



# 2017 IMPACT EVALUATION OF SAN DIEGO GAS & ELECTRIC'S RESIDENTIAL PEAK TIME REBATE AND SMALL CUSTOMER TECHNOLOGY DEPLOYMENT PROGRAMS



## Ex Post and Ex Ante Report CALMAC Study ID: SDG0308

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## EXECUTIVE SUMMARY

This report presents the findings of the 2017 ex post and ex ante evaluation for San Diego Gas and Electric's (SDG&E) Peak Time Rebate (PTR) Program. SDG&E's PTR Program is marketed as the *Reduce Your Use<sup>SM</sup>* (RYU) Rewards. If customers are able to save electricity between 11 a.m. and 6 p.m. on RYU Reward days, they earn a credit on their SDG&E bill. To earn rewards, customers must set up an alert (text, email, phone, or a combination) preference and SDG&E will let them know when to expect an RYU day. This program will be discontinued after 2018.

This report also includes the evaluation findings of the Small Customer Technology Deployment (SCTD) program. SDG&E marketed SCTD by offering free smart thermostats to customers who enrolled in the program. For the 2017 program year, SDG&E added a Bring-Your-Own-Thermostat (BYOT) component to the program. In addition to the free thermostats, two other vendors' smart thermostats could be enrolled in the program. Customers are required to purchase these BYOT thermostats and then register them with the program. All the smart thermostats are demand response technology enabled so that SDG&E can raise their thermostat setting for up to four continuous hours between the hours of 2 p.m. and 9 p.m. on RYU event days. SCTD participants are encouraged to enroll in RYU Rewards in order to receive an incentive for reducing their electricity use on RYU days. In 2018 and beyond, the SCTD program will be renamed to the AC Saver Day Ahead program.

### ES.1 EX POST EVALUATION SUMMARY

#### ES.1.1 PTR Ex Post Evaluation

There were three PTR events during the summer of 2017, occurring on August 31<sup>st</sup>, September 1<sup>st</sup>, and September 2<sup>nd</sup>. The average temperature during event hours was 93.6°F. Table ES-1 shows the average and aggregate PTR ex post load impact estimates for the participant groups of interest in this evaluation. Across all of the 2017 PTR events, the overall PTR population had an average event hour load reduction of 0.10 kW per participant, representing an average reduction of 7.0% relative to the reference load. The average aggregate load reduction during event hours was 7.84 MW. Large participants delivered 79% of the aggregate load reduction (6.22 MW), while Medium and Small participants delivered the remaining 21% (1.99 MW and 0.62 MW, respectively). Inland customers experienced higher temperatures during events (98.8°F) than Coastal customers (88.6°F) and had a higher average load reduction during event hours (0.13 kW versus 0.07 kW). Low income participants had almost no load reduction during events, with an average of 0.01 kW (0.5%). The participants who first enrolled in 2017 saved the most during the 2017 PTR events, with an average of 0.18 kW (16.3%) during event hours. Having both email and text event notification resulted a higher average event hour reduction of 0.13 kW (9.1%). The net energy



metered (NEM) participants, as a group, had an average load reduction of 0.16 (25.3%), higher than the overall PTR group.

**TABLE ES-1: PTR EX POST LOAD IMPACT ESTIMATES BY CUSTOMER CATEGORY - AVERAGE 2017 EVENT (11 A.M. TO 6 P.M.)**

Customer Category	Mean Active Participants	Mean Reference Load (kW)	Mean Observed Load (kW)	Mean Impact (kW)	% Load Reduction	Aggregate Load Reduction (MW)	Mean °F
All	80,572	1.39	1.29	0.10	7.0%	7.84	93.6
Large	36,476	1.79	1.62	0.17	9.5%	6.22	94.3
Medium	27,012	1.30	1.22	0.07	5.7%	1.99	93.6
Small	17,084	0.73	0.69	0.04	5.0%	0.62	92.4
Coastal	40,703	1.08	1.02	0.07	6.2%	2.72	88.6
Inland	39,869	1.70	1.57	0.13	7.8%	5.33	98.8
No SCTD	72,355	1.35	1.29	0.06	4.5%	4.42	93.5
No Load Control (SCTD or SS)	70,138	1.34	1.28	0.06	4.2%	3.95	93.4
Low Income*	13,245	1.19	1.18	0.01	0.5%	0.08	94.0
Non-Low Income*	56,893	1.61	1.57	0.03	2.1%	1.94	93.0
Enroll. Year – 2012*	17,195	1.37	1.35	0.02	1.7%	0.40	93.2
Enroll. Year – 2013*	5,116	1.43	1.40	0.02	1.5%	0.11	93.5
Enroll. Year – 2014*	19,269	1.39	1.34	0.05	3.4%	0.90	93.5
Enroll. Year – 2015*	8,375	1.42	1.40	0.03	1.8%	0.22	93.5
Enroll. Year – 2016*	9,695	1.33	1.28	0.05	3.5%	0.45	93.4
Enroll. Year – 2017*	10,488	1.08	0.91	0.18	16.3%	1.86	93.7
Notification – Email Only*	44,048	1.29	1.25	0.04	2.9%	1.66	93.3
Notification – Text Only*	12,967	1.42	1.36	0.06	4.2%	0.77	93.5
Notification – Both*	11,778	1.45	1.32	0.13	9.1%	1.55	93.8
Net Energy Metered	17,747	0.64	0.48	0.16	25.3%	2.89	94.5

\* Participants excluding load control (no SCTD or Summer Saver).



The PTR customers who were also enrolled in Summer Saver had higher incremental<sup>1</sup> event hour load reductions overall, with an average of 0.18 kW (8.4%). Table ES-2 summarizes the incremental impacts associated with these dually enrolled customers, for the Summer Saver event hours of 4 p.m. to 8 p.m.

**TABLE ES-2: SUMMER SAVER DUALLY ENROLLED IN PTR EX POST LOAD IMPACT ESTIMATES BY CUSTOMER CATEGORY - AVERAGE 2017 EVENT (4 P.M. TO 8 P.M.)**

Customer Category	Mean Active Participants	Mean Reference Load (kW)	Mean Observed Load (kW)	Mean Impact (kW)	% Load Reduction	Aggregate Load Reduction (MW)	Mean °F
All	2,217	2.10	1.92	0.18	8.4%	0.39	96.8
Summer Saver – 50% Cycling	751	2.43	2.39	0.04	1.7%	0.03	97.9
Summer Saver – 100% Cycling	1,465	1.93	1.69	0.23	12.2%	0.34	96.3

### ES.1.1 SCTD Ex Post Evaluation

The SCTD event days in 2017 overlapped with the PTR events. SCTD participants either received a free thermostat through the program, or enrolled using their own thermostat. The latter group is known as “Bring Your Own Thermostat,” or BYOT. The average temperature for participants during the SCTD event was 94.1°F. Table ES-3 shows the average and aggregate SCTD ex post load impact estimates for the overall SCTD group, those dually enrolled in PTR, and those only enrolled in SCTD. Participants dually enrolled in the two programs had the highest event hour load reduction with an average of 0.67 kW, representing 31.5% of the reference load. The average aggregate load reduction for the dually enrolled group was 5.46 MW. Generally, the participants with BYOT thermostats had higher event hour load reductions, averaging 0.69 kW in the overall SCTD group, compared to those with Free thermostats, who averaged 0.52 kW.

