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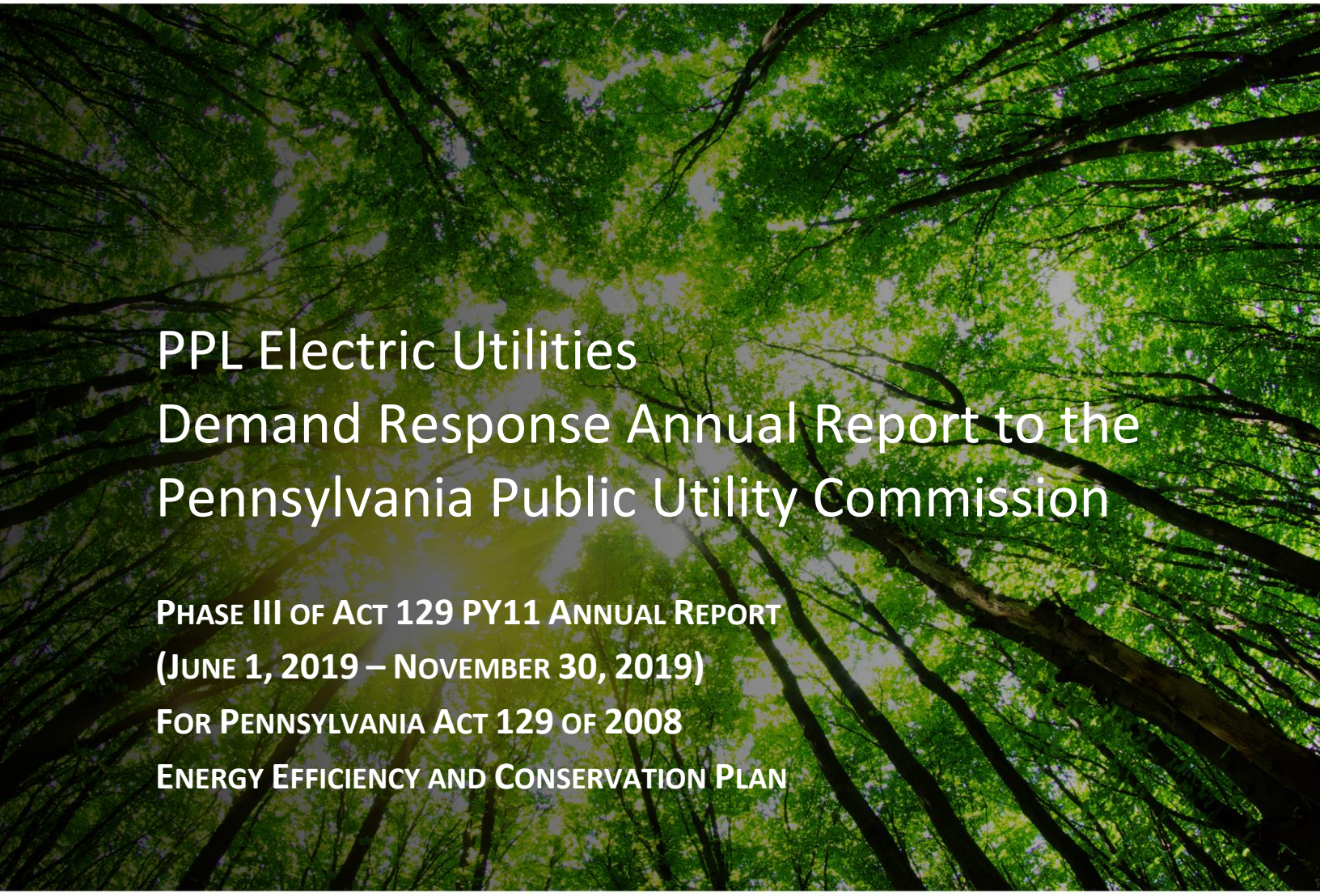

PPL Electric Utilities
Demand Response Annual Report to the Pennsylvania Public Utility Commission

PHASE III OF ACT 129 PY11 ANNUAL REPORT
(JUNE 1, 2019 – NOVEMBER 30, 2019)
FOR PENNSYLVANIA ACT 129 OF 2008
ENERGY EFFICIENCY AND CONSERVATION PLAN

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January 15, 2020

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1 Demand Response Program

During Phase III, PPL Electric Utilities operates the Demand Response Program for commercial and industrial (C&I) customers and government, nonprofit, and education (GNE) customers. PPL Electric Utilities manages the implementation conservation service provider (ICSP) and provides overall strategic direction for the program.

CPower, the ICSP, enrolls and contracts with customers to reduce electricity demand during Act 129 demand response events. After the summer season, the ICSP makes performance-based payments to participating customers.

According to the Act 129 Phase III Implementation Order, a maximum of six events can be called per program year.[1] In PY11, four events were called. All but one occurred on a non-holiday weekday between 2:00 p.m. and 6:00 p.m. The July 18 event occurred between 3:00 p.m. and 7:00 p.m.

