

Preliminary Annual Report to the Pennsylvania Public Utility Commission

Phase III of Act 129

Program Year 10

(June 1, 2018 – May 31, 2019)

For Pennsylvania Act 129 of 2008

Energy Efficiency and Conservation Plan

Prepared by Cadmus

For

PPL Electric Utilities

July 15, 2019

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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
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
GNE	Government, Non-Profit, Education
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
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 + PYTD
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.

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.

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.

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).

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.¹

¹ PPL Electric Utilities did not claim Phase II carryover.

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 2013 and concluded in 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 for PPL Electric Utilities in Program Year 10 (PY10), as well as the cumulative accomplishments of the Phase III programs since inception.

This report details the participation, spending, and reported gross impacts of the energy efficiency programs in PY10. Compliance with Act 129 savings goals are ultimately based on verified gross savings. PPL Electric Utilities has retained Cadmus as an independent evaluation contractor for Phase III of Act 129. Cadmus is responsible for the measurement and verification of the savings and calculation of verified gross savings. The verified gross savings for PY10 energy efficiency programs will be reported in the final annual report, to be filed on November 15, 2019.

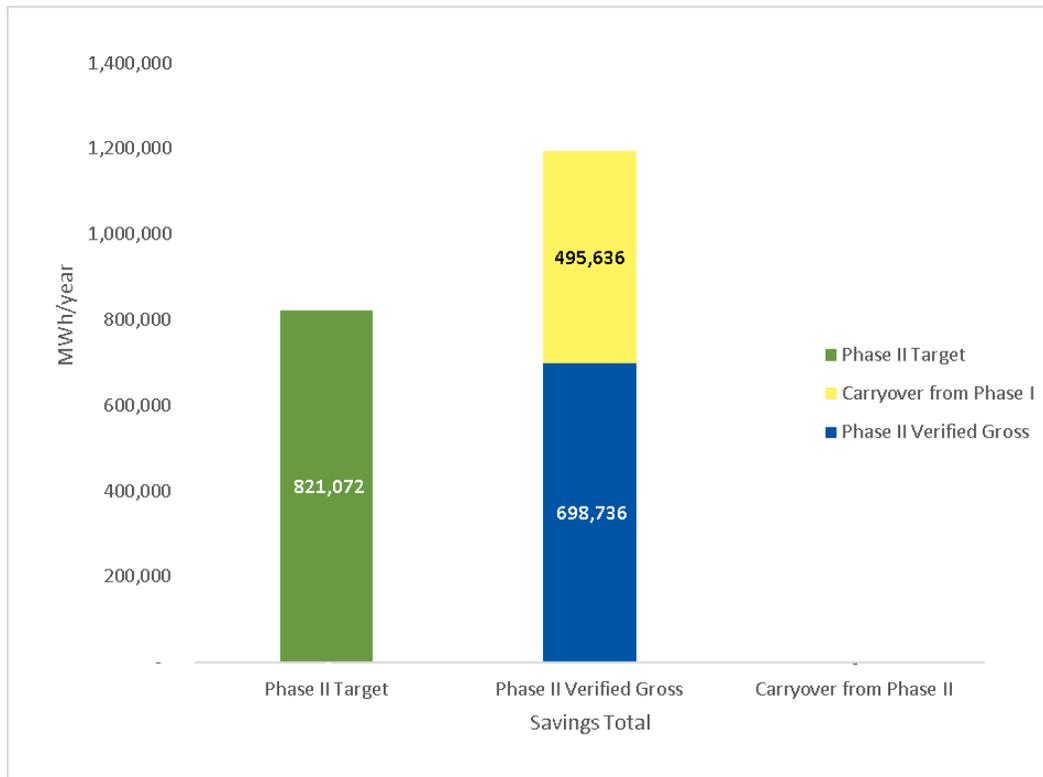
Phase III of Act 129 includes a demand response goal for PPL Electric Utilities. Demand response events are limited to the months of June through September, which are the first four months of the Act 129 program year. Because the demand response season is completed early in the program year, it is possible to complete the independent evaluation of verified gross savings for demand response sooner than is possible for energy efficiency programs. Section 6.2 of this report includes the verified gross demand response impacts for PY10 as well as the cumulative demand response performance of this EE&C program to date for Phase III of Act 129.

2 Summary of Achievements

2.1 CARRYOVER SAVINGS FROM PHASE II OF ACT 129

PPL Electric Utilities does not have carryover savings from Phase II. Figure 1 compares PPL Electric Utilities’ Phase II verified gross savings total to the Phase II compliance target to illustrate the carryover calculation.

Figure 1: Carryover Savings from Phase II of Act 129



The Commission’s Phase III Implementation Order² also allowed EDCs to carry over savings in excess of the overall (portfolio) Phase II savings compliance target, in excess of the Phase II GNE savings compliance target and in excess of the Phase II low-income savings compliance target.³ PPL Electric Utilities did not have carry over savings for the portfolio but did exceed its Phase II compliance targets for GNE and low-income.

² 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.

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

However, in the August 3, 2017, Compliance Order,⁴ the PA PUC determined that because PPL Electric Utilities did not obtain Phase II savings in excess of its Phase II consumption reduction requirement, PPL Electric Utilities was not entitled to any GNE or low-income sector carryover savings into Phase III.

2.2 PHASE III ENERGY EFFICIENCY ACHIEVEMENTS TO DATE

Since the beginning of Program Year 10 on June 1, 2018, PPL Electric Utilities has claimed:

- 416,864 MWh/yr of reported gross electric energy savings (PYRTD).
- 57.49 MW/yr of reported gross peak demand savings (PYRTD) from energy efficiency programs.
- 111.5 MW of reported gross peak demand reduction (PYRTD) from the demand response program.

Since the beginning of Phase III of Act 129 on June 1, 2016, PPL Electric Utilities has reported:

- 1,197,068 MWh/yr of reported gross electric energy savings (RTD).
- 213.86 MW/yr of reported gross peak demand savings (RTD) from energy efficiency programs.
- 112.73 MW of reported gross peak demand savings (RTD) from the demand response program, reported as the average demand reduction across all PY9 and PY10 Act 129 demand response events.

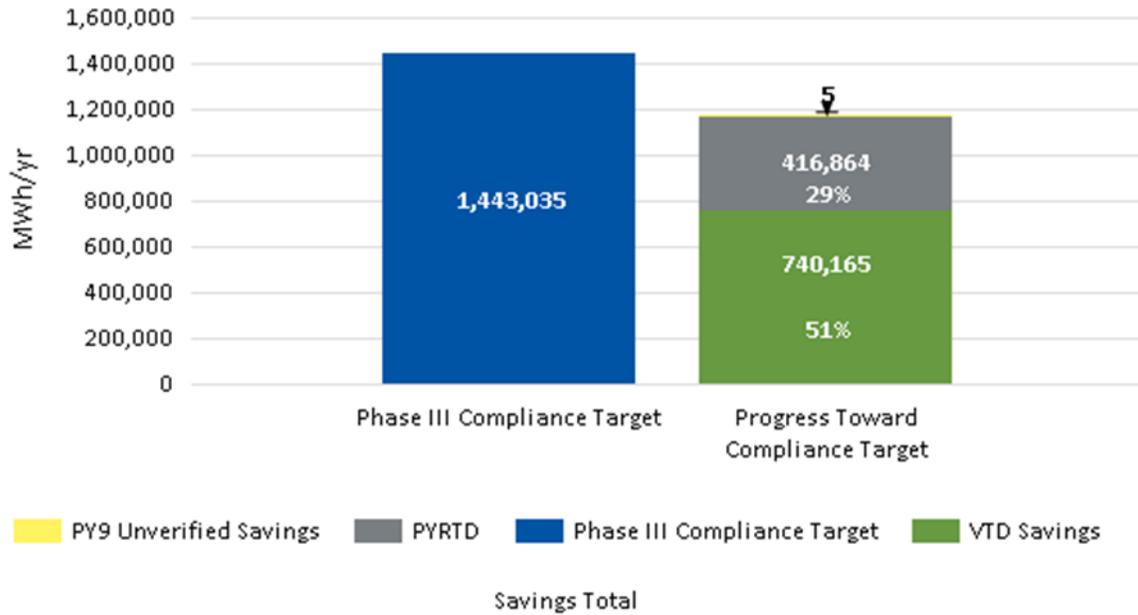
Since the beginning of Phase III of Act 129 on June 1, 2016, PPL Electric Utilities has achieved the following verified gross savings plus PY10 reported gross savings (PSA):