<sup>1</sup> Attributable to the PTR event and not to AC cycling.



**TABLE ES-3: SCTD EX POST LOAD IMPACT ESTIMATES BY CUSTOMER CATEGORY - AVERAGE 2017 EVENT (2 P.M. TO 6 P.M.)\***

Customer Category	Mean Active Participants	Mean Reference Load (kW)	Mean Observed Load (kW)	Mean Impact (kW)	% Load Reduction	Aggregate Load Reduction (MW)	Mean °F
All	17,617	2.18	1.64	0.54	24.7%	9.48	94.1
Free	12,940	2.15	1.63	0.52	24.2%	6.74	94.6
BYOT	4,680	2.36	1.67	0.69	29.2%	3.22	92.7
PTR	8,179	2.12	1.45	0.67	31.5%	5.46	94.2
PTR – Free	6,608	2.10	1.45	0.66	31.2%	4.34	94.5
PTR – BYOT	1,571	2.27	1.46	0.81	35.6%	1.27	92.9
SCTD Only	9,438	2.23	1.80	0.43	19.1%	4.02	93.9
SCTD Only – Free	6,333	2.20	1.82	0.39	17.5%	2.44	94.6
SCTD Only – BYOT	3,109	2.41	1.77	0.64	26.4%	1.98	92.6

\* Participants excluding Summer Saver load control.

## ES.2 EX ANTE EVALUATION SUMMARY

The ex ante evaluation is based on taking the results from the ex post analysis and using them to estimate per participant impacts for different weather scenarios and then multiplying these by forecasts of enrollment for different participant segments.

The current PTR enrollment is approximately 80,000 SDG&E residential customers. Of these, approximately 2,200 are dually enrolled in the Summer Saver Program. SDG&E forecasts that the SCTD program will grow from around 18,000 participants to approximately 28,000 by the end of 2018, when the PTR program will sunset.

Table ES-4 shows the average hourly resource availability (RA) estimates for each of the participant groups and sub-groups, for the two types of weather conditions, 1-in-2 and 1-in-10. The PTR-only group is estimated to have average event hour load impacts of 0.06 kW in 1-in-10 conditions and 1-in-2 conditions. The dually enrolled PTR-SCTD participants are estimated to have the highest average event hour load impacts of 0.66 kW in 1-in-10 scenarios and 0.61 kW in 1-in-2 scenarios.



**TABLE ES-4: EX ANTE AVERAGE HOURLY LOAD IMPACT ESTIMATES BY CUSTOMER CATEGORY – 2017 TYPICAL EVENT HOURS**

Program Segment and Weather Scenario			Mean Reference Load (kW)	Mean Observed Load (kW)	Mean Impact (kW)	% Load Reduction	Aggregate Load Reduction (MW)	Mean Temp. °F
PTR Only	Overall	1-in-10	1.54	1.48	0.06	3.6%	3.98	91.49
		1-in-2	1.42	1.36	0.06	3.9%	3.98	86.62
PTR/SS	100% Cycle	1-in-10	2.05	1.79	0.25	12.3%	0.44	93.93
		1-in-2	1.91	1.65	0.25	13.2%	0.44	88.56
	50% Cycle	1-in-10	2.36	2.34	0.02	0.7%	0.01	95.29
		1-in-2	2.14	2.12	0.02	0.8%	0.01	89.63
	Overall	1-in-10	2.16	1.98	0.18	8.4%	0.47	94.38
		1-in-2	2.00	1.82	0.18	9.1%	0.47	88.92
PTR/SCTD	BYOT	1-in-10	2.14	1.34	0.81	37.6%	1.27	91.41
		1-in-2	1.80	1.05	0.75	41.8%	1.19	86.56
	Free	1-in-10	2.10	1.48	0.62	29.7%	4.22	92.77
		1-in-2	1.80	1.23	0.57	31.9%	3.88	87.64
	Overall	1-in-10	2.11	1.45	0.66	31.2%	5.50	92.51
		1-in-2	1.80	1.19	0.61	33.8%	5.07	87.43
SCTD Only	BYOT	1-in-10	2.20	1.56	0.63	28.9%	2.07	91.10
		1-in-2	1.89	1.29	0.60	31.8%	1.97	86.31
	Free	1-in-10	2.12	1.73	0.40	18.6%	2.65	92.81
		1-in-2	1.83	1.45	0.38	20.7%	2.54	87.67
	Overall	1-in-10	2.15	1.67	0.47	22.0%	4.72	92.25
		1-in-2	1.85	1.40	0.45	24.4%	4.49	87.23

# 1 INTRODUCTION

This report provides estimates of the 2017 ex post and ex ante load impacts for San Diego Gas and Electric's (SDG&E) Peak Time Rebate (PTR) program. The program provides customers with notification on a day-ahead basis that a PTR event will occur on the following day. In emergency situations, a PTR event can be called on a day-of basis to help address an emergency, but day-of events are not the primary design or intended use of the program.

This report also provides estimates of the 2017 ex post and ex ante load impacts for the Small Customer Technology Deployment (SCTD) program. In the past, SDG&E offered free programmable communicating thermostats (PCT) with DR enabling technology to residential customers through the SCTD program. In 2017 it offered a Bring-Your-Own-Thermostat component to the program. In addition, the two control strategies used for the free thermostats in the past was changed to a single method (a 4-degree setback) for PTR events. Although PTR events are 7 hours long from 11 a.m. – 6 p.m. the SCTD thermostats will only be curtailed for 4 hours, typically from 2 p.m. – 6 p.m.

## 1.1 EVALUATION OBJECTIVES

This project has four principal objectives:

- Estimate *ex post* load impacts for the PTR opt-in and SCTD programs,
- Make comparisons of the impacts of several program participant sub-groups,
- Estimate conservation effects resulting from the installation of SCTD thermostats, and
- Estimate *ex ante* load impacts for the PTR opt-in and SCTD programs for the future.

## 1.2 OPT-IN PEAK TIME REBATE PROGRAM OVERVIEW

The PTR program provides customers with notification on a day-ahead basis that a PTR event will occur on the following day. The PTR program is marketed as Reduce Your Use. In emergency situations, a PTR event can be called on a day-of basis to help address an emergency, but day-of events are not the primary design or intended use of the program. PTR is a two-level incentive program, providing a basic incentive level (\$0.75/kWh) to customers that reduce energy use through manual means and a premium incentive (\$1.25/kWh) to customers that reduce energy usage through automated demand response (DR) enabling technologies. The PTR bill credit is calculated based on their event day reduction in electric usage below their established customer-specific reference level (CRL). The program is marketed under the name Reduce Your Use (RYU) and is an opt-in program for residential customers. CPUC Decision D-13-07-003



directed SDG&E to require residential customers to enroll in PTR to receive a bill credit beginning in 2014. Prior to 2014, the PTR program was a default program for all SDG&E residential customers with an opt-in component whereby customers could receive notification of events.

