.13
	C&I Energy Solutions for Business - Large	0.00	0.00	0.00	20.57	3.92
	C&I Demand Response - Large	0.00	0.00	0.00	35.55	5.89
	Governmental & Institutional Tariff	0.00	0.00	0.00	0.00	0.03
	<b>Portfolio Total</b>	<b>55.63</b>	<b>4.95</b>	<b>19.23</b>	<b>56.12</b>	<b>14.03</b>
Penelec	Appliance Turn-in	2.38	0.00	0.00	0.00	0.00
	Energy Efficient Homes	19.27	0.04	0.00	0.00	0.00
	EEH: Behavioral Demand Response	0.00	0.00	0.00	0.00	0.00
	Energy Efficient Products	16.68	0.00	3.08	0.00	0.98
	Low Income Energy Efficiency	0.00	4.43	0.00	0.00	0.00
	C&I Energy Solutions for Business - Small	0.00	0.00	14.18	0.00	3.30
	C&I Demand Response - Small	0.00	0.00	0.00	0.00	0.00
	C&I Energy Solutions for Business - Large	0.00	0.00	0.00	17.02	3.87
	C&I Demand Response - Large	0.00	0.00	0.00	0.00	0.00
	Governmental & Institutional Tariff	0.00	0.00	0.00	0.00	0.06
	<b>Portfolio Total</b>	<b>38.33</b>	<b>4.47</b>	<b>17.27</b>	<b>17.02</b>	<b>8.22</b>
Penn Power	Appliance Turn-in	0.63	0.00	0.00	0.00	0.00
	Energy Efficient Homes	7.67	0.02	0.00	0.00	0.00
	EEH: Behavioral Demand Response	1.90	0.00	0.00	0.00	0.00
	Energy Efficient Products	6.68	0.00	1.05	0.00	0.38
	Low Income Energy Efficiency	0.00	1.39	0.00	0.00	0.00
	C&I Energy Solutions for Business - Small	0.00	0.00	7.74	0.00	0.93
	C&I Demand Response - Small	0.00	0.00	-0.02	0.00	0.05
	C&I Energy Solutions for Business - Large	0.00	0.00	0.00	3.33	0.06
	C&I Demand Response - Large	0.00	0.00	0.00	29.89	0.19
	Governmental & Institutional Tariff	0.00	0.00	0.00	0.00	0.07
	<b>Portfolio Total</b>	<b>16.87</b>	<b>1.41</b>	<b>8.77</b>	<b>33.22</b>	<b>1.68</b>
West Penn Power	Appliance Turn-in	2.97	0.00	0.00	0.00	0.00
	Energy Efficient Homes	22.74	0.08	0.00	0.00	0.00
	EEH: Behavioral Demand Response	2.50	0.00	0.00	0.00	0.00
	Energy Efficient Products	21.68	0.00	3.18	0.00	1.07
	Low Income Energy Efficiency	0.00	4.38	0.00	0.00	0.00
	C&I Energy Solutions for Business - Small	0.00	0.00	15.80	0.00	3.13
	C&I Demand Response - Small	0.00	0.00	1.35	0.00	0.00
	C&I Energy Solutions for Business - Large	0.00	0.00	0.00	12.60	4.53
	C&I Demand Response - Large	0.00	0.00	0.00	102.67	0.02
	Governmental & Institutional Tariff	0.00	0.00	0.00	0.00	0.21
	<b>Portfolio Total</b>	<b>49.89</b>	<b>4.46</b>	<b>20.33</b>	<b>115.27</b>	<b>8.96</b>

# Appendix W Report Validation

## W.1 LINKED IMAGES

Most tables and charts in this report are images that are generated within an excel file. The last image should reflect the time and date of report compilation.

**Table 412: Report Update Timestamp**

<b>Tables and Charts Updated on 11/14/21, at 21:02</b>
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**BEFORE THE  
PENNSYLVANIA PUBLIC UTILITY COMMISSION**

**Final Annual Report to the Pennsylvania Public :  
Utility Commission and Act 129 Statewide :  
Evaluator; Phase III Program Period June 1, 2020:  
to May 31, 2021 for Metropolitan Edison :           Docket No. M-2015-2514767, et. al  
Company, Pennsylvania Electric Company, :  
Pennsylvania Power Company and West Penn :  
Power Company :**

**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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