The ICSP notified participating customers between 10:15 a.m. and 11:30 a.m. on the day before each event. Before the event started, customers confirmed their participation for specific hours by logging into the ICSP's online platform. Customers had the option of participating in all or a subset of event hours. In turn, the ICSP notified PPL Electric Utilities via an event enrollment report of those customers participating in the event and made any updates if a customer status changed.

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 line losses. The peak demand impacts presented in this report have been adjusted for these line losses.

1.1 Participation and Reported Savings by Customer Segment

1.1.1 Definition of a Participant

A participant in the Demand Response Program in PY11 is defined as a customer facility that participated in at least one of PPL Electric Utilities' Act 129 demand response events. The ICSP enrolled 32 customers representing 70 facilities in PY11. A total of 26 customers with 64 sites participated in at least one Act 129 demand response event.

1.1.2 Program Participation and Reported Impacts

Table 1 presents the participation counts, reported demand reductions, and incentive payments for the Demand Response Program in PY11 by customer segment and Act 129 event. In PY11 (summer of 2019), the program reported demand savings of approximately 87.4 MW on July 17, 109.4 MW on July 18,

[1] Phase III Final Implementation Order. From the Public Meeting of June 11, 2015. Pennsylvania Public Utility Commission. Docket No. M-2014-2424864. Available at http://www.puc.pa.gov/pcdocs/1367313.doc.

104.1 MW on July 19, and 111.4 MW on August 19. Between 93% and 95% of the reported demand savings for each of these events were achieved by large C&I customers.

Table 1. PY11 Demand Response Program Participation and Reported Demand Reductions

Parameter	Small C&I (Non-GNE)	Large C&I (Non-GNE)	GNE	Total [1]
PYTD Number of Participants [2]	31	21	12	**64**
Event 1, July 17, 2019, Reported MW	0.8	82.2	4.3	**87.4**
Event 2, July 18, 2019, Reported MW	2.1	101.8	5.5	**109.4**
Event 3, July 19, 2019 Reported MW	0.8	98.6	4.7	**104.1**
Event 4, August 19, 2019, Reported MW	1.4	106.2	3.8	**111.4**
Total Average Reported MW	1.3	97.2	4.6	**103.1**
PYVTD MW	1.6	96.7	5.9	**104.3**
PY11 Incentives ($1000)	$16	$1,114	$54	**$1,183**

The load impacts reported in this table have been grossed up to reflect transmission and distribution losses.
[1] Total may not equal total of row due to rounding.
[2] Number of facilities that participated in at least one event (64), not the number enrolled in the program (70).

A dual-enrolled participant is a facility that participated in PPL Electric Utilities' Demand Response Program and is enrolled in a PJM demand response program. In PY11, all PPL Electric Utilities demand response program participants were dual-enrolled participants. Table 2 reports the number of these participating facilities and the incentives paid.

Table 2. PY11 Dual-Enrolled Participants (PPL Act 129 and PJM programs)

Dual-Enrolled and Participating Customer Facilities	Act 129-Only Customer Facilities	Incentives Paid to Dual-Enrolled Customers	Incentives Paid to Act 129-Only Customers
64	0	$1,183,474.02	0

1.2 Gross Impact Evaluation

1.2.1 Gross Impact Evaluation Activities

The impact evaluation strategy is shown in Table 3. Cadmus analyzed consumption data to estimate Act 129 load impacts for the population of participating facilities (that is, there was no sampling). The impact evaluation counts as participants all facilities that participated in at least one event from any of the three demand response aggregators – CPower or its subcontractors NRG and Direct Energy.

Cadmus evaluated each facility's demand savings by comparing the facility's metered demand during event hours with an estimated baseline. The baseline was estimated using either regression analysis or a day-matching method.[2] For each facility, Cadmus analyzed interval consumption data to identify the

[2] Cadmus applied standard day-matching baseline calculation methods, such as selecting the seven days of the previous 10 with highest average demand, in accordance with SWE guidelines.

most accurate baseline calculation method. Additional details about the evaluation and baseline selection methodology are in *Appendix A*.

Table 3. PY11 Demand Response Program Gross Impact Evaluation

Stratum	Event	Population Size [1]	Assumed Proportion or Cv in Sample Design	Achieved Sample Size	PYRTD MW	Impact Evaluation Activity
Small C&I	July 17	31	100%	31	0.8	Analysis of individual participating facility loads was performed for each event hour
	July 18	31	100%	31	2.1	
	July 19	30	100%	30	0.8	
	August 19	30	100%	30	1.4	
Large C&I	July 17	17	100%	17	82.2	
	July 18	20	100%	20	101.8	
	July 19	19	100%	19	98.6	
	August 19	20	100%	20	106.2	
GNE	July 17	12	100%	12	4.3	
	July 18	11	100%	11	5.5	
	July 19	10	100%	10	4.7	
	August 19	10	100%	10	3.8	
Program Total [2]	July 17	60	100%	60	87.4	
	July 18	62	100%	62	109.4	
	July 19	59	100%	59	104.1	
	August 19	60	100%	60	111.4	

The load impacts reported in this table have been grossed up to reflect transmission and distribution losses.
[1] Population size is the count of facilities that participated in one or more hours of the event as reported by the ICSP.
[2] Totals may not sum exactly due to rounding.