- 1,157,029 MWh/yr of gross electric energy savings (PSA). This total includes verified gross savings from previous Phase III program years⁵ and the PYTD reported gross savings from PY10.
 - 5 MWh/yr from PY9 remain unverified, thus are not included in PSA.
 - The PSA represents 80 percent of the May 31, 2021, energy savings compliance target of 1,443,035 MWh/yr.
- 161.72 MW/yr of gross peak demand savings (PSA) from energy efficiency programs. This total includes verified gross savings from previous Phase III program years and the PYTD reported gross savings from PY10.
- 116.60 MW of verified gross peak demand savings (PSA) from demand response programs, calculated as the average demand savings across all PY9 and PY10 Act 129 demand response events.

⁴ The Order addresses the EDCs' compliance with the Phase II energy reduction targets and the Petitions for reconsideration of the April 6, 2017, Compliance Order filed by Duquesne, PECO, and PPL Electric Utilities. Pennsylvania Public Utility Commission. Act 129 Phase II Final Compliance Order. Docket No. M-2012-2289411. Adopted August 3, 2017. Available online: http://www.puc.pa.gov/filing_resources/issues_laws_regulations/act_129_information/energy_efficiency_and_conservation_e_e_c_program.aspx

⁵ Verified savings from previous program years have been adjusted to account for Home Energy Education Program energy savings uplift (see Appendix C in the PY9 Annual Report). Uplift results in savings counted in more than one program; therefore, an adjustment is made to prevent double counting. Verified savings for the Home Energy Education Program and the Efficient Lighting Program, as well as uplift adjustments, reflect changes made subsequent to the PY9 Annual Report (see Table Note 3 in Table 6). Unverified savings from PY9 are not included in PSA.

Figure 2: EE&C Plan Performance Toward Phase III Portfolio Compliance Target

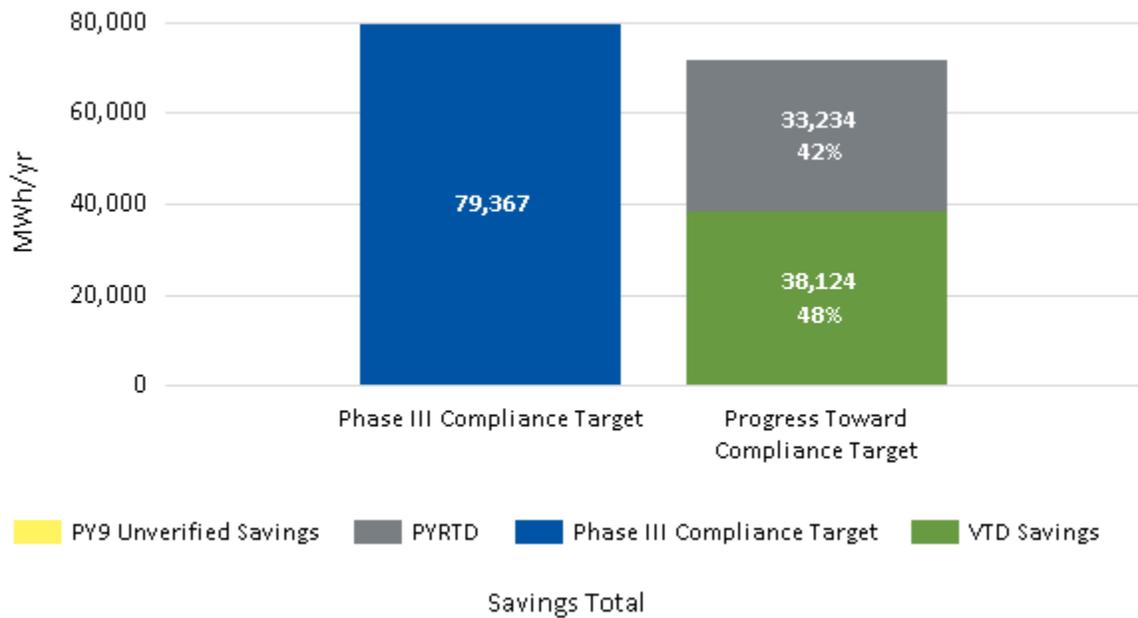


Both verified savings for the Home Energy Education Program and uplift adjustments reflect corrections made subsequent to the filed PY9 Annual Report (see Table Note 3 in Table 6). PY9 verified savings for Efficient Lighting were reduced by 282 MWh to conform with the SWE PY9 annual report findings.

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 target for PPL Electric Utilities is 9.95%. PPL Electric Utilities offers a total of 109 EE&C measures to its residential and non-residential customer classes. There are 22 measures available to the low-income customer segment at no cost to the customer. This represents 20% of the total measures offered in the EE&C plan and exceeds the proportionate number of measures target.

The PA PUC also established a low-income energy savings target of 5.5% of the total portfolio savings target. The low-income savings target for PPL Electric Utilities is 79,367 MWh/yr and is based on verified gross savings. Figure 3 compares the PSA+CO performance to date for the low-income customer segment to the Phase III savings target. Based on the latest available information, PPL Electric Utilities has achieved 90% of the Phase III low-income energy savings target.

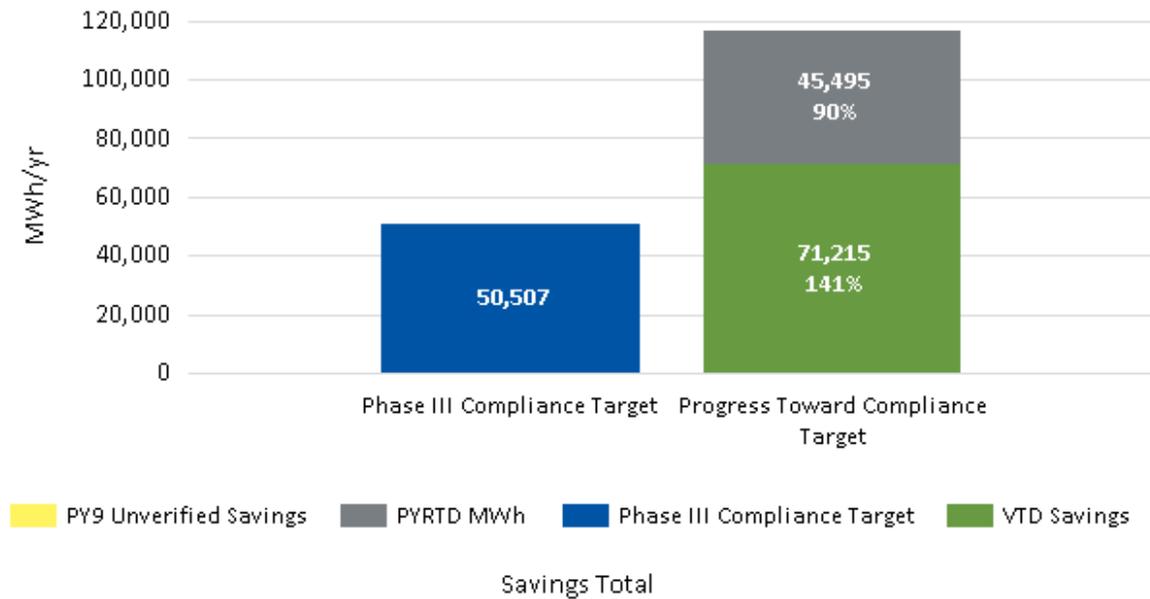
Figure 3: EE&C Plan Performance Toward Phase III Low-Income Compliance Target