Table 1-1 summarizes the PTR program enrollment. A total of nearly 80,000 customers had enrolled in PTR as of the singular event day of 2017 (September 26<sup>th</sup>). Five percent of these participants were dually enrolled in the Summer Saver Program and seven percent were dually enrolled in the SCTD program. These dually enrolled participants were eligible for the premium incentive (\$1.25/kWh) for reducing energy use through automated DR enabling technologies. Not all of the SCTD participants enrolled in PTR, however. Of the roughly 9,700 SCTD participants, only 55% of them also enrolled in PTR.

Approximately 63% of PTR participants enrolled for email notification only, with another 17% enrolled jointly in email and text notifications. Text message-only notifications account for most of the remaining participants at 19%. Only 2% of participants received only telephone notifications.

**TABLE 1-1: SUMMARY OF PTR ENROLLMENT BY CUSTOMER CATEGORY<sup>1</sup>**

Customer Category	Participants	
	N	%
PTR without Enabling Technology	71,947	77.5
Dually enrolled in Summer Saver	2,590	2.8
Dually enrolled in SCTD	8,343	9.0
SCTD not enrolled in PTR <sup>2</sup>	9,961	10.7
Coastal Climate Zone <sup>3</sup>	46,250	49.9
Inland Climate Zone <sup>3</sup>	46,512	50.1
Notification Type – Email Only	48,438	52.2
Notification Type – Text Only	14,850	16.0
Notification Type – Phone Only	1,615	1.7
Notification Type – Email & Text	12,627	13.6
Notification Type – Email & Phone	2522	2.7
Notification Type – Text & Phone	701	0.7
Notification Type – All Three	2,055	2.2
<b>All PTR Participants</b>	<b>82,801</b>	<b>100</b>

<sup>1</sup> As of December 2017

<sup>2</sup> These customers are not included in the total PTR enrollment counts

<sup>3</sup> These customers include SCTD not enrolled in PTR



### 1.3 OVERVIEW OF THE SCTD RESIDENTIAL PROGRAM

The program provides demand response enabling technology to residential. In past years, SDG&E offered at no cost to qualifying customers the Ecobee Smart Si thermostat. This thermostat is signaled by SDG&E through Wi-Fi through use of an Ecobee utility portal. In 2017 only one cycling strategy was used with the free thermostats, namely a four-degree temperature setback. Beginning in 2017, SDG&E added a BYOT element to the program. The eligible thermostats include the Nest Learning Thermostat, the Nest Thermostat E, the Ecobee 3 Thermostat, and the Ecobee 4 Thermostat. These can be purchased on SDG&E's website or the individual vendors' websites.

Although PTR events were seven hours long (11 a.m. to 6 p.m.), SCTD thermostats can be signaled between 11:00 a.m. and 9:00 p.m. but for more than four hours in a row. Typically, PTR events run from 2 p.m. – 6 p.m.

Since PTR is opt-in, customers must enroll to receive a bill credit. Not all SCTD customers enrolled themselves in PTR. If the customer did not enroll in PTR their thermostat was curtailed but they did not receive a bill credit. SCTD customers receive a \$50 e-gift card for enrolling and will receive a \$25 e-gift card at the end of each summer they stay enrolled and their thermostat stays connected.

SDG&E also offers an air-conditioning cycling program called Summer Saver. Residential customers are either enrolled on a 50% cycling option or a 100% cycling option. Some of these customers are also enrolled in PTR and receive the higher bill credit of \$1.25. The Summer Saver program is run by a third-party aggregator.

### 1.4 OVERVIEW OF METHODS

For both the overall opt-in PTR population and the SCTD participants, Itron estimated *ex post* impacts using aggregate models for participants using a control group based on a set of accounts from the non-alert population that has been matched based on their similarity with the participant accounts. These aggregate models will mitigate the variability from the individual accounts while the control group will account for other factors that influence consumption for both the alert participant and non-participant populations. The models were estimated for a number of participant segments to ensure that the results have the granularity necessary to address all research questions.

The *ex ante* forecasts combined the models developed for the *ex post* analysis, an enrollment forecast provided by SDG&E, and normal weather forecasts for both 1-in-2 and 1-in-10 weather scenarios for SDG&E and Cal ISO system peaks.



For the purposes of this report, the SCTD *ex ante* impacts are provided separately as part of the SCTD program. Therefore, the opt-in PTR *ex ante* load impact estimates specifically refer to the non-SCTD customers.

## **1.5 REPORT ORGANIZATION**

The remainder of this report contains the following sections:

- Ex Post Methodology,
- Ex Post Results,
- Ex Ante Methodology and Results,
- Appendix A – Ex Post Impact Tables, and
- Appendix B – Ex Ante Forecast Tables.

## 2 EX POST METHODS AND VALIDATION

To estimate ex post load impacts for the PTR opt-in and SCTD programs, Itron developed regression-based models using a difference in differences (DiD) format, comparing participant and reference aggregate hourly residential loads. The reference loads for these models were calculated from matched control groups selected from SDG&E’s population of non-program participants. The methods for matching and ex post estimations are described in detail below.

### 2.1 CONTROL GROUP SELECTION

Control groups were used to measure impacts from the PTR and SCTD programs. The use of control groups helps to improve the estimation of reference loads and impacts when obfuscating conditions exist, such as: a) few events, with the potential of these events being the hottest days during the summer, b) some events occurring during non-cooling months and/or months where hot weather is not typical, c) small average impacts relative to the overall size of the average participant load during the events. To develop control groups for this evaluation, Itron used a Stratified Propensity Score Matching (SPSM) method.

#### 2.1.1 Pre-Matching Stratification and Design

Prior to generating propensity scores, the participant sites were stratified to control for variables that may observationally influence participation. Strata were defined using a combination of three major participant characteristics: PTR participation, SCTD participation, and having Net Energy Metering (NEM). Each of the six possible participant combinations of these characteristics were also stratified by climate zone (coastal and inland). In total, this provided 12 different strata from which to develop control groups.

**TABLE 2-1: PRE-MATCHING PARTICIPANT STRATIFICATION**

<b>PTR Participant</b>	<b>Net Energy Metered</b>	<b>SCTD Participant</b>	<b>Climate Zones</b>
✓	✓	✗	Inland, Coastal
✓	✗	✗	Inland, Coastal
✓	✓	✓	Inland, Coastal
✓	✗	✓	Inland, Coastal
✗	✗	✓	Inland, Coastal
✗	✓	✓	Inland, Coastal



Using these customer segments and strata, the SPSM methodology used a logistic regression (logit) model to estimate the probability of participation within each stratum. The matching routine paired each participant with a non-participant that had the most similar estimated probability of participation.

The control group selection used the hourly interval data for a random sample of 600,000 non-participant customers. The PSM selected the control group using variables developed from interval data. The matching was performed separately for all PTR and SCTD participants by the stratification detailed above, as well as for the other various participant subgroups, namely SCTD, Summer Saver, and Low Income.

After experimenting with various combinations, the final set of variables based on interval data for the months of June through September of 2017 were chosen. The logit model included: monthly hot day morning kWh usage, monthly hot day event hours kWh usage, monthly hot day evening kWh usage, monthly Saturday event hours kWh usage, and dummy variables for Low Income status, presence of an electric vehicle, enrollment in Summer Saver and usage size category.

The second stage of matching saw the additional inclusion of hourly kWh usage during the event hours for summer hot days<sup>2</sup> and coefficients of variation of kWh usage during event hours.