1.2.2 Gross Impact Evaluation Results

PPL Electric Utilities is on track to meet its Phase III Act 129 Demand Reduction compliance target specified in the Implementation Order. Figure 1 shows the PY11 evaluation impact findings. In PY11, verified peak load reductions were 104.3 MW (equal to the average demand reduction over the four demand response events), a realization rate of 101% relative to the reported (*ex ante*) load reduction.

The P3TD verified peak load reductions were 112.8 MW (the average load reduction over PY9, PY10, and PY11 event hours), which exceeds the Phase III compliance target of 92 MW. In addition, for PY11, PPL Electric Utilities met its per-event compliance target of at least 78.2 MW (85% of the total compliance target) in each demand response event. Figure 1 shows the gross verified savings for PY11 compared to the Act 129 targets during PY9 through PY11.

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

Figure 1. Gross Verified Savings Compared to Act 129 Targets

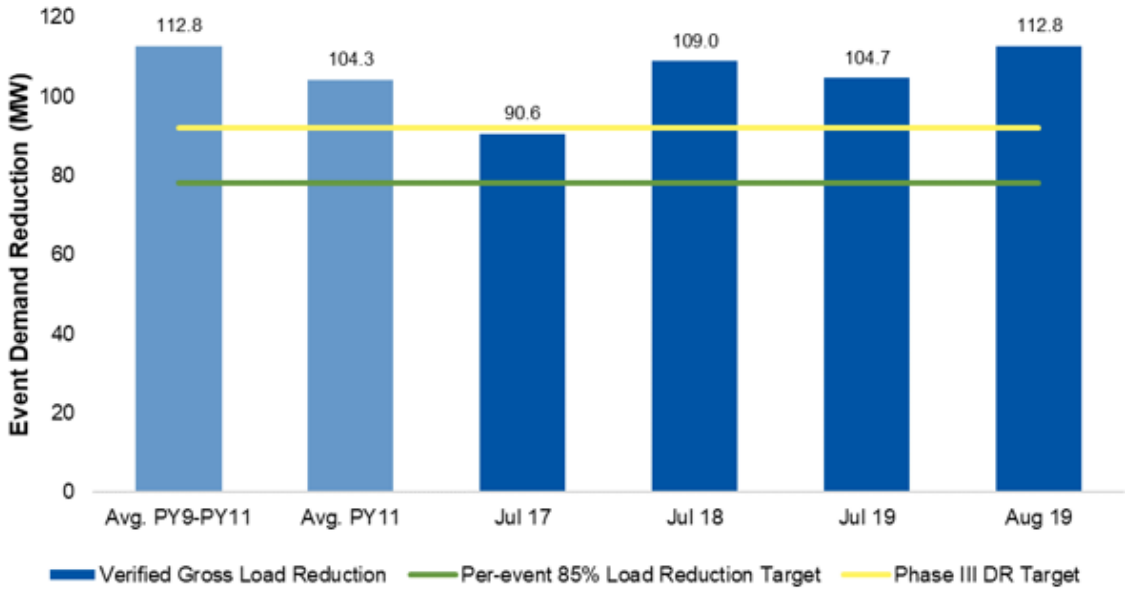


Table 4 shows PY11 Demand Response Program achievements by sector.

Table 4. PY11 Demand Response Program Gross Impact Results for Demand by Sector

Stratum	Event	Number of Participants	PYRTD MW	Demand Realization Rate	PYVTD MW [1] [2]	Standard Error	Relative Precision at 90% C.L. [3]
Small C&I	July 17, 2019	31	0.8	204%	1.7	0.14	13.5%
	July 18, 2019	31	2.1	96%	2.0	0.13	10.5%
	July 19, 2019	30	0.8	171%	1.4	0.14	16.0%
	August 19, 2019	30	1.4	97%	1.4	0.13	16.0%
Large C&I	July 17, 2019	17	82.2	100%	82.4	4.20	8.4%
	July 18, 2019	20	101.8	98%	100.0	4.52	7.4%
	July 19, 2019	19	98.6	99%	97.3	4.52	7.6%
	August 19, 2019	20	106.2	101%	107.2	4.55	7.0%
GNE	July 17, 2019	12[4]	4.3	152%	6.5	0.45	11.4%
	July 18, 2019	11	5.5	127%	7.0	0.36	8.4%
	July 19, 2019	10	4.7	127%	5.9	0.34	9.4%
	August 19, 2019	10	3.8	112%	4.3	0.35	13.5%
Event [5]	**July 17, 2019**	**60**	**87.4**	**104%**	**90.6**	**4.23**	**7.7%**
	July 18, 2019	**62**	**109.4**	**100%**	**109.0**	**4.53**	**6.8%**
	July 19, 2019	**59**	**104.1**	**101%**	**104.7**	**4.53**	**7.1%**
	August 19, 2019	**60**	**111.4**	**101%**	**112.8**	**4.56**	**6.7%**
Average		**64**	**103.1**	**101%**	**104.3**	**2.23**	**3.5%**