Low-Income WRAP includes savings for master-metered multifamily projects that are allocated to the GNE and Small C&I sectors based on the rate class of the buildings’ meters. All savings from this program, including GNE and Small C&I savings, are counted toward the low-income compliance target, as set forth in PPL Electric Utilities EE&C Plan Act 129 Phase III, Docket No. M-2015-2515642, November 2018 and included in this figure. Therefore, the total savings shown here do not match the totals in Table 3. The additional savings counted toward the low-income compliance target total 1,240 MWh/yr of verified savings: 1,028 MWh/yr from GNE and 212 MWh/yr from Small C&I, and 1,591 MWh/yr of reported savings from PY10: 1,333 MWh/yr from GNE and 258 MWh/yr from Small C&I.

The Phase III Implementation Order established a government, non-profit, and educational energy savings target of 3.5% of the total portfolio savings target. The GNE savings target for PPL Electric Utilities is 50,507 MWh/yr and is based on verified gross savings. Figure 4 compares the PSA+CO performance to date for the GNE customer segment to the Phase III savings target. Based on the latest available information, PPL Electric Utilities has achieved 231% of the Phase III GNE energy savings target.

Figure 4: EE&C Plan Performance Toward Phase III GNE Compliance Target



Low-Income WRAP includes savings for master-metered multifamily projects that are allocated to the GNE and Small C&I sectors based on the rate class of the buildings’ meters. All savings from the WRAP program are counted toward the low-income compliance target, as set forth in PPL Electric Utilities EE&C Plan Act 129 Phase III, Docket No. M-2015-2515642, November 2018. Therefore, the savings in this figure do not include the 1,028 verified MWh/yr and 1,333 reported MWh/yr GNE savings allocated to Low-Income WRAP and do not match the GNE savings in Table 3.

2.3 PHASE III DEMAND RESPONSE ACHIEVEMENTS TO DATE

The Phase III demand response performance target for PPL Electric Utilities is 92 MW per event hour. Compliance targets for demand response programs are based on average performance across events and 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.

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 PY10, there were 6 demand response events called.

Table 1 lists the days that DR events were called along with the verified gross demand reductions achieved by each program. The table also lists the average DR performance for PY10 and for Phase III to date. PPL Electric Utilities’ average DR performance to date is above the Phase III compliance reduction target by 27%.

Table 1: PY10 Demand Response PYVTD Performance by Event

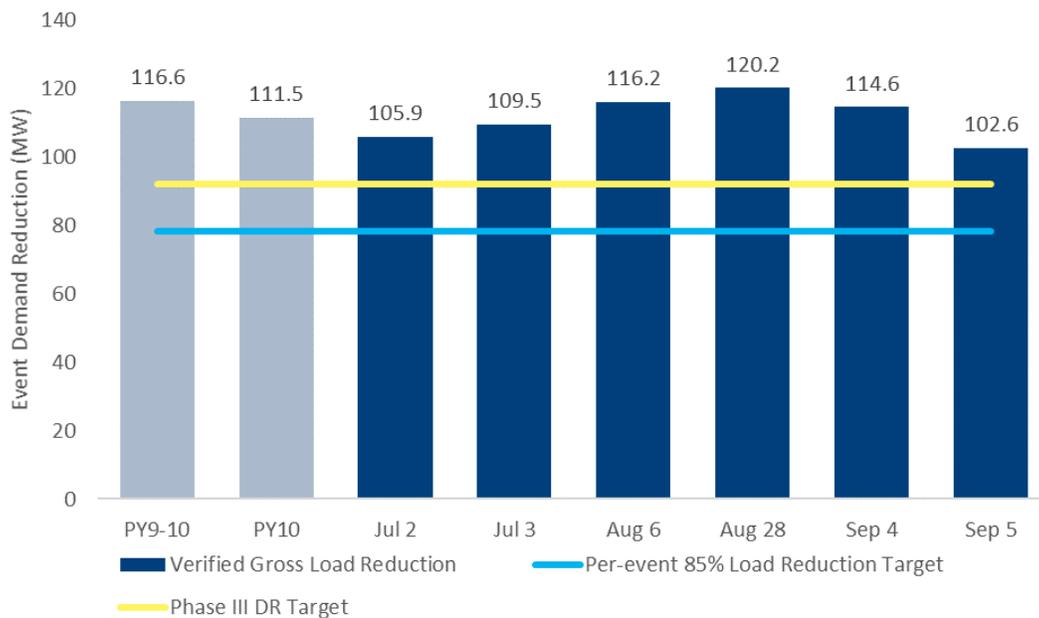
Event Date	Start Hour	End Hour	Small CI Load Curtailment	Large CI Load Curtailment	GNE Load Curtailment	Portfolio MW/event Impact ^[1]
July 2, 2018	2:00 p.m.	6:00 p.m.	1.9	97.2	6.8	105.9
July 3, 2018	2:00 p.m.	6:00 p.m.	1.4	101.8	6.3	109.5
August 6, 2018	2:00 p.m.	6:00 p.m.	1.8	108.1	6.3	116.2
August 28, 2018	2:00 p.m.	6:00 p.m.	1.6	114.5	4.1	120.2
September 4, 2018	2:00 p.m.	6:00 p.m.	1.9	110.9	1.8	114.6
September 5, 2018	2:00 p.m.	6:00 p.m.	1.8	99.2	1.6	102.6
PYVTD - Average PY10 DR Event Performance						111.5
VTD - Average Phase III DR Event Performance						116.6

^[1] Portfolio MW/event may not equal sum of customer segment MW/event because of rounding error.

The Commission’s Phase III Implementation Order also established a requirement that EDCs achieve at least 85% of the Phase III compliance reduction target in each DR event. For PPL Electric Utilities, this translates to a 78.2 MW minimum for each DR event. Figure 5 compares the performance of each of the DR events in PY10 to the event-specific minimum and average targets.

These reported load impacts are based on Cadmus’ analysis of participant AMI consumption data and have been grossed up to reflect transmission and distribution losses.

Figure 5: Event Performance Compared to 85% Per-Event Target



2.4 PHASE III PERFORMANCE BY CUSTOMER SEGMENT

Table 2 presents the participation, savings, and spending by customer sector for PY10. The residential, small C&I, and large C&I sectors are defined by EDC tariff and the residential low-income and governmental/non-profit/educational 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 GNE 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 GNE segments have been removed from the parent sectors in Table 2.