### **2.1.2 Propensity Score Matching Results**

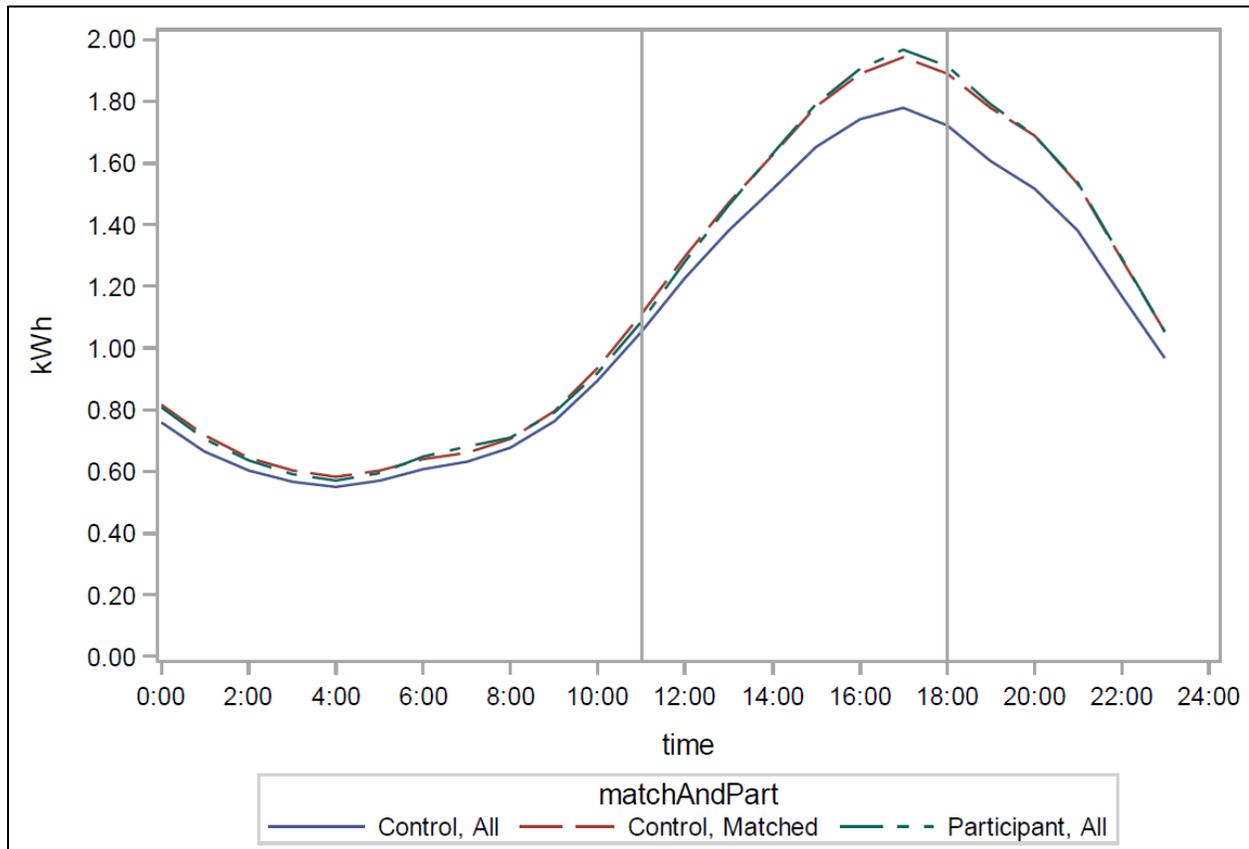
One of the key methods of assessing the effectiveness of the PSM is to conduct t-tests on the independent variables used in the logistic regression for the groups both before and after matching. If the matching is successful, the participant and control groups should not be statistically significantly different for these variables. The results of the t-tests for both stages of the PTR and SCTD participant PSM matching show that none of the PSM variables had a statistically significant difference after selecting the control premise candidates. A final assessment of the efficacy of the PSM is a graphical comparison of the annual load profiles of the participant premises with the control premises before and after matching. The candidate premises selected in the PSM have virtually the same profile as the participants, whereas the load profile for all non-participant premises before matching has substantially lower consumption. Figure 2-1 shows a comparison of the average hourly load profile on hot days for the participant and control groups for the Inland PTR group before and after the matching. The event window is marked by vertical lines and it is clear that the control and participants line up much more closely after the matching during these key hours. While the t-test results are strong evidence that the PSM method worked well, these visual representations provide further confirmation of its success.

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<sup>2</sup> For hot days, Itron selected the five non-event days in summer 2017 with the highest average peak temperatures across the different weather stations used for the analysis. The dates with these peak temperatures were the 26<sup>th</sup> of June, the 7<sup>th</sup> and 8<sup>th</sup> of July, and the 29<sup>th</sup> and 30<sup>th</sup> of August 2017. Load profiles by season were also compared to confirm that the groups were sufficiently similar.



**FIGURE 2-1: COMPARISON OF HOURLY HOT DAY LOAD PROFILES FOR CONTROL GROUP WITH ALL AND ONLY MATCHED PTR PARTICIPANTS**



## 2.2 ESTIMATING EX POST LOAD IMPACTS

Following validation of the control group matching processes, *ex post* load impact models were developed based on aggregate hourly residential loads for both the opt-in alert customers and the matched control groups for each of the identified segments. Load impacts were estimated using a DiD methodology, controlling for event hours and factors such as weather conditions, day of the week, and month.

### 2.2.1 PTR Ex Post Estimation

A number of different combinations of specifications were tested in developing the aggregate *ex post* model. The final model specifications used for the analysis included variables for hour, day of the week,



month, cooling degree hours (CDH65), and event indicators. Additionally, because enrollment increased during the summer, the model included a binary variable to indicate whether a participant was “active,” meaning that they had opted in to the program by the date in question. This means that for periods prior to enrollment, some participants were effectively part of the control group.

Expressed symbolically, the model is as follows:

$$\begin{aligned}
 kWh_t = & \beta_0 + \sum_d \beta_1^d \times DOW_d + \sum_m \beta_2^m \times Month_m + \sum_h \beta_3^h \times Hour_h \\
 & + \sum_d \sum_h \beta_4^{h,d} \times Hour_h \times DOW_d + \sum_m \sum_h \beta_5^{h,m} \times Hour_h \times Month_m + \beta_6 \\
 & \times CDH65 + \sum_h \beta_7^h \times Hour_h \times CDH65_h + \sum_{e=1,2,3} \sum_h \beta_{8,e}^h \times Hour_h \times Event_e \\
 & + \sum_{e=1,2,3} \sum_h \beta_{9,e}^h \times Hour_h \times Event_e \times InactivePart \\
 & + \sum_{e=1,2,3} \sum_h \beta_{10,e}^h \times Hour_h \times Event_e \times ActivePart + \varepsilon_t
 \end{aligned}$$