[1] Due to rounding, multiplying the PYRTD savings by the realization rate will not accurately reflect the final verified savings.
[2] Based on Cadmus' analysis of participant AMI consumption data. MW were grossed up to reflect transmission and distribution losses.
[3] Precision accounts for covariances of savings across hours of each event but not between events.
[4] The ICSP reported savings for 12 GNE facilities. The evaluation disqualified one facility's savings due to the ICSP not notifying PPL Electric Utilities that it was enrolling the facility in the event.
[5] Total may not sum due to rounding.

In general, the reported and evaluated savings were close, but the following factors may have contributed to differences between the reported and verified savings and the realization rates that deviated from 100%.

- **Different treatment of estimated readings**. The ICSP provided estimates rather than actual values for about 1% of all hourly interval readings for participating facilities on event or weekdays that were not holidays or notification days between April 1, 2019, and September 15, 2019. Cadmus replaced these estimated readings with missing values and did not include them in the analysis dataset.
- **Different methods for calculating customer baselines.** To the extent possible, the ICSP attempted to align its baseline calculation method with Cadmus' method. However, whereas the ICSP employed day-matching, Cadmus employed regression analysis to calculate the baseline for all small C&I facilities, 92% of GNE facilities, and 24% of large C&I facilities. The ICSP employed day-matching because it is transparent and easier for participants to understand savings (and anticipated incentives) than regression. Cadmus chose regression after determining this method yielded more accurate *ex post* savings estimates than day-matching.

1.3 Process Evaluation

1.3.1 Research Objectives

The process evaluation assessed program implementation, customer experience with consecutive event participation, and customer satisfaction.

1.3.2 Evaluation Activities

The PY11 process evaluation activities for the Demand Response Program featured interviews with PPL Electric Utilities and ICSP program managers and surveys with enrolled customers.

Table 5 lists the process evaluation sampling strategy. Unlike the impact evaluation, which analyzed the entire population of participating facilities, the process evaluation conducted a survey of enrolled customers contracted by the ICSP (29 unique companies). Customers did not have to participate in an event in PY11 to qualify for the survey but must have enrolled for the PY11 program and received the event notifications.

Table 5. PY11 Process Evaluation Sampling Strategy

Stratum	Stratum Boundaries	Mode	Population Size	Assumed Proportion or Cv in Sample Design	Target Sample Size	Achieved Sample Size	Number of Records Selected for Sample Frame [1]	Percent of Sample Frame Contacted to Achieve Sample [2]
PPL Electric Utilities Program and ICSP Staff	Staff	Telephone in-depth Interview	2	N/A	2	2	2	N/A
Customer Surveys	Enrolled Companies Contracted by CPower	Online and telephone survey	29 [3]	N/A	12	10	29	100%
Program Total			**31**	**N/A**	**14**	**12**	**31**	**N/A**

[1] Sample frame is the enrolled customer companies with contact information that were asked to complete the survey. The final sample frame includes unique records in the PPL Electric Utilities tracking database.
[2] Percent contacted means the percentage of the sample frame that were emailed to complete surveys.
[3] The ICSP contracted with 29 unique companies that enrolled in the PY11 Demand Response Program. Cadmus included all enrolled companies, even those that did not participate in any events, in its survey population. Cadmus did not survey the companies under contract with the demand response aggregators NRG and Direct Energy. The survey population, therefore, differs from the population used in the impact evaluation. The impact evaluation counts as participants all facilities that participated in at least one event across CPower, NRG, and Direct Energy.

1.3.2.1 Program Staff and ICSP Interview Methodology

In November 2019, Cadmus interviewed the program managers from PPL Electric Utilities and the ICSP. The interviews covered program operations, event implementation, and event performance outcomes as well as any program changes, areas working well, and areas experiencing challenges.

1.3.2.2 Survey Methodology

Between November and December 2019, Cadmus contacted all 29 enrolled companies by email and telephone,[3] even if they did not participate in any PY11 events, to ask them to complete a short survey.