Table 2: PY10 Summary Statistics by Customer Segment

Parameter	Residential ^[1]	Low-Income	Small C&I ^[1]	Large C&I	GNE	Total ^[2]
Number of Participants ^{[3][5]}	474,992	32,690	18,294	971	2,413	529,361
PYRTD MWh/yr	168,281	31,642	104,969	65,144	46,828	416,864
PYRTD MW/yr (Energy Efficiency)	23.52	2.73	17.24	8.53	5.47	57.49
PYVTD MW/yr (Demand Response) ^[4]	N/A	N/A	1.7	105.3	4.6	111.5
Incentives (\$1000)	\$6,610	\$0	\$8,214	\$5,665	\$2,599	\$23,087

^[1] 24,619 of reported MWh/yr from Efficient Lighting are attributed to Small C&I.

^[2] Total may not sum due to rounding.

^[3] See Table 5 for participant definitions.

^[4] Savings are presented as the average of the total demand response savings per event across the July 2, July 3, August 6, August 28, September 4, and September 5 Act 129 events.

^[5] The Residential Lighting participant count will be updated for the Annual Report delivered Nov. 2019 using PY10 survey data.

Table 3 summarizes plan performance by sector since the beginning of Phase III.

Table 3: Phase III Summary Statistics by Customer Segment

Parameter	Residential ^[1]	Low-Income	Small C&I ^[1]	Large C&I	GNE	Total ^[2]
Number of Participants ^[3]	1,216,956	72,774	55,876	1,693	4,844	1,352,143
PSA MWh/yr ^[4]	513,622	68,526	274,601	191,525	119,071	1,167,345
PSA MW/yr ^[4] (Energy Efficiency)	70.46	6.51	44.87	24.86	15.80	162.49
Phase III MW/yr (Demand Response) ^[5]	N/A	N/A	1.7	110.6	4.5	116.6
Incentives (\$1000)	\$27,581	\$0	\$16,256	\$13,146	\$7,140	\$64,123

^[1] 86,127 of PSA MWh/yr and 17.78 PSA MW from Efficient Lighting are attributed to Small C&I. The residential total is comprised of 39,455 jobs for EE Kits, 27,519 distinct WRAP accounts, and 5,800 WRAP giveaway bulbs. It does not include 433 WRAP GNE accounts and 20 WRAP Small C&I accounts included in the GNE and Small C&I counts.

^[2] Total may not sum due to rounding.

^[3] Please see Table 5 for participant definitions. Some participant definitions, e.g., Low-Income WRAP, have been retroactively changed.

^[4] The residential verified savings included in PSA MWh/yr and MW/yr have not been adjusted to account for energy savings uplift (double counting) in the Home Energy Education Program. As shown in Table 4 and Table 6, the double-counting adjustments applied to cumulative verified savings are -10,316 MWh and -0.77 MW. In this table, PY9 verified savings for Efficient Lighting were reduced by 282 MWh/yr to conform with the SWE PY9 annual report findings. The adjustment was divided proportionally (based on PY9 verified savings) between residential (78%) and small C&I sectors (22%).

^[5] Savings are presented as the average of the total demand response savings per event across the June 13, 2017, July 20, 2017, July 21, 2017, July 2, 2018, July 3, 2018, August 6, 2018, August 28, 2018, September 4, 2018, and September 5, 2018 Act 129 events.

3 Updates and Findings

3.1 IMPLEMENTATION UPDATES AND FINDINGS

PPL Electric Utilities filed an EE&C plan change in July 2018, which was approved by the PA PUC in November 2018.⁶ The plan change transferred dollars from DR to EE in the GNE Sector, transferred dollars from EE to DR in the Large C&I Sector, reduced the savings for the Small C&I Sector, increased the savings for the GNE Sector, and transferred dollars from the Residential Sector to the Low-Income Sector. All changes were accepted and approved by the PA PUC.

- **Appliance Recycling (residential sector).** Customers continue to provide PPL Electric Utilities with positive feedback for this program. There were over 14,200 participants in PY10 and over 38,400 phase-to-date who recycled refrigerators, freezers, room air conditioners, and dehumidifiers. Two small appliance recycling events were held at The Home Depot in PY10, in Lancaster and Dickson City. These events provided a convenient drop-off location for room air conditioners and dehumidifiers without the necessity of including a large appliance. Approximately 450 units were collected at the Lancaster event and over 1,000 units collected at the Dickson City event. During these events, PPL Electric Utilities partnered with a Girl Scout and Cub Scout troop for a food drive – a pack of LEDs was given to any customer who brought in two or more canned goods. PPL Electric Utilities utilized Facebook for the Lancaster event, receiving over 700 Facebook shares. For the Dickson City event, PPL Electric Utilities used its Connect Newsletter, a local newspaper, and social media to market the events. The success of the events shows the effectiveness of using various media outlets to reach PPL Electric Utilities’ customers.
- **Demand Response (nonresidential sector).** PPL Electric Utilities’ ICSP, CPower, along with CPower’s subcontractors, enrolled 64 customers’ facilities in the PY10 program, and 60 participated in at least one event. PPL Electric Utilities initiated six events during the summer of PY10 because the PJM Threshold trigger was met. The average performance of the events was 111.5 MWs, exceeding the program performance requirement of 92 MW per event and a minimum of 78.2 MWs per event.
- **Efficient Lighting (residential sector).** PPL Electric Utilities continued to see strong LED bulb sales with sales in PY10 exceeding 2,584,000 bulbs; over 9,000,000 bulbs were sold phase-to-date. PPL Electric Utilities continued to build upon the strong relationships with independent retailers established in PY8. There was a diverse mix of bulbs sold: general service (67%), reflector (17%), specialty (12%), and indoor fixtures (4%). The connected lighting pilot was launched in February 2018 and completed in November 2018. The intent of the pilot was to evaluate the adoption, use and energy savings potential of home automation and smart lighting technologies. The kit distributed through the pilot consisted of one central hub (Wink 2) and five pre-configured bulbs, including three A19 general service bulbs and two BR30 reflector bulbs used for recessed lighting. Throughout the pilot period, PPL Electric Utilities collected information about usage and usability from participating customers. A final survey was completed in November 2018 by 300 participants.

⁶ PPL Electric Utilities revised *Energy Efficiency and Conservation Plan Act 129 Phase III*. Docket No. M-2015-2515642. November 2018.