Where

$kWh_t$	Is the kWh in hour t
$\beta_0$	Is the intercept
$\beta_1^d$	Is the set coefficient for day of week (DOW) d
$\beta_2^m$	Is the set of coefficient for month m
$\beta_3^h$	Is the set of coefficients for hour h
$\beta_4^{h,d}$	Is the set of coefficients for the interaction of hour h and DOW d
$\beta_5^{h,m}$	Is the set of coefficients for the interaction of hour h and month m
$\beta_6$	Is the coefficient for cooling degree hours (CDH)
$\beta_7^h$	Is the set of coefficients for CDH interacted with hour h
$\beta_{8,e}^h$	Is the set of coefficients that measure how much energy the non-participants would consume during the three event days, e=1,2,3, and in hour h
$\beta_{9,e}^h$	Is the set of coefficients for the program impacts on the inactive participants during the three event days, e=1,2,3, and in hour h
$\beta_{10,e}^h$	Is the set of coefficients for the program impacts on the active participants during the three event days, e=1,2,3, and in hour h
$\varepsilon_t$	Is the error

The program impacts were modeled using three sets of dummy variables, one for each event day. In year 2017, three events were called for three consecutive days, on Thursday, Friday and Saturday. It has long



been noticed that the residential customers' energy consumption behaviors are different during weekdays and weekends. Therefore, it is expected that they react differently to a weekday DR event and a weekend DR event, and the difference is more likely to be due to behavior difference than to weather difference. For the two week-day events, by modeling the impacts using dummy variables, the model estimates the impact energy without attributing any of the impact difference to weather change. If more events were called in 2017, the model can allocate the weather sensitive impact better, but with only two week-day events, it is either attributing all impacts to weather or none. The purpose of the ex post analysis is to quantify the impact, and hence the dummy model serves the purpose better.

### **2.2.2 SCTD Ex Post Estimation**

The model used to estimate savings for the SCTD participants was nearly identical to that applied to the PTR opt-in alert customers. Using the population of SCTD participants and its associated matched control group, ex post impacts were estimated in an analogous fashion to the PTR groups. Each set of estimated impacts were grouped by SCTD thermostat source (BYOT or Free) as well as overall.

### **2.2.3 Data Attrition**

Underlying all of the analysis were the many steps that were necessary to integrate the many data sources into the structure required for analysis. These steps, in addition to diagnostics to identify outliers or other problematic data, mean that participants analyzed in the estimation of impacts was lower than the actual number of active participants. In the case of this analysis, the primary source of data attrition was a lack of information necessary to associate the appropriate weather station with a participant, followed by confusing or contradictory program participation information.

Prior to the PSM, participants were excluded from the analysis if they had an average monthly consumption or coefficient of variation greater than 5 standard deviations from the mean. Participants were also excluded if any of the inputs for the PSM logistic regression were missing (CDD, monthly consumption, etc.). After the PSM, additional criteria were implemented that the difference between matched propensity scores was less than 0.0005 and that participants with PV generation that were not identified as NEM were excluded. These counts represent the final set of participants used to model the ex post impacts. The aggregate results incorporate the initial full counts of participants to determine the total impact of the programs for each of the sub-groups.

Unless the data attrition results in a shortage of the needed accounts to estimate the impacts, the main concern is whether it results in bias. That is, is there some systematic difference associated with the reason for dropping the accounts that would strongly influence the results in one direction or the other? While this is typically difficult to determine with certainty, in the case of this analysis there is no reason to assume that the removal of the participants had any influence on the results.

# 3 EX POST RESULTS

## 3.1 COMPARISON OF EX POST LOAD IMPACTS

In 2017, SDG&E called a total of three PTR events and three SCTD events. The events were on the same days for both programs: August 31<sup>st</sup>, September 1<sup>st</sup>, and September 2<sup>nd</sup>. The event hours for PTR were from 11 a.m. to 6 p.m. and the event hours for SCTD were from 2 p.m. to 6 p.m.

This section presents the *ex post* load impact estimates for each of the analysis program participant sub-groups. These are:

- All PTR customers,
- PTR customers without SCTD,
- PTR customers without Load Control (SCTD or Summer Saver),
- PTR customers Dually Enrolled in Summer Saver, by Cycling Strategy,
- PTR customers Dually Enrolled in SCTD, by Thermostat Source,
- SCTD customers not enrolled in PTR, by Thermostat Source,
- PTR customers without Load Control by Notification Type,
- PTR customers without Load Control by Low Income status,
- PTR customers without Load Control by Year of Enrollment, and
- PTR customers with Net Energy Metering.

Table 3-1 through Table 3-6 present a high-level summary of these sub-groups for the PTR and SCTD programs, respectively.

**TABLE 3-1: PTR EX POST LOAD IMPACT ESTIMATES – BY 2017 EVENT DATE (11 A.M. TO 6 P.M.)**

Customer Category	Mean Active Participants	Mean Reference Load (kW)	Mean Observed Load (kW)	Mean Impact (kW)	% Load Reduction	Aggregate Load Reduction (MW)	Mean °F
August 31st, 2017	80,342	1.18	1.05	0.13	11.1%	10.57	90.9
September 1st, 2017	80,630	1.41	1.30	0.11	7.7%	8.78	95.7
September 2nd, 2017	80,745	1.57	1.52	0.05	3.3%	4.15	94.3
Average 2017 Event	80,572	1.39	1.29	0.10	7.0%	7.84	93.6



**TABLE 3-2: PTR EX POST LOAD IMPACT ESTIMATES BY CUSTOMER CATEGORY – AVERAGE 2017 EVENT (11 A.M. TO 6 P.M.)**

<b>Customer Category</b>	<b>Mean Active Participants</b>	<b>Mean Reference Load (kW)</b>	<b>Mean Observed Load (kW)</b>	<b>Mean Impact (kW)</b>	<b>% Load Reduction</b>	<b>Aggregate Load Reduction (MW)</b>	<b>Mean °F</b>
All	80,572	1.39	1.29	0.10	7.0%	7.84	93.6
Large	36,476	1.79	1.62	0.17	9.5%	6.22	94.3
Medium	27,012	1.30	1.22	0.07	5.7%	1.99	93.6
Small	17,084	0.73	0.69	0.04	5.0%	0.62	92.4
Coastal	40,703	1.08	1.02	0.07	6.2%	2.72	88.6
Inland	39,869	1.70	1.57	0.13	7.8%	5.33	98.8
No SCTD	72,355	1.35	1.29	0.06	4.5%	4.42	93.5
No Load Control (SCTD or SS)	70,138	1.34	1.28	0.06	4.2%	3.95	93.4
Low Income*	13,245	1.19	1.18	0.01	0.5%	0.08	94.0
Non-Low Income*	56,893	1.61	1.57	0.03	2.1%	1.94	93.0
Enroll. Year – 2012*	17,195	1.37	1.35	0.02	1.7%	0.40	93.2
Enroll. Year – 2013*	5,116	1.43	1.40	0.02	1.5%	0.11	93.5
Enroll. Year – 2014*	19,269	1.39	1.34	0.05	3.4%	0.90	93.5
Enroll. Year – 2015*	8,375	1.42	1.40	0.03	1.8%	0.22	93.5
Enroll. Year – 2016*	9,695	1.33	1.28	0.05	3.5%	0.45	93.4
Enroll. Year – 2017*	10,488	1.08	0.91	0.18	16.3%	1.86	93.7
Notification – Email Only*	44,048	1.29	1.25	0.04	2.9%	1.66	93.3
Notification – Text Only*	12,967	1.42	1.36	0.06	4.2%	0.77	93.5
Notification – Both*	11,778	1.45	1.32	0.13	9.1%	1.55	93.8
Net Energy Metered	17,747	0.64	0.48	0.16	25.3%	2.89	94.5

\* Participants excluding load control (no SCTD or Summer Saver).



