

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

**PHASE III OF ACT 129 PY12 ANNUAL REPORT  
(JUNE 1, 2020 – NOVEMBER 15, 2020)  
FOR PENNSYLVANIA ACT 129 OF 2008  
ENERGY EFFICIENCY AND CONSERVATION PLAN**

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## 1 Demand Response Program

To comply with the Pennsylvania Public Utility Commission's Act 129 Phase III demand response compliance targets, PPL Electric Utilities' Demand Response Program must reduce its system load (measured at the generator level) by an average of 92 MW during demand response events in PY9, PY10, and PY11 of Phase III.<sup>1</sup> In addition, PPL Electric Utilities is required to achieve a minimum of 85% of the 92 MW compliance target, or 78.2 MW, during each event during these program years. Compliance with Act 129 will not be based on performance in PY12 per the Pennsylvania Public Utility Commission's Phase III Modification Order that the Pennsylvania electric distribution companies may operate the demand response programs in PY12 on a voluntary basis.<sup>2</sup> The Commission modified the compliance requirements in response to disruptions to electric utility customer operations related to the COVID-19 pandemic. However, the Commission encouraged the utilities to operate their programs in PY12, and PPL Electric Utilities elected to continue operating the program for commercial and industrial (C&I) customers and for 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 PPL Electric Utilities retail customers to reduce electricity demand during Act 129 demand response events.<sup>3</sup> After the summer season concludes, the ICSP makes performance-based payments to participating customers.<sup>4</sup>

### Definition of a Participant

A participant in the Demand Response Program in PY12 is defined as a customer facility that participated in at least one of PPL Electric Utilities' Act 129 demand response events. The ICSP enrolled 43 customers representing 126 facilities in PY12. A total of 36 customers with 118 facilities participated in at least one Act 129 demand response event.

### Program Participation and Reported Impacts

Table 1 presents the participation counts, reported demand reductions, and incentive payments for the Demand Response Program in PY12 by customer segment and Act 129 event. In PY12 (summer of 2020), there were five Act 129 events. The program reported demand savings of approximately 108.7 MW on

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<sup>1</sup> Program objectives are stipulated on PPL Electric Utilities' revised EE&C Plan (Docket No. M-2015-2515642) filed with the Pennsylvania Public Utilities Commission in July 2018 and approved in November 2018.

<sup>2</sup> Pennsylvania Public Utility Commission. June 3, 2020. *Phase III Modification Order*. Docket No. M-2014-2424864. [http://www.puc.pa.gov/filing\\_resources/issues\\_laws\\_regulations/act\\_129\\_information/energy\\_efficiency\\_and\\_conservation\\_ee\\_c\\_program.aspx](http://www.puc.pa.gov/filing_resources/issues_laws_regulations/act_129_information/energy_efficiency_and_conservation_ee_c_program.aspx)

<sup>3</sup> CPower, the ICSP, contracted with four PPL Electric Utilities' customer facilities through the demand response aggregators NRG, COI Energy Services, and Direct Energy.

<sup>4</sup> In PY12, 43 customers representing 126 facilities were enrolled in the program; however, seven customers representing eight facilities did not participate in any events.

July 20, 103.0 MW on July 27, 79.4 MW on July 29, 93.3 MW on August 25, and 109.2 MW on August 27. Between 93% and 98% of the reported demand savings for each of these events were attributable to large C&I customers.