- **Energy Efficiency Kits and Education (residential low-income sector).** The Energy Efficiency Kits and Education program targets income eligible customers. The program is on target with more than 39,000 kits delivered through direct mail or one of the 20 participating community agencies. The program enjoys an extremely high customer satisfaction level of 98%.
- **Energy Efficient Home (residential sector).** Phase-to-date, this program has had over 64,600 participants across all program components. The ICSP reports over 46,000 customers have completed the online assessment and approximately 34,000 requested and received an energy efficiency kit for their home. Ductless heat pumps remain the most popular HVAC measure with approximately 1,800 projects in PY10. PPL Electric Utilities continues to experience strong performance in efficient new home construction with 1,002 homes-to-date in PY10. A new instant rebate pilot for heat pump water heaters was launched in November 2018 at Lowes locations and online; a second phase of this pilot will be launched in PY11 and will include an instant rebate for dehumidifiers. An online marketplace was launched in December 2018, powered by EFI. The marketplace offers discounted energy efficient products such as smart thermostats, lighting, smart strips and weatherization.
- **Home Energy Education (residential sector).** The Home Energy Education program sends Home Energy Reports to customers; it is not a rebate program. In PY10, approximately 173,000 customers received a report. An improved report was rolled out in PY10 that provided customers with more accurate comparisons and more personalized recommendations, resulting in a much lower opt out rate. In September and November 2018, A/B studies were conducted using the electronic HERs distribution by using nuanced language differences for a similar home comparison chart. The purpose of the study was to learn whether language differences change customer engagement levels or satisfaction. The new messaging received a favorable response and features increased customer engagement. In PY10, PPL Electric Utilities will claim savings for the residential sector from the program's four residential cohorts and the two low-income cohorts.
- **Low-Income WRAP (residential low-income sector).** This program is offered to income eligible customers. Interest and satisfaction remain high. The program has completed more than 33,500 weatherization jobs throughout Phase III, including participants in the Manufactured Home Initiative.
- **Continuous Energy Improvement (nonresidential sector).** In PY10, the focus for CEI was on the district-wide rollout for the four Phase III participating districts; monthly meetings monitor progress. PPL Electric Utilities is not recruiting new districts for participation in CEI for the remainder of Phase III.
- **Custom (nonresidential sector).** The Custom program continues to grow, with 35% of the non-residential savings in PY10 attributed to custom projects. PPL Electric Utilities Custom program includes a mix of HVAC, Advanced Lighting Controls, Process Improvement, CHP, and Motors projects that contributed to the program's savings.
- **Efficient Equipment (nonresidential sector).** PPL Electric Utilities continues to receive applications for prescriptive equipment rebate projects. About two percent of the overall savings for the non-residential portfolio are attributed to the prescriptive equipment projects.
- **Efficient Equipment Lighting (nonresidential sector).** About 50% of Non-Residential PY10 savings are attributed to Efficient Equipment lighting measures. Direct Discount (DD) contributes about 20% of the lighting savings, and that number continues to increase as PPL Electric Utilities expands its DD offering.
- **Midstream Lighting (nonresidential sector).** This program continues to grow. PPL Electric Utilities now has 27 Distributors with 94 locations and is continually working with more interested distributors. In PY10,

12% of total savings were attributed to the Distributor Instant Discount (DID) midstream lighting program. On January 1, 2019, PPL Electric Utilities launched a distributor-facing portal for customer and product verification.

- **Student Energy Efficient Education (residential sector).** This program offers classroom training to three grade-level cohorts. The program was fully subscribed for PY10 with wait lists for each grade-level cohort. The program reached over 24,000 children at approximately 200 schools, with over 23,600 kits distributed to participating children. Nightlights were going to be offered to participating teachers during December 2018; however, it was decided to forego nightlights going forward. In PY9, the program introduced an app pilot aimed at increasing installation rates; in PY10, the app was used in all Take Action presentations. Tier II power strips were included in half of the Innovation classes (approximately 2,500 kits) and the popular Bright Ideas Energy Efficiency Student Poster Contest was reinstated. The contest was organized into three grade clusters: K-2, 3-5, and 6-8. Within each grade cluster, one student grand prize winner was awarded, and three finalists were recognized.

3.2 EVALUATION UPDATES AND FINDINGS

This section summarizes evaluation activities occurring within each program during PY10. For each program offered in PY10, Cadmus updated the evaluation plans and submitted them to PPL Electric Utilities and the SWE.

- **Appliance Recycling (residential sector).** Cadmus received participant data from PPL Electric Utilities' tracking database for Q1 through Q4 and confirmed it contains the necessary data for evaluation activities. Cadmus completed participant satisfaction surveys for Q1 through Q4 and has begun analyzing the survey results and drafting the PY10 report.
- **Demand Response (nonresidential sector).** Cadmus estimated the load impacts for each of the PY10 participant facilities during the six events called by PPL Electric Utilities and the ICSP. After meeting with PPL Electric Utilities and the ICSP to discuss the PY10 program design, implementation, outcomes, challenges, and successes, Cadmus administered an online participant survey. Cadmus drafted the findings of the load impact analysis, staff interviews and participant surveys for the PY10 DR annual report submitted in January 2019.
- **Efficient Lighting (residential sector).** Cadmus received data from PPL Electric Utilities' tracking database and copies of manufacturer invoices and tracking data from the ICSP for Q1 through Q3. Cadmus provided data to the SWE to fulfill the PY10 quarterly data requests and is preparing the PY10 Q4 data request. Cadmus is completing surveys with general population residential and small business customers to assess awareness and use of LEDs. Data will inform the cross-sector sales analysis that attributes savings to the small commercial customers.
- **Energy Efficiency Kits and Education (residential low-income sector).** Cadmus received and reviewed the PY10 Q1 through Q3 tracking data from PPL Electric Utilities' tracking database and confirmed it contained the information needed for the evaluation. Cadmus will conduct a records review with Q1 through Q4 data provided by the subcontracting ICSP.
- **Energy Efficient Home (residential sector).** Cadmus fielded the equipment, online assessment, in-home audit, and weatherization participant surveys from April through June 2019. Cadmus received the PY10 Q1 through Q3 data for all program components and confirmed it contains the necessary data for evaluation activities. Cadmus selected verification samples for equipment, online assessment, in-home

audit, weatherization, and new homes components, and is preparing the PY10 Q4 data request for the SWE. Cadmus prepared an evaluation plan for the new pilot, Online Marketplace. Cadmus requested all data related to the Online Marketplace, such as marketing activities and results from the survey fielded by the ICSP. Cadmus drafted the Online Marketplace participant survey and plans to field it and complete the Online Marketplace evaluation in PY11, after the ICSP provides participant data to PPL Electric Utilities.

- **Home Energy Education (residential sector).** Cadmus conducted interviews with program staff in Q3 and administered telephone and online surveys with customers who received the Home Energy Report. Cadmus will receive the program tracking data from the ICSP in mid-July and will begin the PY10 impact evaluation analysis.
- **Low-Income WRAP (residential low-income sector).** Cadmus reviewed the PY10 Q1 through Q3 program tracking data from PPL Electric Utilities, and the ICSP's audit records, database extracts, and product specifications. Cadmus is reviewing PY10 Q4 data to complete the PY10 WRAP impact evaluation. Cadmus conducted the first wave of participant phone surveys with WRAP participants in January 2019 and the second wave of surveys in June 2019. Surveys assess program satisfaction and gather energy education and in-service rate data. In addition, Cadmus conducted master-metered multifamily property manager interviews to support the program satisfaction assessment.
- **Continuous Energy Improvement (nonresidential sector).** Cadmus completed the participant interviews in April and May. Cadmus received AMI data from PPL Electric Utilities in May and June and requested participant documentation from the ICSP. Cadmus' PY10 analysis will commence after receipt of all requested data.
- **Custom (nonresidential sector).** Cadmus completed customer satisfaction surveys for PY10 Q1 and Q2, and will complete PY10 Q3 and Q4 satisfaction surveys by the end of July 2019. Cadmus verified savings for 27 PY10 large projects. Evaluation activities--reviewing project documentation, creating site-specific measurement and verification plans, deploying metering equipment, determining project savings using a high-rigor approach, and presenting finalized savings in a verification report--are underway for ten projects in the small stratum and approximately 40 large stratum projects.
- **Efficient Equipment (nonresidential sector).** Cadmus completed customer satisfaction surveys for PY10 Q1 and Q2, and will complete PY10 Q3 and Q4 satisfaction surveys by the end of July 2019. Cadmus received the final PY10 Q4 database and selected the combined Q3 and Q4 project verification sample. Cadmus sent a data request for the 12 sampled projects to the ICSP and requested PPL Electric Utilities account manager outreach to the sampled sites. Cadmus will conduct site visits in July 2019.
- **Efficient Equipment Lighting (nonresidential sector).** Cadmus completed customer satisfaction surveys for PY10 Q1 and Q2, and will complete PY10 Q3 and Q4 satisfaction surveys by the end of July 2019. Cadmus received the final PY10 Q4 database for the Prescriptive Lighting program, selected a final evaluation verification sample of five threshold (>750,000 kWh reported savings) projects, requested project data from the ICSP, and requested PPL Electric Utilities' account manager outreach for three Q2 sites. Cadmus completed PY10 verification site visits in June.