**TABLE 3-3: SCTD EX POST LOAD IMPACT ESTIMATES BY THERMOSTAT TYPE- AVERAGE 2017 EVENT (2 P.M. TO 6 P.M.)\***

Customer Category	Mean Active Participants	Mean Reference Load (kW)	Mean Observed Load (kW)	Mean Impact (kW)	% Load Reduction	Aggregate Load Reduction (MW)	Mean °F
All	17,617	2.18	1.64	0.54	24.7%	9.48	94.1
BYOT	4,680	2.13	1.67	0.69	29.2%	3.22	92.7
Free	12,940	2.15	1.63	0.52	24.2%	6.74	94.6

\* Participants excluding Summer Saver load control.

**TABLE 3-4: PTR DUALY ENROLLED IN SUMMER SAVER EX POST LOAD IMPACT ESTIMATES – AVERAGE 2017 EVENT (4 P.M. TO 8 P.M.)**

Customer Category	Mean Active Participants	Mean Reference Load (kW)	Mean Observed Load (kW)	Mean Impact (kW)	% Load Reduction	Aggregate Load Reduction (MW)	Mean °F
All	2,217	2.10	1.92	0.18	8.4%	0.39	96.8
Summer Saver – 50% Cycling	751	2.43	2.39	0.04	1.7%	0.03	97.9
Summer Saver – 100% Cycling	1,465	1.93	1.69	0.23	12.2%	0.34	96.3

**TABLE 3-5: SCTD EX POST LOAD IMPACT ESTIMATES BY 2017 EVENT DATE - AVERAGE 2017 EVENT (2 P.M. TO 6 P.M.)\***

Customer Category	Mean Active Participants	Mean Reference Load (kW)	Mean Observed Load (kW)	Mean Impact (kW)	% Load Reduction	Aggregate Load Reduction (MW)	Mean °F
August 31st, 2017	17,588	1.87	1.26	0.61	32.8%	10.79	91.1
September 1st, 2017	17,645	2.22	1.60	0.62	27.8%	10.87	96
September 2nd, 2017**	12,948	2.44	2.06	0.38	15.7%	4.98	95.1
Average 2017 Event***	17,617	2.05	1.43	0.62	30.1%	10.84	93.6

\* Participants excluding Summer Saver load control.

\*\* One BYOT contractor did not signal this event.

\*\*\* An average of 2017 weekday events only.



**TABLE 3-6: SCTD EX POST LOAD IMPACT ESTIMATES BY CUSTOMER CATEGORY - AVERAGE 2017 EVENT (2 P.M. TO 6 P.M.)\***

Customer Category	Mean Active Participants	Mean Reference Load (kW)	Mean Observed Load (kW)	Mean Impact (kW)	% Load Reduction	Aggregate Load Reduction (MW)	Mean °F
All	17,617	2.18	1.64	0.54	24.7%	9.48	94.1
Free	12,940	2.15	1.63	0.52	24.2%	6.74	94.6
BYOT	4,680	2.36	1.67	0.69	29.2%	3.22	92.7
PTR	8,179	2.12	1.45	0.67	31.5%	5.46	94.2
PTR – Free	6,608	2.10	1.45	0.66	31.2%	4.34	94.5
PTR – BYOT	1,571	2.27	1.46	0.81	35.6%	1.27	92.9
SCTD Only	9,438	2.23	1.80	0.43	19.1%	4.02	93.9
SCTD Only – Free	6,333	2.20	1.82	0.39	17.5%	2.44	94.6
SCTD Only – BYOT	3,109	2.41	1.77	0.64	26.4%	1.98	92.6

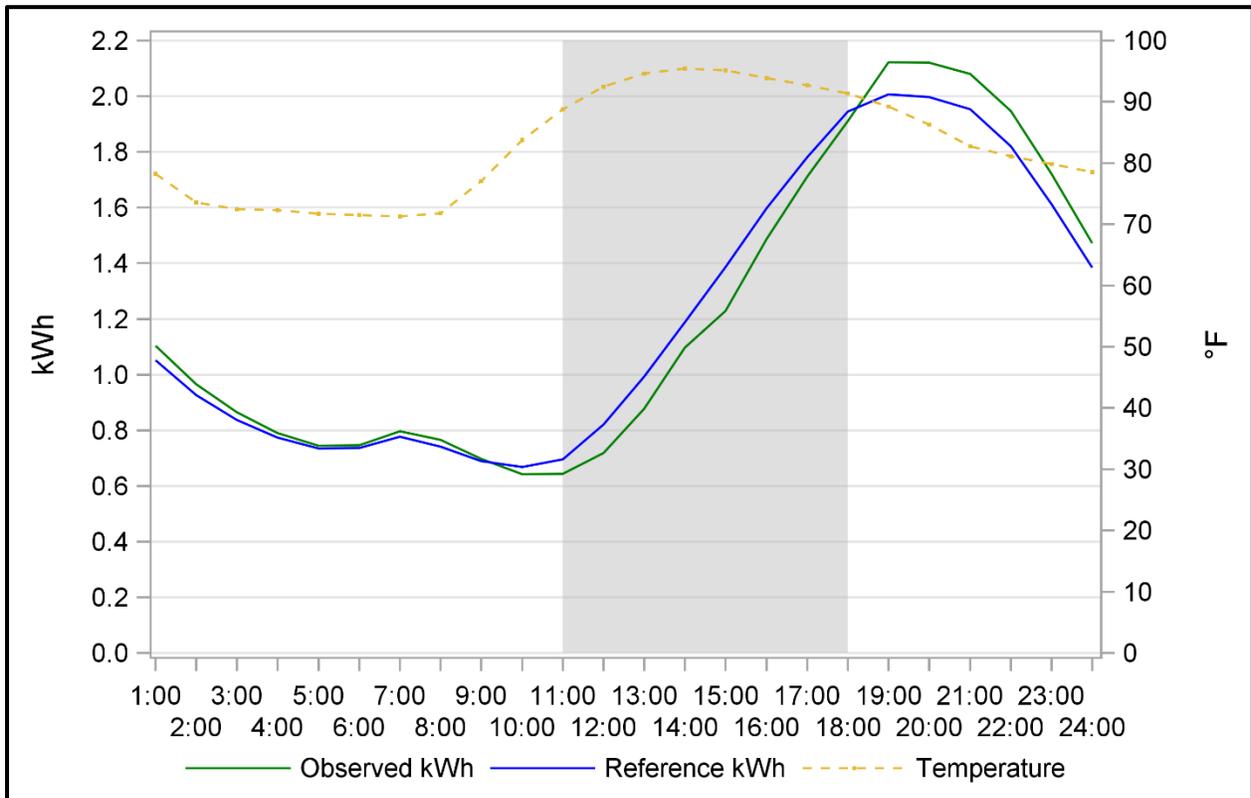
\* Participants excluding Summer Saver load control.