**Table 1. PY12 Demand Response Program Participation and Reported Demand Reductions**

Parameter	Small C&I (Non-GNE)	Large C&I (Non-GNE)	GNE	Total <sup>(1)</sup>
PYTD Number of Participants <sup>(2)</sup>	78	32	8	118
Event 1, July 20, 2020, Reported MW	1.0	104.6	3.1	108.7
Event 2, July 27, 2020, Reported MW	1.4	99.3	2.3	103.0
Event 3, July 29, 2020, Reported MW	2.5	73.7	3.1	79.4
Event 4, August 25, 2020, Reported MW	1.6	90.3	1.5	93.3
Event 5, August 27, 2020, Reported MW	0.3	106.7	2.2	109.2
Total Average Reported MW	1.4	94.9	2.4	98.7
PYVTD MW	2.1	92.2	2.6	96.9
PY12 Incentives (\$1000)	\$26	\$1,344	\$37	\$1,407

The load impacts reported in this table have been grossed up to reflect transmission and distribution losses.  
<sup>(1)</sup> Total may not equal total of row due to rounding.  
<sup>(2)</sup> Number of facilities that participated in at least one event (118) in PY12, not the number enrolled in the program (126).

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 PY12, all but three PPL Electric Utilities demand response program participants were dual-enrolled participants. Table 2 reports the number of these dual-enrolled and Act 129-only participating facilities and the incentives paid.

**Table 2. PY12 Dual-Enrolled Participants (PPL Electric Utilities Act 129 and PJM programs)**

Dual-Enrolled and Participating Customer Facilities	Act 129-Only and Participating Customer Facilities	Incentives Paid to Dual-Enrolled Customers	Incentives Paid to Act 129-Only Customers
115	3	\$1,384,812.95	\$22,193.68

## 1.1 Gross Savings Impact Evaluation

### Impact Evaluation Data Collection and Sample Design

In PY12, 118 facilities operated by 36 customers of PPL Electric Utilities participated in one or more Act 129 demand response events. Table 3 shows the number of participating facilities by customer stratum. About two-thirds (66%) of the participants were small C&I facilities, one-quarter (27%) were large C&I customers, and the remainder (7%) were GNE customers.<sup>5</sup> Cadmus estimated load impacts for all participant facilities for one or more events.

<sup>5</sup> Appendix A.1 provides a count of participants by stratum for each Act 129 event in PY12.

**Table 3. PY12 Program Sampling Strategy**

Stratum	Population Size (Facilities)	Target Levels of Confidence & Precision	Target Sample Size	Achieved Sample Size	Evaluation Activity
Small C&I	78	NA	Census	78	Analysis of individual customer hourly consumption
Large C&I	32	NA	Census	32	
GNE	8	NA	Census	8	
<b>Program Total</b>	<b>118</b>	<b>NA</b>	<b>Census</b>	<b>118</b>	

Compliance targets for demand response programs were established at the generator level, which means load reductions measured at the customer meter must be increased to reflect transmission and distribution losses (line losses). The peak demand impact estimates presented in this report have been adjusted for these line losses. PPL Electric Utilities uses the following line loss percentages and/or multipliers by customer sector:

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

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.<sup>6</sup> For each facility, Cadmus analyzed interval consumption data to identify the most accurate baseline calculation method. Additional details about the evaluation and baseline selection methodology are in *Appendix A*.

### Gross Savings Impact Evaluation Results

PPL Electric Utilities met its Phase III Act 129 demand reduction compliance target specified in the Implementation Order and Phase III Modification Order. Figure 1 shows the PY9-PY11 gross verified savings, the basis for determining Phase III compliance. For Phase III, the verified Act 129 event 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, in PY9, PY10, and 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 also shows the gross verified savings for PY12 by event. In PY12, verified Act 129 event load reductions were 96.9 MW (equal to the average demand reduction over the five demand response events), a realization rate of 98.2% relative to the reported (*ex ante*) load reduction.

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.

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<sup>6</sup> Cadmus applied standard day-matching baseline calculation methods, such as selecting the seven days of the previous 10 with the highest average demand, in accordance with Statewide Evaluator (SWE) guidelines.