- **Midstream Lighting (nonresidential sector).** Cadmus received the PY10 Q1 through Q4 Midstream database and confirmed that it contains the necessary information for PY10 evaluation activities. Cadmus selected the evaluation project sample in two rounds: combined for Q1 and Q2, and Q3. Cadmus completed reviewing records and will complete desk audits and site visits for the evaluation sample in July. Cadmus completed interviews with participating distributors, and a sample of contractor and end-user purchasers.
- **Student Energy Efficient Education (residential sector).** Cadmus conducted stakeholder interviews with the PPL Electric Utilities program manager and the implementer. Cadmus received annual home energy worksheet (HEW) program data and will analyze participant satisfaction data from the HEWs as part of the annual process evaluation. Cadmus does not plan to complete an impact evaluation for PY10.

4 Summary of Energy Impacts by Program

Figure 6 presents a summary of the PYTD reported gross energy savings by program for PY10. The energy impacts in this report are presented at the meter level and do not reflect adjustments for transmission and distribution losses.

Figure 6: PYTD Reported Gross Energy Savings by Program

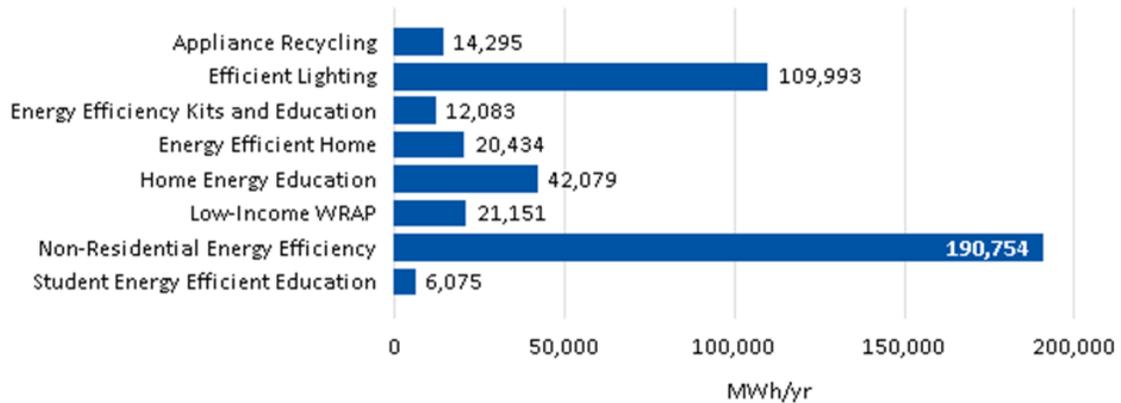
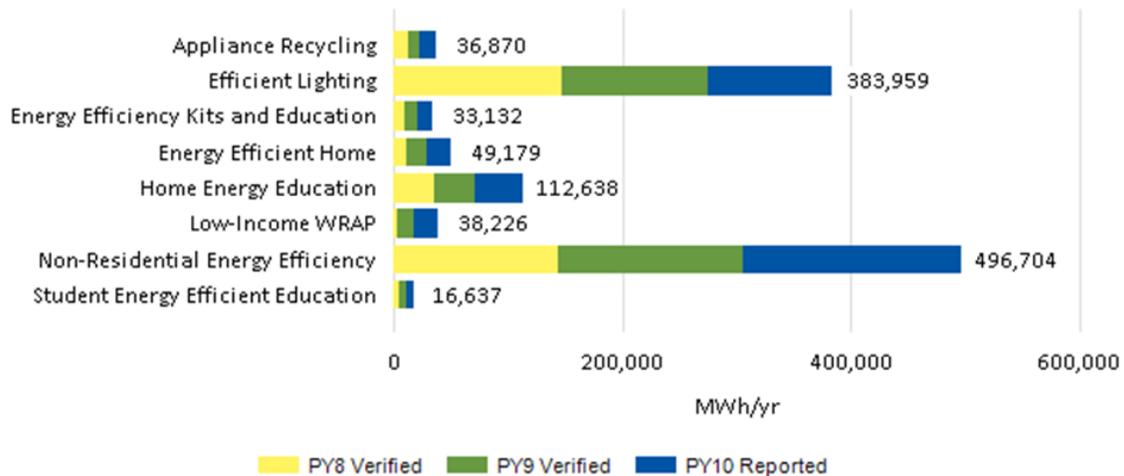


Figure 7 presents a summary of the PSA gross energy savings by program for Phase III of Act 129. PSA savings include verified gross savings from previous program years and the PYTD savings from the current program year.

Figure 7: PSA Energy Savings by Program for Phase III



A summary of energy impacts by program through the current reporting period is presented in Table 4.

Table 4: Energy Savings by Program (MWh/Year)

Program	PYTD MWh/yr	RTD MWh/yr	VTD MWh/yr	Unverified Savings from PY9 MWh/yr	PSA MWh/yr ^[1]
Appliance Recycling	14,295	39,784	22,575		36,870
Efficient Lighting ⁽²⁾	109,993	388,667	273,965		383,959
Energy Efficiency Kits and Education	12,083	34,708	21,049		33,132
Energy Efficient Home	20,434	52,760	28,746		49,179
Home Energy Education ⁽³⁾	42,079	116,422	70,558		112,638
Low-Income WRAP	21,151	42,171	17,075		38,226
Non-Residential Energy Efficiency	190,754	505,765	305,950	5	496,704
Student Energy Efficient Education	6,075	16,790	10,562		16,637
Total	416,864	1,197,068	750,480	5	1,167,345
Adjustment for Residential Energy-Efficiency Behavior & Education Double-Counted Savings ^[3]			(10,316)		(10,316)
Adjusted Portfolio Savings	416,864	1,197,068	740,165	5	1,157,029

⁽¹⁾Total may not sum due to rounding.
⁽²⁾86,127 of PSA MWh/yr from Efficient Lighting are attributed to Small C&I. PY9 verified savings for Efficient Lighting were reduced by 282 MWh/yr to conform with the SWE PY9 annual report findings. The adjustment was divided proportionally (based on PY9 verified savings) between residential (78%) and small C&I sectors (22%).
⁽³⁾VTD savings for the Home Energy Education program were reported in the PY9 Annual Report as 70,654 MWh/yr and the adjustment for double-counted savings (uplift) was -10,333 MWh/yr. This table corrects and updates the savings reported in the PY9 Annual Report.

5 Summary of Participation by Program

Participation is defined differently for each program depending on the program delivery channel and data tracking practices. The nuances of the participant definition vary by program and are summarized in Table 5. The table also provides the current participation totals for PY10 and Phase III.