### 3.1.1 Peak Time Rebate (PTR) Total

Figure 3-1 and Table 3-7 show the hourly event load impacts for the overall PTR customer population compared with the reference loads. In the 2017 events, there was a definitive load reduction during event hours (11 a.m. to 6 p.m.), averaging 0.10 kW per participant, representing an average reduction of 7% relative to the reference load. The hourly load reductions ranged between 0.04 kW and 0.16 kW during event hours. In the hours following events, there are noticeable snapback effects, with an average hourly increase in load of 0.11 kW per customer from 6 p.m. to midnight. The average hourly aggregate load reduction from the 80,572 participants during event hours was 7.84 MW. The average temperature across all the events and the associated event hours was 93.6°F.



**FIGURE 3-1: HOURLY LOAD PROFILE FOR ALL PTR CUSTOMERS – 2017 EVENT AVERAGE**





**TABLE 3-7: SUMMARY OF EVENT IMPACTS FOR ALL PTR CUSTOMERS – 2017 AVERAGE**

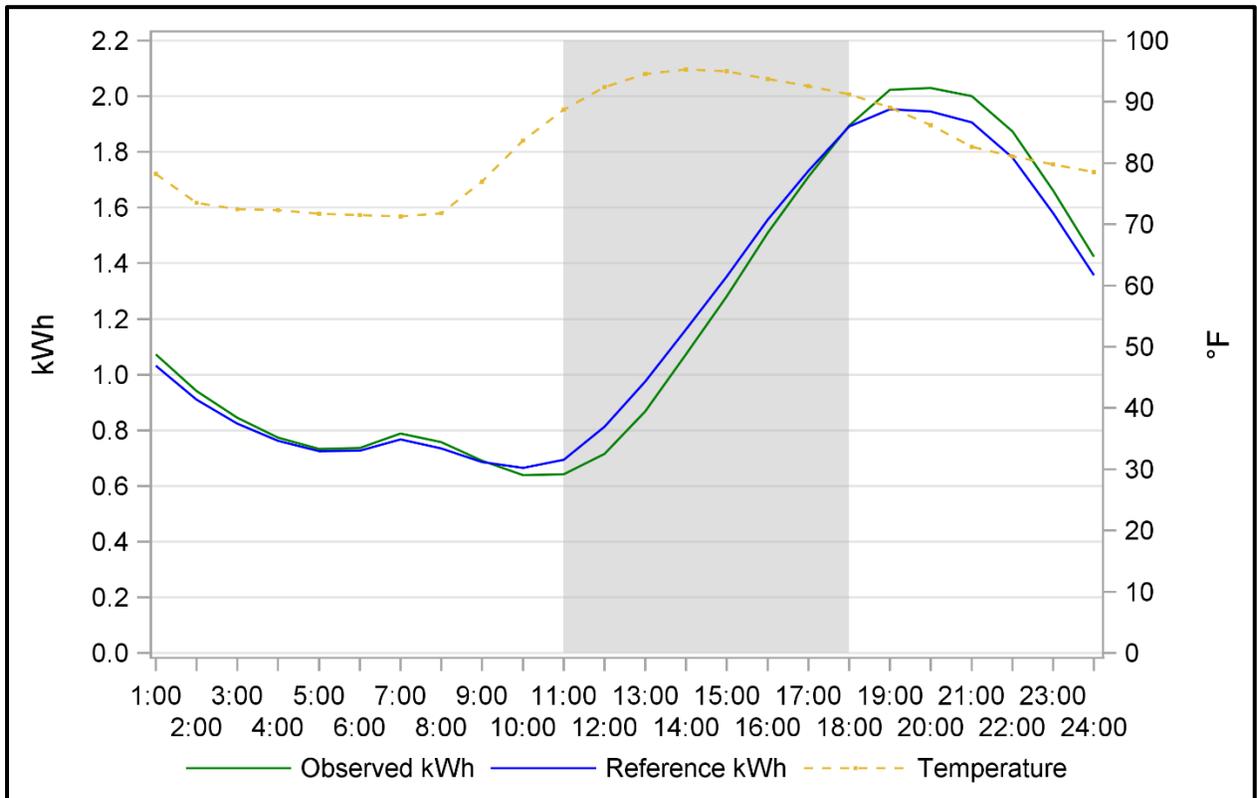
Hour Beg.	Hour End.	Event Hour	Mean °F	Mean Reference Load (kW)	Mean Observed Load (kW)	Mean Impact (kW)	% Load Reduction	Mean Active Participants	Aggregate Load Reduction (kW)
8:00	9:00	No	77.0	0.69	0.70	-0.008	-1.1%	80,572	-617
9:00	10:00	No	83.8	0.67	0.64	0.025	3.7%	80,572	2,001
10:00	11:00	No	88.8	0.70	0.64	0.052	7.4%	80,572	4,166
11:00	12:00	Yes	92.5	0.82	0.72	0.102	12.4%	80,572	8,207
12:00	13:00	Yes	94.6	0.99	0.88	0.115	11.6%	80,572	9,295
13:00	14:00	Yes	95.4	1.19	1.10	0.092	7.7%	80,572	7,378
14:00	15:00	Yes	95.1	1.39	1.23	0.158	11.4%	80,572	12,705
15:00	16:00	Yes	93.9	1.60	1.49	0.111	6.9%	80,572	8,910
16:00	17:00	Yes	92.7	1.78	1.71	0.069	3.9%	80,572	5,531
17:00	18:00	Yes	91.3	1.95	1.91	0.035	1.8%	80,572	2,843
18:00	19:00	No	89.2	2.01	2.12	-0.114	-5.7%	80,572	-9,183
19:00	20:00	No	86.3	2.00	2.12	-0.124	-6.2%	80,572	-9,951
20:00	21:00	No	82.7	1.95	2.08	-0.128	-6.5%	80,572	-10,288
<b>Total kWh- Entire Day</b>			82.7	29.12	29.25	-0.135	-0.5%	80,572	-10,884
<b>Total kWh - Event Hours</b>			93.6	9.71	9.03	0.681	7.0%	80,572	54,868

### 3.1.2 PTR without SCTD

Figure 3-2 and Table 3-8 show the hourly event load impacts for PTR customers that are not dually enrolled in the SCTD thermostat program. These PTR participants do not have enabling DR technology. Therefore, the load reduction in the PTR without SCTD population is smaller. The average event hour load reduction for this group is lower than the overall group at 0.06 kW. Moreover, the PTR without SCTD group had a lower average aggregate event hour reduction with 4.42 MW (4.5%) than the overall PTR group, with 7.84 MW (7%).