**Figure 1. Gross Verified Savings Compared to Act 129 Targets, PY9-PY12**

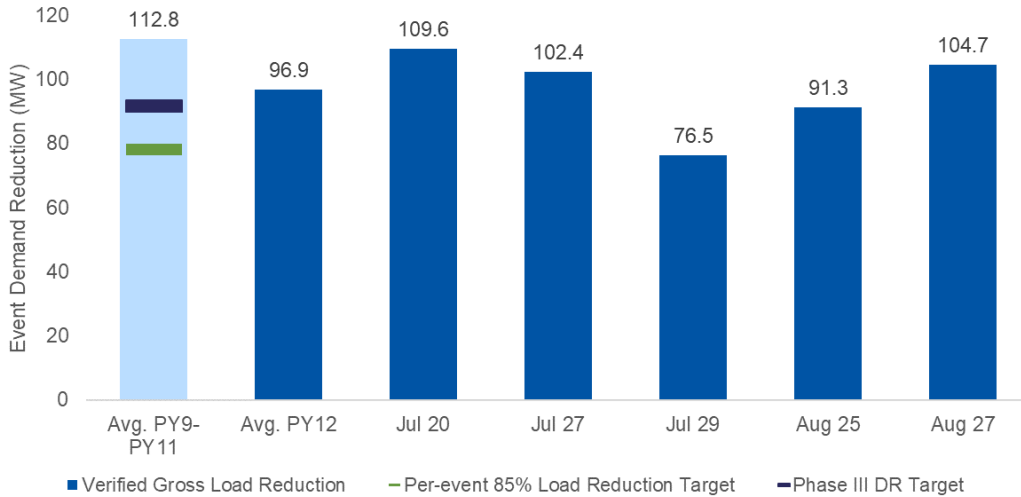


Table 4 shows PY12 Demand Response Program load reduction achievements by sector and demand response event.

**Table 4. PY12 Demand Response Program Gross Impact Results for Demand by Sector**

Stratum	Event	Number of Participants	PYRTD MW	Demand Realization Rate <sup>(1)</sup>	PYVTD MW <sup>(2)</sup>	Standard Error	Relative Precision at 90% C.L. <sup>(3)</sup>
Small C&I	July 20, 2020	77	1.0	204%	2.1	0.1	11.4%
	July 27, 2020	78	1.4	121%	1.6	0.1	14.6%
	July 29, 2020	78	2.5	80%	2.0	0.1	11.2%
	August 25, 2020	78	1.6	178%	2.9	0.1	8.3%
	August 27, 2020	77	0.3	543%	1.9	0.1	11.7%
Large C&I	July 20, 2020	28	104.6	99%	103.1	4.2	6.7%
	July 27, 2020	28	99.3	98%	97.5	4.2	7.0%
	July 29, 2020	22	73.7	97%	71.2	3.5	8.1%
	August 25, 2020	29	90.3	97%	87.6	4.1	7.7%
	August 27, 2020	30	106.7	95%	101.5	4.2	6.8%
GNE	July 20, 2020	8	3.1	143%	4.5	0.6	22.2%
	July 27, 2020	8	2.3	139%	3.2	0.6	29.3%
	July 29, 2020	7	3.1	106%	3.3	0.5	27.1%
	August 25, 2020	7	1.5	58%	0.9	0.4	78.7%
	August 27, 2020	4	2.2	58%	1.3	0.5	59.8%
Event <sup>(4)</sup>	July 20, 2020	113	108.7	101%	109.6	4.3	6.4%
	July 27, 2020	114	103.0	99%	102.4	4.2	6.8%
	July 29, 2020	107	79.4	96%	76.5	3.5	7.6%
	August 25, 2020	114	93.3	98%	91.3	4.1	7.4%
	August 27, 2020	111	109.2	96%	104.7	4.2	6.7%
<b>Average</b>	-	<b>112</b>	<b>98.7</b>	<b>98%</b>	<b>96.9</b>	<b>4.1</b>	<b>3.1%</b>

<sup>(1)</sup> Due to rounding, multiplying the PYRTD savings by the realization rate may not exactly equal the final verified savings.