The survey was directed to the person who authorized the events at each company, typically an energy manager. Cadmus coordinated with the ICSP on emailing notice of the survey in advance. Cadmus made six attempts to gather survey responses. The first and second attempts were by email; the third, fourth, and fifth attempts were by telephone; and the sixth attempt was by email. Despite multiple attempts, Cadmus gathered data for 10 completed surveys, which was less than the target of 12 completed surveys.

Table 6 lists total contacts, the outcome (final disposition) of each record, and response rate.

[3] Cadmus did not survey the enrolled customers under contract with the demand response sub-contractors NRG and Direct Energy, only customers enrolled under contract with CPower.

Table 6. PY11 Demand Response Participant Survey Sample Attrition Table

Description of Online Survey Outcomes	Count
Population (number of CPower, NRG, and Direct Energy enrolled facilities)	**70**
Removed: NRG and Direct Energy contracted facilities	5
Removed: Duplicate facility contacts for managers with multiple enrolled facilities	36
Sample Frame (number of unique companies)	**29**
Survey Sample Frame (used for surveys)	**29**
Not started	18
Refused or opted out	1
Completed Surveys (online and telephone combined)	**10**
Response Rate (completed surveys divided by number of records)	**34%**

Because of the small number of respondents (n=10), the expected confidence and precision levels for survey data are not reported here. Therefore, data gathered from the participant surveys should be viewed as qualitative.

1.3.3 Process Evaluation Findings

1.3.3.1 Program Delivery

In PY11, PPL Electric Utilities and the ICSP operated the program the same as in previous years. They implemented four events, three of which occurred on consecutive days (July 17, 18, and 19). This was the first time in Phase III that the program implemented three consecutive events.

As shown in Figure 1 in the *1.2.2 Gross Impact Evaluation Results* section above, the program exceeded its per-event compliance target on each of the three consecutive events and performed better on the second and third day. The program achieved its highest per-event load reduction on the fourth and final event (August 19), exceeding the per-event compliance target and the Phase III compliance target. The program's strong performance can be attributed to three factors:

- Having a familiar and clear set of operational procedures
- Oversubscribing the number of participating customers
- Knowing which participating customers could fill in load performance gaps

1.3.3.2 Event Experience

Cadmus's PY11 survey focused on the three-day consecutive event experience. Nine of the 10 companies that completed the survey participated in the three consecutive events; one company did not participate in any events during PY11.

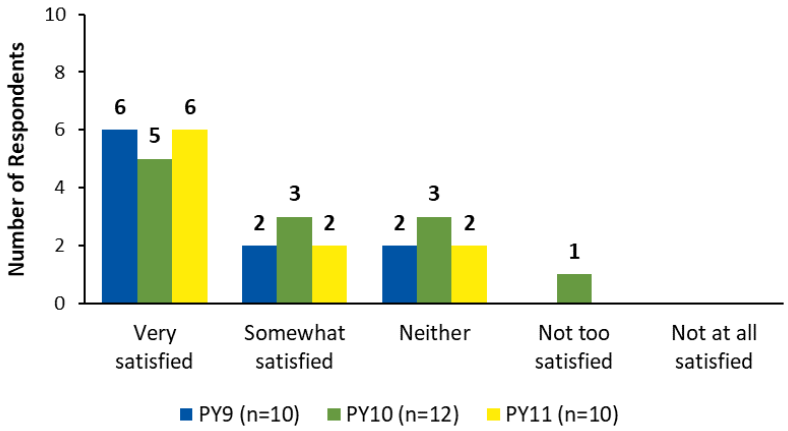
Eight said they were aware of the forecast for the three consecutive events. Of these, six were concerned about adverse impacts on business operations, particularly the managers of manufacturing facilities who were concerned about the loss of production for their business. Two respondents said they were not concerned.

The survey asked the nine respondents who participated in at least two of three consecutive events how easy or difficult it was for their facilities to participate. Two said *somewhat easy*, and one said *very easy*. Six respondents said it was difficult—one said *very difficult*, and five said *somewhat difficult.* These respondents explained that the consecutive events required additional staff, operational planning, and communication to employees. Notably, the respondent who said it was *very easy* manages a higher education facility and explained that events in general were easy to implement because there were fewer occupants in the building during the summer semester.

1.3.3.3 Customer Satisfaction

In PY11, eight of 10 respondents were satisfied with the Demand Response Program—six were *very satisfied* and two were *somewhat satisfied*. No respondent said they were dissatisfied. Figure 2 shows overall satisfaction with the program for PY9, PY10, and PY11. PY11 achieved the same overall program satisfaction results as PY9.

Figure 2. Overall Satisfaction with Demand Response Program



Source: Survey question, "How would you rate your overall satisfaction with the Demand Response Program?"

The survey asked respondents a follow-up question about the reason for their program satisfaction rating. The satisfied respondents said the event notifications and communications were very good. Respondents who gave a neutral rating said the program is fair and reasonable; however, they would like to receive additional compensation for participating in consecutive events.