Table 5: EE&C Plan Participation by Program

Program	Participant Definition	PY10TD Participation	P3TD Participation
Appliance Recycling	Unique job number; corresponds with each unique appliance decommissioned through the program during the program year	14,210	38,430
Demand Response	Unique account number; corresponds to a customer that enrolled in the Program; not the number who participated in at least one event	64	157
Efficient Lighting	Person or business purchasing discounted bulbs. See <i>Section 9.1.2 Definition of a Participant</i> in the PY9 annual report ⁽¹⁾ describing the approach to computing number of participants. The estimates for PY10 will be updated in the annual report based on the PY10 general-population surveys.	256,529	881,673
Energy-Efficiency Kits and Education	Unique job number; corresponds to an energy-savings kit delivered to an income-eligible customer through the agency or the direct-mail delivery channel Participation is determined by the unique job numbers. Returned kits are assigned two unique job numbers: one for the distributed kit, and one for the returned kit	13,932	39,455
Energy Efficient Home	Unique job number; corresponds to a rebated project Households could have more than one rebated project	19,866	64,601
Home Energy Education	Unique bill account number (household) that receives a home energy report in any program year (a household is counted once, even if it received reports in more than one year)	173,525	205,750
Low-Income Winter Relief Assistance Program (WRAP)	Unique bill account number; corresponds to an income-eligible household that receives an audit and program services In PY8, a participant was defined as a unique job number, but the PY9 updated definition is applied retroactively here. Therefore, the P3TD total will not match the PYTD totals from the annual reports. In PY10, an LED giveaway component was added to the program. The participant count for this component is equal to the number of bulbs given away, 5,800 in PY10	18,812	33,541

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Program	Participant Definition	PY10TD Participation	P3TD Participation
Non-Residential Energy Efficiency	<i>Custom:</i> Unique job number; commercially operable job that received an incentive payment during the reporting period <i>Continuous Energy Improvement:</i> Unique job number; corresponds to each Individual school <i>Midstream Program:</i> Unique job number (RBT); corresponds to each purchase of discounted products <i>Prescriptive Lighting and Equipment:</i> Unique job number; corresponds to each unique job that received a rebate	8,758	16,512
Student Energy Efficient Education	Number of participants is counted as the number of energy conservation kits delivered	23,665	72,024
Portfolio Total		529,361	1,352,143
^[1] PPL Electric Utilities. <i>Annual Report Program Year 9: June 1, 2017–May 31, 2018</i> . Presented to Pennsylvania Public Utility Commission. Prepared by Cadmus. November 15, 2018. Available online: http://www.puc.pa.gov/pcdocs/1595564.pdf			

6 Summary of Demand Impacts by Program

PPL Electric Utilities’ Phase III EE&C programs achieve peak demand reductions in two ways. The first is through coincident reductions from energy efficiency measures and the second is through dedicated demand response programs 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 targets. 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 targets 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 Phase III to date. Because of these differences, demand impacts from energy efficiency and demand response are reported separately in the following sub-sections.

6.1 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 to August. 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 8 presents a summary of the PYRTD reported gross peak demand savings by energy efficiency program for Program Year 10.

Figure 8: PYRTD Gross Demand Savings by Energy Efficiency Program

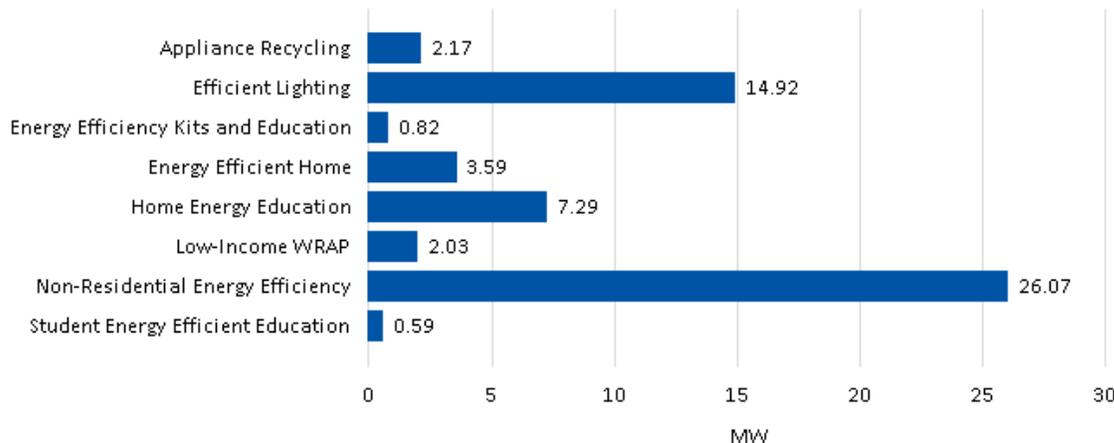
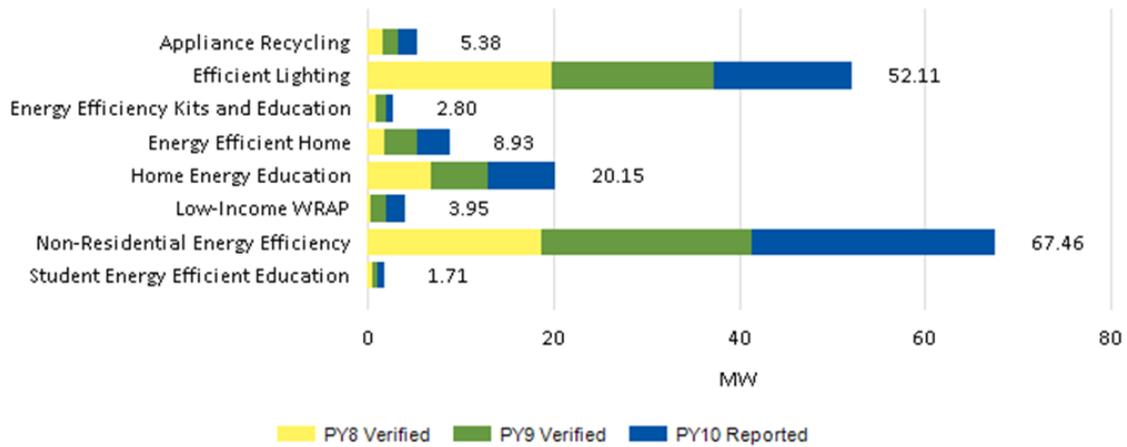


Figure 9 presents a summary of the PSA gross demand savings by energy efficiency program for Phase III of Act 129.

Figure 9: PSA Demand Savings by Energy Efficiency Program for Phase III



A summary of the peak demand impacts by energy efficiency program through the current reporting period are presented in Table 6.

Table 6: Peak Demand Savings by Energy Efficiency Program (MW/Year)

Program	PYTD MW/yr	RTD MW/yr	VTD MW/yr	Unverified Savings from PY9 MW/yr	PSA MW/yr ^[1]
Appliance Recycling	2.17	5.71	3.21		5.38
Efficient Lighting ⁽²⁾	14.92	55.08	37.19		52.11
Energy Efficiency Kits and Education	0.82	2.47	1.98		2.80
Energy Efficient Home	3.59	9.22	5.33		8.93
Home Energy Education ⁽³⁾	7.29	68.22	12.86		20.15
Low-Income WRAP	2.03	4.13	1.92		3.95
Non-Residential Energy Efficiency	26.07	67.41	41.40	0.0001	67.46
Student Energy Efficient Education	0.59	1.62	1.11		1.71
Total	57.49	213.86	105.00	0.0001	162.49
Adjustment for Residential Energy-Efficiency Behavior & Education Double-Counted Savings ⁽³⁾			-0.77		-0.77
Adjusted Portfolio Savings	57.49	213.86	104.23	0.0001	161.72

⁽¹⁾ Total may not sum due to rounding.