<sup>(2)</sup> Based on Cadmus' analysis of participant AMI consumption data. MW were grossed up to reflect transmission and distribution losses.

<sup>(3)</sup> Precision accounts for covariances of facility savings across hours of each event but not between events.

<sup>(4)</sup> Total may not sum due to rounding.

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

- **Different treatment of estimated readings.** The ICSP provided estimates rather than actual values for fewer than 1% of all hourly interval readings for participating facilities on event or weekdays that were not holidays or notification days between April 1, 2020, and September 11, 2020. 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 95% of small C&I facilities, 71% of GNE facilities, and 38% 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.

## 1.2 Process Evaluation

### Process Evaluation Data Collection and Sample Design

The process evaluation gathered program implementation details and assessed customer satisfaction with the Demand Response Program. Table 5 lists the process evaluation sampling strategy. Unlike the impact evaluation, which analyzed the entire population of participating facilities, the process evaluation attempted a survey of enrolled customers contracted by the ICSP CPower. Customers did not have to participate in an event in PY12 to qualify for the survey but must have enrolled for the PY12 program and received the event notifications.

**Table 5. PY12 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 <sup>(1)</sup>	Percent of Sample Frame Contacted to Achieve Sample <sup>(2)</sup>
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	38 <sup>(3)</sup>	N/A	12	6	36	100%
<b>Program Total</b>			<b>40</b>	<b>N/A</b>	<b>14</b>	<b>8</b>	<b>38</b>	<b>N/A</b>

<sup>(1)</sup> 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.

<sup>(2)</sup> Percent contacted means the percentage of the sample frame that were emailed to complete surveys.

<sup>(3)</sup> The ICSP contracted with 38 unique companies that enrolled in the PY12 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, COI Energy Services, 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, COI Energy Services, and Direct Energy.

In October 2020, Cadmus contacted 36 enrolled companies by email and telephone, even if they did not participate in any PY12 events, to ask them to complete a short survey.<sup>7</sup>

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 four attempts to gather survey responses. The first, second, and third attempts were by email; the fourth attempt was by telephone. Despite multiple attempts, Cadmus only gathered six completed surveys, which was less than the target of 12 completed surveys. Because of the small number of respondents, 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.

### *Program Satisfaction*

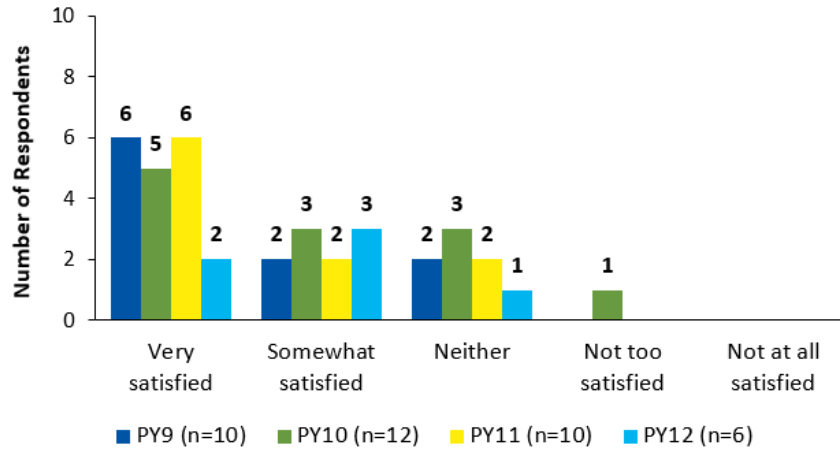
In PY12, five of six respondents were satisfied with the Demand Response Program—two were *very satisfied* and three were *somewhat satisfied*. No respondent reported being dissatisfied. Figure 2 shows overall satisfaction with the program for PY9 through PY12.