1.3.4 Cost-Effectiveness Reporting

Cadmus will include a detailed breakdown of finances and cost-effectiveness for the Demand Response Program in the PY11 Annual Report due November 15, 2020, when program costs are finalized.

1.4 Recommendations

In PY11, the Demand Response Program exceeded the Act 129 compliance target of 78 MW demand reduction for each event and is on track to meet the Act 129 compliance target of 92 MW demand reduction for Phase III. Most customers were satisfied with the program overall.

Because the program continues to successfully implement events and deliver strong performance, Cadmus does not have any program recommendations.

Conclusion 1: In PY11, PPL Electric Utilities' demand savings exceeded the Act 129 per-event compliance target and the Phase III compliance target.

Findings Support

- The program achieved an average peak load reduction of 104.3 MW in PY11. To date for Phase III, the program has achieved an average peak load reduction of 112.8 MW, putting the program on track to exceed the Act 129 compliance target of 92 MW (see Figure 1).
- The program met its per-event compliance target of at least 78.2 MW, or 85% of the total 92 MW compliance target, in each of the four events (see Figure 1).

Conclusion 2: The three-day consecutive events were difficult for most respondents but did not have a negative impact on demand reduction and satisfaction.

Findings Support

- Of the four events called in PY11, three of these events occurred on consecutive days (July 17, 18, and 19). This was the first time in Phase III that the program implemented three consecutive events (see section 1.3.3.1 *Program Delivery*).
- Six of nine respondents said it was difficult to participate in the consecutive events. They noted that consecutive events required additional staff, operational planning, and communication to employees (see section 1.3.3.2 *Event Experience*). Despite these difficulties, these respondents participated in all three consecutive events, and the program exceeded its per-event compliance target on each of the three consecutive events (see Figure 1).
- Eight of 10 respondents were satisfied with the overall program in PY11. No respondent said they were dissatisfied. PY11 achieved the same overall program satisfaction results as PY9 (see Figure 2).

Appendix A. Evaluation Detail – Demand Response Program

A.1 Gross Impact Evaluation

This appendix describes the methodology for estimating savings and program load impacts.

A.1.1 *Ex Post* Verified Savings Methodology

Cadmus analyzed advanced metering infrastructure (AMI) interval consumption data for each participating facility. A facility was defined as the area over which the participating customer's electricity consumption was metered and the load reductions measured during PY11 Demand Response Program period (June 1, 2019, through September 30, 2019). In PY11, 64 facilities participated in one or more Act 129 events.

Cadmus estimated the event load impacts for a facility as the difference between baseline electricity demand and metered demand, as shown in this equation:

$$\text{kW impact} = \text{Baseline kW} - \text{Metered kW}$$

Baseline demand is a counterfactual and represents what the facility's load would have been if the load curtailment event had not been called. The baseline is unobservable and must be estimated. Accurate estimation of load impacts requires establishing a valid method for estimating the baseline. The methods Cadmus employed for estimating the baselines are described below.

Data Collection

Cadmus collected data from several sources to evaluate the PY11 Demand Response Program impacts. Table A-1 lists the data and sources.

PPL Electric Utilities provided 15-minute or one-hour interval consumption data between April 1, 2019, and September 15, 2019, for 64 participating facilities. Cadmus aggregated all facility 15-minute interval data to the hour level. A small percentage of intervals was estimated or included one or more estimated or missing 15-minute intervals. Cadmus flagged these observations and set them to missing for the analysis. Estimated readings were not used in the calculation of facility baselines or in estimating savings. Cadmus also screened the data for outliers but did not remove any observations.

Table A-1. Data Sources

Data	Population	Period	Variables	Source
Customer information system data	Demand Response Program participant facilities	From beginning of enrollment to end of summer 2019	Customer name, account number, business segment, ICSP baseline calculation method, enrolled MW, event hour participation indicators and reported load reductions, advance notification times, PJM economic market participation dates	CPower (ICSP)
PJM day-ahead forecasts and Act 129 event dates and hours	PPL Electric Utilities Demand Response Program participants	Summer 2019	Event dates and hours	PJM Interconnection LLC website
Facility interval consumption data	PPL Electric Utilities Demand Response Program participants	April 1, 2019–September 15, 2019	15 minute or hour interval kWh, estimated read indicator	PPL Electric Utilities
Weather	11 weather stations in PPL Electric Utilities service area	April 1, 2019–September 15, 2019	Dry-bulb temperature	NOAA
Solar radiation	Penn State, Pennsylvania SURFRAD site	April 1, 2019-September 15, 2019	Global horizontal irradiance	NOAA ESRL GMD
Line losses	Commercial and industrial electric utility customers	Phase III Act 129	Line loss factor	PA Technical Resource Manual (2016), Table 1-4

Baseline Calculation Approach

Day-Matching Customer Baselines and Regression Baselines

Cadmus estimated individual consumption baselines for each participating facility and event using either a day-matching approach or regression. Day-matching identifies a set of nearby, non-event, non-holiday weekdays for each event day, referred to as the basis window. For each event hour, the baseline is the average consumption during the same hour of the days or subset of days in the basis window.