⁽²⁾ 17.78 of PSA MW from Efficient Lighting are attributed to Small C&I. PY9 verified savings for Efficient Lighting were reduced by 0.04 MW to conform with the SWE PY9 annual report findings.

⁽³⁾ VTD savings for the Home Energy Education program were reported as 17.90 MW/yr and adjustment for double-counted savings (uplift) was -0.93 MW/yr in the PY9 Annual Report. This table corrects and updates the savings reported in PY9.

6.2 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 requirements included in the Phase III Implementation Order:

- 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 PJM’s 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. PPL Electric Utilities uses the following line loss percentages/multipliers by sector.

- Residential = [8.75% or 1.0875]
- Small C&I = [8.75% or 1.0875]
- Large C&I = [4.2% or 1.0420]

Table 7 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 indicate the margin of error (at the 90% confidence interval) around the PYVTD and VTD demand reductions.

Table 7: Verified Gross Demand Response Impacts by Program

Program	PYVTD Gross MW	Relative Precision (90%)	VTD Gross MW	Relative Precision (90%)
Demand Response	111.5	2.7%	116.6	2.1%
Portfolio Total	111.5	2.7%	116.6	2.1%

7 Summary of Finances

Section 7 provides an overview of the expenditures associated with PPL Electric Utilities’ portfolio and the recovery of those costs from ratepayers.

7.1 PROGRAM FINANCIALS

Program-specific and portfolio total finances for PY10 are shown in Table 8. The columns in Table 8 and Table 9 are adapted from the ‘Direct Program Cost’ categories in the Commission’s EE&C Plan template⁷ 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 an EDC employs to support program delivery.

Table 8: Program Year (PY10) to Date Financials

Program	Incentives to Participants and Trade Allies	EDC Materials, Labor, and Administration	ICSP Materials, Labor, and Administration	EM&V	Total ^[1]
Appliance Recycling Program	\$404	\$46	\$1,628		\$2,078
Demand Response Program	\$1,879	\$41	\$833		\$2,753
Efficient Lighting Program	\$3,330	\$41	\$1,911		\$5,283
Energy Efficiency Kits & Education Program ^[2]		\$48	\$1,196		\$1,244
Energy Efficient Home Program	\$3,189	\$41	\$3,299		\$6,529
Home Energy Education Program		\$40	\$1,500		\$1,540
Low-Income WRAP Program ^[2]		\$197	\$8,505		\$8,702
Non-Residential Energy Efficiency	\$14,286	\$171	\$7,184		\$21,641
Student Energy Efficiency Education Program		\$26	\$1,128		\$1,153
Common Portfolio Costs ^[3]		\$3,817	\$879	\$2,645	\$7,341
Portfolio Total ^{[3] [4]}	\$23,087	\$4,468	\$28,063	\$2,645	\$58,264
SWE Costs ^[5]					\$400
Total ^[4]	\$23,087	\$4,468	\$28,063	\$2,645	\$58,664

^[1] Total may not sum due to rounding.

^[2] Costs associated with low-income program measures provided to customers at no cost are categorized as administrative costs.

^[3] Common Portfolio Costs are costs applicable to more than one customer class, to more than one program, or those that provide portfolio-wide benefits. These include PPL Electric Utilities labor and materials, costs related to PPL Electric Utilities’ tracking system, EE&C plan development, etc.

^[4] Portfolio Total and Total may not equal total of column due to rounding.

^[5] 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 9.

⁷ Pennsylvania Public Utility Commission Phase III Energy Efficiency and Conservation Plan Template (Docket No. M-2014-2424864) dated July 21, 2015. (<http://www.puc.pa.gov/pcdocs/1372426.doc>)

Table 9: Phase III to Date Financials

Program	Incentives to Participants and Trade Allies	EDC Materials, Labor, and Administration	ICSP Materials, Labor, and Administration	EM&V	Total ^[1]
Appliance Recycling Program	\$1,108	\$124	\$4,866		\$6,097
Demand Response Program	\$2,858	\$243	\$2,035		\$5,136
Efficient Lighting Program	\$21,396	\$179	\$4,986		\$26,561
Energy Efficiency Kits & Education Program ^[2]		\$150	\$5,020		\$5,170
Energy Efficient Home Program	\$7,442	\$160	\$10,006		\$17,608
Home Energy Education Program		\$103	\$3,905		\$4,008
Low-Income WRAP Program ^[2]		\$662	\$21,423		\$22,086
Non-Residential Energy Efficiency	\$31,319	\$590	\$18,213		\$50,121
Student Energy Efficiency Education Program		\$152	\$3,009		\$3,160
Common Portfolio Costs ^[3]		\$9,767	\$4,255	\$8,492	\$22,513
Portfolio Total ^{[3][4]}	\$64,123	\$12,129	\$77,718	\$8,492	\$162,461
SWE Costs ^[5]					\$1,500
Total ^[4]	\$64,123	\$12,129	\$77,718	\$8,492	\$163,961

^[1] Total may not sum due to rounding.

^[2] Costs associated with low-income program measures provided to customers at no cost are categorized as administrative costs.

^[3] Common Portfolio Costs are costs applicable to more than one customer class, to more than one program, or those that provide portfolio-wide benefits. These include PPL Electric Utilities labor and materials, costs related to PPL Electric Utilities' tracking system, EE&C plan development, etc.

^[4] Portfolio Total and Total may not equal total of column due to rounding.

^[5] Statewide Evaluation costs are outside of the 2% spending cap.

Cost-effectiveness testing for Act 129 EE&C programs is performed using the TRC Test. Benefit-cost modeling is conducted annually using verified gross and verified net savings once the results of the independent impact evaluation are completed. TRC test results for PY10 will be presented in the final annual report to the PA PUC on November 15, 2019, along with a more granular breakdown of portfolio costs.

7.2 COST RECOVERY

Act 129 allows Pennsylvania EDCs to recover EE&C plan costs through a cost-recovery mechanism. PPL Electric Utilities’ cost-recovery charges are organized separately by 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 necessarily tied to the way customers are metered and charges for electric service. Readers should be mindful of the differences between Table 10 and Section 7.1. For example, the low-income customer segment is a subset of PPL Electric Utilities’ residential tariff(s) and therefore not listed in Table 10.

Table 10: EE&C Plan Expenditures by Cost-Recovery Category^[1] (\$1,000)

Cost Recovery Customer Sector	Rate Schedules Included	PYTD Spending	P3TD Spending
Residential & Low-Income	Residential (primarily RS)	\$25,647	\$84,295
Small C&I	Small C&I (primarily GS1 & GS3)	\$12,877	\$26,232
Large C&I	Large C&I (primarily LP4 & LP5)	\$9,484	\$23,492
GNE	Residential, Small C&I, and Large C&I	\$4,840	\$12,835
Common ^[2]	N/A	\$5,815	\$17,107
Portfolio Total ^[3]	-	\$58,664	\$163,961

^[1] Includes SWE costs.

^[2] Includes costs not collected at the sector level. These costs are allocated to the sectors at the end of the phase.

^[3] Totals may not sum due to rounding.