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<sup>7</sup> Cadmus did not survey the enrolled customers under contract with the demand response sub-contractors NRG, COI Energy Services, and Direct Energy, only customers enrolled under contract with CPower.



**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. Three respondents answered the question. One *very satisfied* respondent said their rating was because of the simplicity of participation. One *somewhat satisfied* respondent said they were less than very satisfied due to a reduction in their incentive payments. The one respondent who said they were *neither satisfied nor dissatisfied* said it was because of the short notice, which made it challenging for their business.

### 1.3 Cost-Effectiveness Reporting

Cadmus will include a detailed breakdown of finances and cost-effectiveness for the Demand Response Program in the PY12 Annual Report due November 15, 2021, when program costs are finalized.

## *1.4 Recommendations*

Because the program did well in PY12 and will not be delivered in Phase IV, Cadmus does not have any recommendations to make for the program.

## Appendix A. Evaluation Detail – Demand Response Program

### A.1 Evaluation Sampling Approach

The impact evaluation strategy is shown in Table A-1. Cadmus analyzed consumption data to estimate Act 129 demand response event load impacts in PY12 for the population of participating facilities. Participants were facilities that participated in at least one Act 129 demand response event and were associated with any of the four demand response aggregators—CPower or one of its subcontractors: NRG, COI Energy Services, or Direct Energy.

**Table A-1. PY12 Demand Response Program Gross Impact Evaluation Design**

Stratum	Event	Population Size <sup>(1)</sup>	Assumed Proportion or Cv in Sample Design	Target Sample Size	Achieved Sample Size	Impact Evaluation Activity
Small C&I	July 20, 2020	77	NA	77	77	Analysis of individual participating facility loads was performed for each event hour
	July 27, 2020	78	NA	78	78	
	July 29, 2020	78	NA	78	78	
	August 25, 2020	78	NA	78	78	
	August 27, 2020	77	NA	77	77	
Large C&I	July 20, 2020	28	NA	28	28	
	July 27, 2020	28	NA	28	28	
	July 29, 2020	22	NA	22	22	
	August 25, 2020	29	NA	29	29	
	August 27, 2020	30	NA	30	30	
GNE	July 20, 2020	8	NA	8	8	
	July 27, 2020	8	NA	8	8	
	July 29, 2020	7	NA	7	7	
	August 25, 2020	7	NA	7	7	
	August 27, 2020	4	NA	4	4	
Program Total <sup>(2)</sup>	<b>July 20, 2020</b>	<b>113</b>	<b>NA</b>	<b>113</b>	<b>113</b>	
	<b>July 27, 2020</b>	<b>114</b>	<b>NA</b>	<b>114</b>	<b>114</b>	
	<b>July 29, 2020</b>	<b>107</b>	<b>NA</b>	<b>107</b>	<b>107</b>	
	<b>August 25, 2020</b>	<b>114</b>	<b>NA</b>	<b>114</b>	<b>114</b>	
	<b>August 27, 2020</b>	<b>111</b>	<b>NA</b>	<b>111</b>	<b>111</b>	

<sup>(1)</sup> Population size is the count of facilities that participated in one or more Act 129 DR event hours as reported by the ICSP.

### A.2 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 PY12 Demand Response Program period (June 1, 2020, through September 30, 2020). In PY12, 118 facilities participated in one or more Act 129 events.

Cadmus estimated the event load impacts for a facility as the difference between the facility’s 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 Act 129 demand response 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 PY12 Demand Response Program impacts. Table A-2 lists the data and sources.

PPL Electric Utilities provided 15-minute or one-hour interval consumption data between April 1, 2020, and September 11, 2020, for the 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-2. Data Sources**

Data	Population	Period	Variables	Source
Participant information data	Demand Response Program participant facilities	June 1, 2020 – September 30, 2020	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 2020	Event dates and hours	PJM Interconnection LLC website
Facility interval consumption data	PPL Electric Utilities Demand Response Program participants	April 1, 2020– September 11, 2020	15 minute or hour interval kWh, estimated read indicator	PPL Electric Utilities
Weather	11 weather stations in PPL Electric Utilities service area	April 1, 2020– September 11, 2020	Dry-bulb temperature	NOAA
Solar radiation	Penn State, Pennsylvania SURFRAD site	April 1, 2020– September 11, 2020	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.