Selection of Facility Baseline Calculation Methods

Before the beginning of PY11, Cadmus assigned each participating facility to one of the following day-matching baseline calculation methods or a regression method:

- 2 previous days
- 3 previous days
- 4 previous days
- 5 previous days
- 10 previous days
- 3 of 5 previous days with highest average load during event hours
- 4 of 5 previous days with highest average load during event hours 7 of 10 previous days with highest average load during event hours
- 3 previous days of the same day type (e.g., Wednesdays)
- 4 previous days of the same day type
- Regressions (one of 81 models)

Cadmus selected the most accurate baseline calculation method for each participating facility based on tests of predictive accuracy.[4]

Table A-2 shows counts of participating facilities by final baseline modeling approach for all facilities, by customer segment, and for 19 facilities with capacity enrollments greater than or equal to 1 MW. These 19 facilities accounted for 95% of enrolled capacity.

Table A-2. Number of Facilities by Baseline Modeling Approach

Baseline	All Facilities	GNE	Large C&I	Small C&I	DR Capacity ≥ 1 MW
2 OF 2	4	0	4	0	4
3 OF 3	1	0	1	0	1
3 OF 5	1	0	1	0	1
4 OF 4	0	0	0	0	0
4 OF 5	1	0	1	0	1
5 OF 5	1	0	1	0	1
7 OF 10	6	1	5	0	5
10 OF 10	2	0	2	0	2
Day of Week 4 of 4	1	0	1	0	1
Day of Week 3 of 3	0	0	0	0	0
Regression	47	11	5	31	3
Total	**64**	**12**	**21**	**31**	**19**

Many large C&I facilities used day-matching approaches because they had nearly constant or highly variable day-to-day consumption between 2:00 p.m. and 6:00 p.m., and regression did not predict better than day-matching methods. For these facilities, the best predictor of consumption was the consumption in days within some range of the days of the events, so Cadmus selected X-of-Y-previous-day baseline methods for many large C&I facilities.

Act 129 Events in Program Year 11

Table A-3 presents the Act 129 event dates, hours, advance notification date and times, and the average outside temperature during events in PY11.

[4] Cadmus performed a separate analysis for each facility, selecting the day-matching or regression baseline method that performed best in terms of accuracy, bias, and variability (risk). It assessed the accuracy of the baseline using relative root mean squared error (RRMSE), bias using mean absolute percentage error (MAPE) and median percentage prediction error, and variability using the distribution of errors. Cadmus calculated and plotted the distribution of errors to see if for a small number of hours the models predicted poorly.

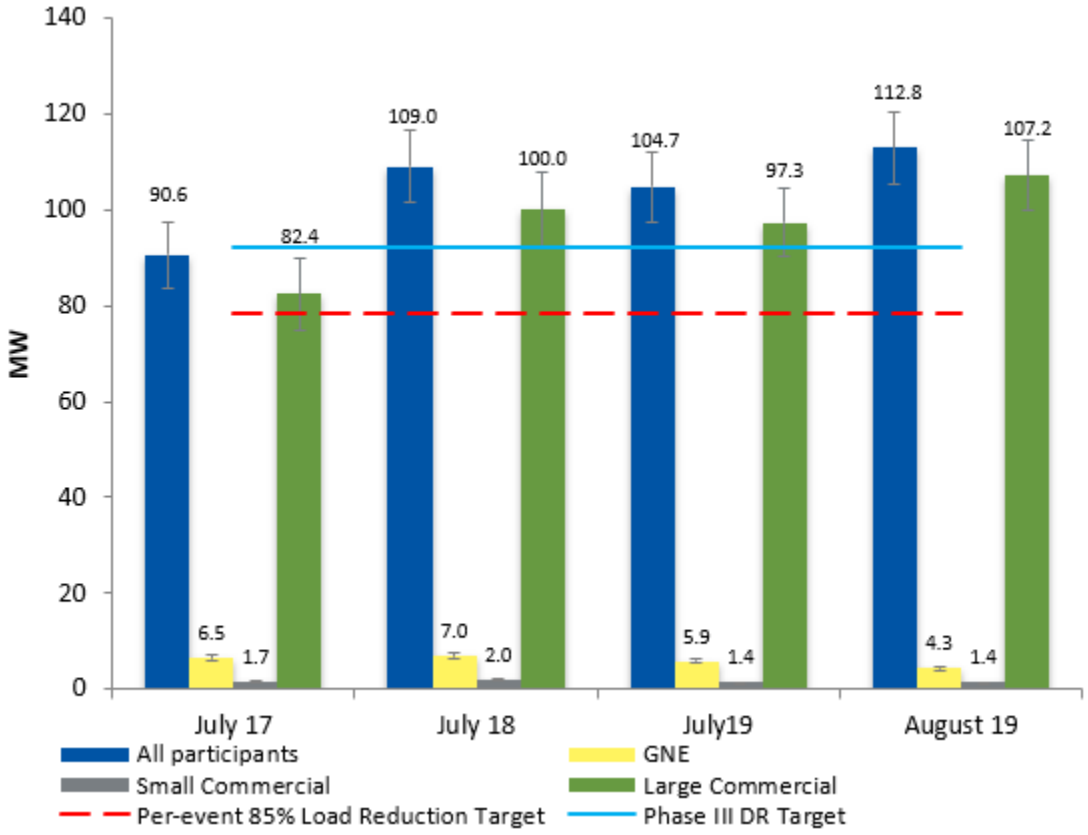
Table A-3. PY11 Act 129 Events Dates and Times