The facility baseline regression models were estimated with data from days that almost qualified as Act 129 event days. These “almost Act 129 event days” were the 30 non-notification, non-holiday weekdays with the highest PJM day-ahead load forecasts that did not qualify as event days. The load on these days provided a natural baseline for assessing the impact of Act 129 events.

### Selection of Facility Baseline Calculation Methods

Before the beginning of PY12, Cadmus assigned each participating facility to one of the following day-matching baseline calculation methods or a regression method:

- 2 previous days<sup>8</sup>
- 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.<sup>9</sup>

Table A-3 shows counts of participating facilities by final baseline modeling approach for all facilities, by customer segment, and for 20 facilities with capacity enrollments greater than or equal to 1 MW. These 20 facilities accounted for 92% of enrolled capacity.

Many large C&I facilities used day-matching approaches because they had nearly constant demand or they had highly variable day-to-day demand, and regression did not predict better than day-matching methods. For these facilities, the best predictor of demand was the demand in days close to events, so Cadmus selected X-of-Y-previous-day baseline methods for many large C&I facilities.

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<sup>8</sup> When selecting basis days, Cadmus excluded previous weekend days, holidays, Act 129 event days, and Act 129 event notification days from the basis window.

<sup>9</sup> 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. 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	-	4	-	4
3 OF 3	1	-	1	-	1
3 OF 5	4	2	2	-	1
4 OF 4	-	-	-	-	-
4 OF 5	4	-	2	2	1
5 OF 5	2	-	1	1	1
7 OF 10	5	-	5	-	5
10 OF 10	3	-	3	-	2
Day of Week 4 of 4	3	-	2	1	2
Day of Week 3 of 3	-	-	-	-	-
Regression	92	6	12	74	3
<b>Total</b>	<b>118</b>	<b>8</b>	<b>32</b>	<b>78</b>	<b>20</b>

### Impacts of COVID-19 on Baseline Calculation Approach

The COVID-19 pandemic affected the operations and electricity consumption of many PPL Electric Utilities C&I customers, especially at the beginning of the pandemic in spring 2020. A concern is that the baseline calculation methods tested in previous years of normal business operations might perform poorly and not yield accurate estimates of demand savings for the demand response program participants during the COVID pandemic.

To investigate the validity of the baseline calculation methods, Cadmus started by plotting hourly consumption between April 1, 2020, and September 10, 2020, for all participant facilities. Many participants exhibited electricity consumption patterns similar to in previous years, and no COVID impacts were evident. For other participants, particularly for big-box retail stores and other retailers, it was obvious that business operations had been disrupted, as electricity consumption remained below normal and the levels observed in previous years. However, in June, as the Pennsylvania economy reopened, it appears many impacted businesses resumed normal operations and electricity consumption increased to expected levels. These normal operations persisted through summer. This lessened Cadmus' concerns that the existing baseline calculation methods may not be valid.

In addition, Cadmus conducted an interim evaluation of the demand response savings for the July 20, 2020, event to evaluate the performance of the baseline calculation methods and the reasonableness of the savings estimates. For the six participant facilities with the greatest committed capacity (91 MW), Cadmus estimated demand savings within 11% of the committed capacity. In addition, Cadmus verified that the baseline calculation methods predicted accurately for recent non-event (placebo) days in July.

Overall, Cadmus concluded that despite the COVID pandemic disruptions, the baseline calculation methods remained valid and it was unnecessary to adjust them.

## Act 129 Events in Program Year 12

Table A-4 presents the Act 129 event dates, hours, advance notification date and times, and the average outside temperature during events in PY12.

**Table A-4. PY12 Act 129 Events Dates and Times**

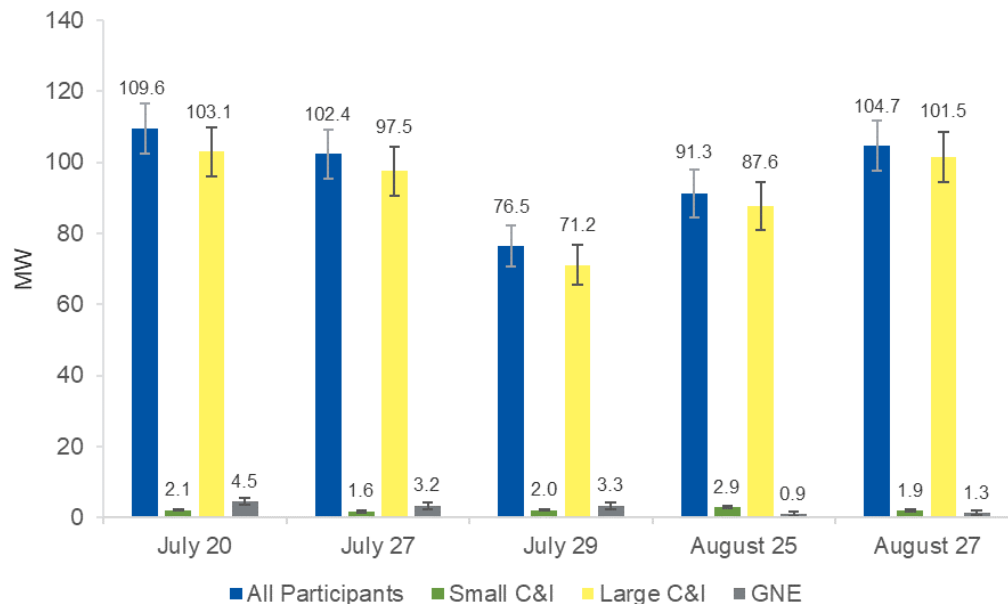
Event Date	Event Hours	Advance Notification Date and Time	Average Outside Temperature (°F) During Event
Monday, July 20, 2020	2:00 p.m. – 6:00 p.m.	Sunday, July 19, 2020, at 10:42 a.m.	89.2
Monday, July 27, 2020	2:00 p.m. – 6:00 p.m.	Sunday, July 26, 2020, at 10:23 a.m.	89.6
Wednesday, July 29, 2020	3:00 p.m. – 7:00 p.m.	Tuesday, July 28, 2020, at 10:35 a.m.	88.6
Tuesday, August 25, 2020	2:00 p.m. – 6:00 p.m.	Monday, August 24, 2020, at 10:32 a.m.	84.6
Thursday, August 27, 2020	3:00 p.m. – 7:00 p.m.	Wednesday, August 26, 2020, at 10:32 a.m.	90.5

Note: Advance notification times were obtained from CPower, the ICSP, through Cadmus data request.

## Results and Discussion

The estimates of program and customer segment demand savings for each PY12 Act 129 event date are presented in Figure 1 and Table 4 in the main content of this report (*Gross Savings 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, PY12**



Notes: Estimates based on Cadmus analysis of AMI interval consumption data for participant facilities. Error bars show 90% confidence intervals. All savings estimates were adjusted for line losses.

In PY12, PPL Electric Utilities achieved average demand savings of 96.9 MW across the five 2020 Act 129 events. PPL Electric Utilities achieved the maximum event demand savings of 109.6 MW on July 20 and the minimum event demand savings of 76.5 MW on July 29. As Figure A-1 shows, large C&I customers were responsible for between 93% and 97% of the gross verified demand response savings depending on the event.