Event Date	Event Hours	Advance Notification Date and Time	Average Outside Temperature (°F) During Event
Wednesday, July 17, 2019	2:00 p.m. - 6:00 p.m.	Tuesday, July 16, 2019, 10:27 a.m.	87
Thursday, July 18, 2019	3:00 p.m. - 7:00 p.m.	Wednesday, July 17, 2019, 11:15 a.m.	87
Friday, July 19, 2019	2:00 p.m. - 6:00 p.m.	Thursday, July 18, 2019, 11:28 a.m.	94
Monday, August 19, 2019	2:00 p.m. - 6:00 p.m.	Sunday, August 18, 2019, 10:30 a.m.	90
Note: Advance notification times were obtained from CPower, the ICSP, through Cadmus data request.			

A.1.2 Results and Discussion

The estimates of program and customer segment demand savings for each PY11 Act 129 event date are presented in Figure 1 and Table 4 in the main content of this report (*1.2.2 Gross Impact Evaluation Results*). In Figure A-1, Cadmus presents the results graphically. Unless noted otherwise, all demand load impacts have been adjusted for line losses.

Figure A-1. PPL Electric Utilities Act 129 Gross Verified Demand Savings, PY11



Notes: Estimates based on Cadmus analysis of AMI interval consumption data for participant facilities. Error bars show 90% confidence intervals. The Phase III demand response compliance target for PPL Electric Utilities is 92 MW. All savings estimates were adjusted for line losses.

PPL Electric Utilities averaged 104 MW across the four 2019 events and 113 MW for all Phase III events, which puts the program on track to exceed PPL Electric Utilities' compliance target of 92 MW for Phase III of Act 129. PPL Electric Utilities achieved the maximum event demand savings of 112.8 MW on August 19 and the minimum event demand savings of 90.6 MW on July 17. As Figure A-1 shows, large C&I customers were responsible for more than 90% of the demand response savings.

Table A-4 reports the evaluation estimated demand savings, metered demand, estimated baseline demand, and the percentage demand savings by event for each customer segment and the program. On average in PY11, the program produced demand savings of 42% relative to baseline consumption. The small C&I and GNE sectors produced savings between 15% and 25% of baseline demand. The large C&I sector produced savings between 40% and 50% of baseline consumption.

Table A-4. Event Demand Savings and Baseline Demand

Stratum	Event	Demand Savings (MW/hour)	Metered Demand (MW/hour)	Baseline Demand (MW/hour)	Relative Precision at 90% C.L.	Percentage Demand Savings
Small C&I	7/17/2019	1.7	8.3	10.0	8.1%	17%
	7/18/2019	2.0	6.8	8.8	6.4%	23%
	7/19/2019	1.4	8.3	9.8	8.9%	15%
	8/19/2019	1.4	7.4	8.8	8.9%	16%
Large C&I	7/17/2019	82.4	124.7	207.1	8.3%	40%
	7/18/2019	100.0	111.2	211.2	7.4%	47%
	7/19/2019	97.3	111.1	208.5	7.6%	47%
	8/19/2019	107.2	105.6	212.7	7.0%	50%
GNE	7/17/2019	6.5	22.2	28.7	10.1%	23%
	7/18/2019	7.0	20.8	27.8	8.3%	25%
	7/19/2019	5.9	23.0	28.9	9.2%	20%
	8/19/2019	4.3	23.0	27.3	11.0%	16%
Event [(1)]	**7/17/2019**	**90.6**	**155.2**	**245.8**	**7.6%**	**37%**
	7/18/2019	**109.0**	**138.8**	**247.8**	**6.8%**	**44%**
	7/19/2019	**104.7**	**142.5**	**247.2**	**7.1%**	**42%**
	8/19/2019	**112.8**	**135.9**	**248.8**	**6.6%**	**45%**
Average	**-**	**104.3**	**143.1**	**247.4**	**3.5%**	**42%**

[(1)] Event totals may not sum due to rounding.