Table A-5 reports the gross verified demand savings, metered demand, estimated baseline demand, and the percentage demand savings by event for each customer segment and the program. All MW/hour have been adjusted for line losses and reflect demand at the generator. On average, the program produced demand savings of 47% relative to baseline consumption. The small C&I sector produced savings between 6% and 10% of baseline demand. The GNE sector produced savings between 14% and 50% of baseline demand. The large C&I sector produced savings between 50% and 57% of baseline demand.

**Table A-5. Gross Verified Demand Savings, Metered Demand, and Baseline Demand by Customer Segment and Event**

Stratum	Event	Gross Verified Demand Savings (MW/hour)	Metered Demand (MW/hour)	Baseline Demand (MW/hour)	Relative Precision at 90% C.L.	Percentage Demand Savings
Small C&I	July 20, 2020	2.1	27.3	29.3	11.4%	7.1%
	July 27, 2020	1.6	28.9	30.6	14.6%	5.4%
	July 29, 2020	2.0	26.7	28.7	11.2%	7.1%
	August 25, 2020	2.9	25.7	28.6	8.3%	10.0%
	August 27, 2020	1.9	26.6	28.5	11.7%	6.6%
Large C&I	July 20, 2020	103.1	81.5	184.6	6.7%	55.8%
	July 27, 2020	97.5	72.5	170.1	7.0%	57.4%
	July 29, 2020	71.2	56.0	127.2	8.1%	56.0%
	August 25, 2020	87.6	87.6	175.2	7.7%	50.0%
	August 27, 2020	101.5	83.9	185.4	6.8%	54.8%
GNE	July 20, 2020	4.5	6.9	11.4	22.2%	39.3%
	July 27, 2020	3.2	7.2	10.5	29.3%	31.0%
	July 29, 2020	3.3	5.9	9.3	27.1%	35.9%
	August 25, 2020	0.9	5.2	6.1	78.7%	14.1%
	August 27, 2020	1.3	1.3	2.5	59.8%	49.4%
All Participants	July 20, 2020	109.6	115.7	225.3	6.4%	48.7%
	July 27, 2020	102.4	108.7	211.1	6.8%	48.5%
	July 29, 2020	76.5	88.6	165.1	7.6%	46.3%
	August 25, 2020	91.3	118.6	209.9	7.4%	43.5%
	August 27, 2020	104.7	111.8	216.4	6.7%	48.4%
<b>Average</b>	-	96.9	108.7	205.6	3.1%	47.1%

Note: All MW/hour have line loss adjustments applied and represent demand at the generator. Event totals may not sum due to rounding. Difference between baseline demand and metered demand may not equal the gross verified demand savings due to rounding. The percentage demand savings may not equal the ratio of gross verified demand savings to baseline demand due to rounding.

### A.3 Survey Participant Profile

Of the 38 enrolled companies (contracted by CPower, the ICSP), 68% had one facility enrolled in the PY12 program, 58% were manufacturing facilities, and 45% participated in all five events. The surveys captured six respondents.

These six survey respondents represented approximately 22% of the total enrolled demand response capacity (138.3 MW) in PY12.

### Survey Sample Attrition

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

**Table A-6. PY12 Demand Response Participant Survey Sample Attrition Table**

Description of Survey Outcomes	Count
<b>Population (number of CPower, NRG, COI Energy Services, and Direct Energy enrolled facilities)</b>	<b>126</b>
Removed: NRG, COI Energy Services, and Direct Energy contracted facilities	6
Removed: Duplicate facility contacts for managers with multiple enrolled facilities	82
<b>Sample Frame (number of unique companies)</b>	<b>38</b>
Removed: Records with no contact information	2
<b>Survey Sample Frame (used for surveys)</b>	<b>36</b>
Not started	26
Refused or opted out	4
<b>Completed Surveys (online and telephone combined)</b>	<b>6</b>
<b>Response Rate (completed surveys divided by number of records)</b>	<b>17%</b>