**FIGURE 3-2: HOURLY LOAD PROFILE FOR PTR CUSTOMERS WITHOUT SCTD – 2017 EVENT AVERAGE**





**TABLE 3-8: SUMMARY OF EVENT IMPACTS FOR PTR CUSTOMERS WITHOUT SCTD – 2017 AVERAGE**

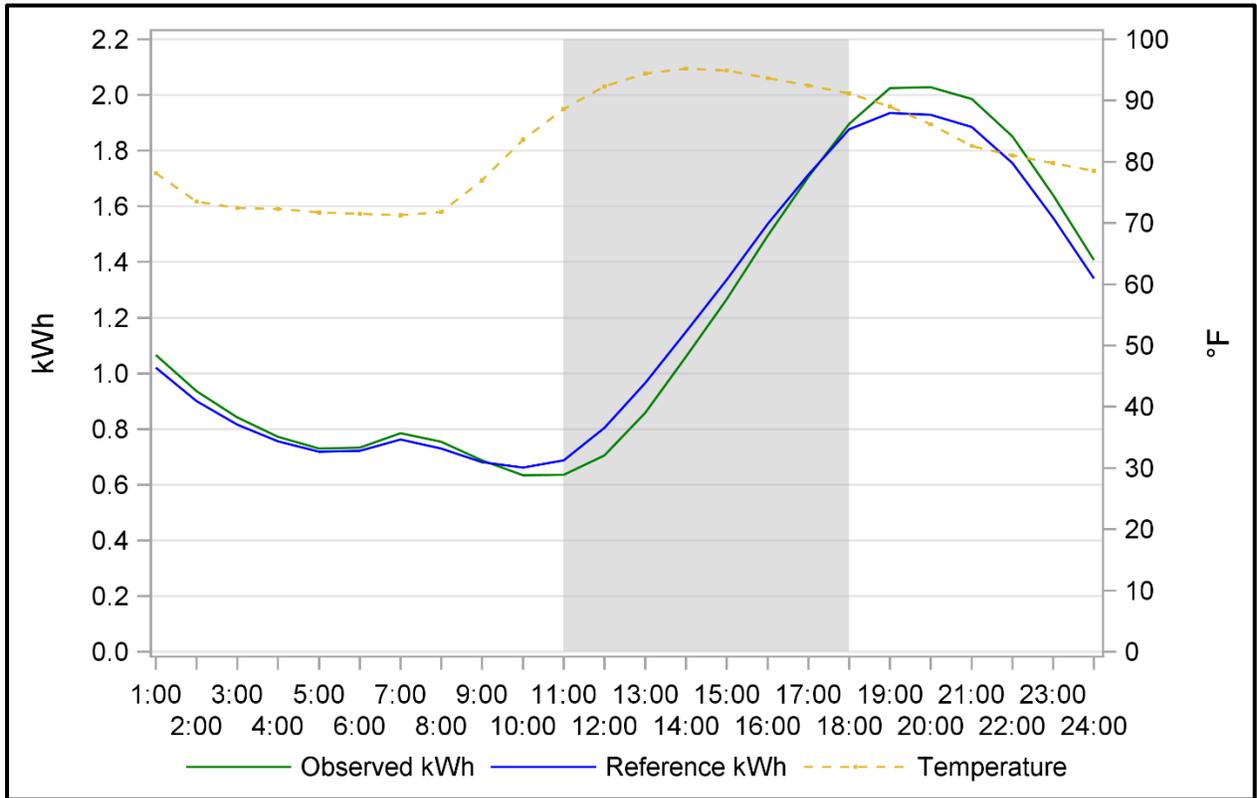
Hour Beg.	Hour End.	Event Hour	Mean °F	Mean Reference Load (kW)	Mean Observed Load (kW)	Mean Impact (kW)	% Load Reduction	Mean Active Participants	Aggregate Load Reduction (kW)
8:00	9:00	No	77.0	0.69	0.69	-0.005	-0.8%	72,355	-388
9:00	10:00	No	83.7	0.67	0.64	0.027	4.1%	72,355	1,954
10:00	11:00	No	88.7	0.69	0.64	0.051	7.4%	72,355	3,718
11:00	12:00	Yes	92.4	0.81	0.71	0.097	12.0%	72,355	7,042
12:00	13:00	Yes	94.5	0.98	0.87	0.107	11.0%	72,355	7,765
13:00	14:00	Yes	95.3	1.16	1.07	0.089	7.7%	72,355	6,459
14:00	15:00	Yes	95.0	1.35	1.28	0.071	5.3%	72,355	5,165
15:00	16:00	Yes	93.8	1.56	1.51	0.046	2.9%	72,355	3,313
16:00	17:00	Yes	92.6	1.73	1.71	0.02	1.1%	72,355	1,431
17:00	18:00	Yes	91.2	1.89	1.90	-0.004	-0.2%	72,355	-266
18:00	19:00	No	89.1	1.95	2.02	-0.071	-3.6%	72,355	-5,120
19:00	20:00	No	86.2	1.94	2.03	-0.084	-4.3%	72,355	-6,099
20:00	21:00	No	82.7	1.91	2.00	-0.094	-4.9%	72,355	-6,772
<b>Total kWh- Entire Day</b>			82.7	28.52	28.68	-0.154	-0.5%	72,355	-11,134
<b>Total kWh - Event Hours</b>			93.5	9.48	9.05	0.427	4.5%	72,355	30,910

### 3.1.3 PTR without Any Load Control (SCTD or Summer Saver)

Another participant subgrouping saw the additional exclusion of Summer Saver participants from the overall PTR group. This leaves a PTR participant group without the effects of any load control devices during events. Figure 3-3 and Table 3-9 show the hourly event load impacts for this group. The average event hour load reduction for this group was 0.06 kW, which was slightly lower than the 0.10 kW for the overall PTR group, and the same as the PTR group without SCTD. The average aggregate load reduction during event hours was 3.95 MW (4.2%), which was also lower than the overall group. This suggests that the load control programs did have an effect on increasing the overall program impact, which will be explored in the subsequent sections.



**FIGURE 3-3: HOURLY LOAD PROFILE FOR PTR CUSTOMERS WITHOUT ANY LOAD CONTROL – 2017 EVENT AVERAGE**





**TABLE 3-9: SUMMARY OF EVENT IMPACTS FOR PTR CUSTOMERS WITHOUT ANY LOAD CONTROL – 2017 AVERAGE**

Hour Beg.	Hour End.	Event Hour	Mean °F	Mean Reference Load (kW)	Mean Observed Load (kW)	Mean Impact (kW)	% Load Reduction	Mean Active Participants	Aggregate Load Reduction (kW)
8:00	9:00	No	76.9	0.68	0.69	-0.007	-1.0%	70,138	-468
9:00	10:00	No	83.6	0.66	0.63	0.028	4.2%	70,138	1,942
10:00	11:00	No	88.6	0.69	0.64	0.053	7.7%	70,138	3,698
11:00	12:00	Yes	92.3	0.8	0.71	0.098	12.2%	70,138	6,894
12:00	13:00	Yes	94.4	0.97	0.86	0.108	11.1%	70,138	7,541
13:00	14:00	Yes	95.2	1.15	1.06	0.089	7.7%	70,138	6,227
14:00	15:00	Yes	94.9	1.33	1.27	0.069	5.1%	70,138	4,807
15:00	16:00	Yes	93.6	1.54	1.49	0.042	2.7%	70,138	2,914
16:00	17:00	Yes	92.5	1.71	1.71	0.009	0.5%	70,138	642
17:00	18:00	Yes	91.1	1.88	1.9	-0.02	-1.1%	70,138	-1,403
18:00	19:00	No	89	1.94	2.02	-0.088	-4.5%	70,138	-6,172
19:00	20:00	No	86.1	1.93	2.03	-0.099	-5.2%	70,138	-6,968
20:00	21:00	No	82.6	1.88	1.99	-0.102	-5.4%	70,138	-7,161
<b>Total kWh- Entire Day</b>			82.6	28.24	28.49	-0.258	-0.9%	70,138	-18,125
<b>Total kWh - Event Hours</b>			93.4	9.38	8.99	0.394	4.2%	70,138	27,622

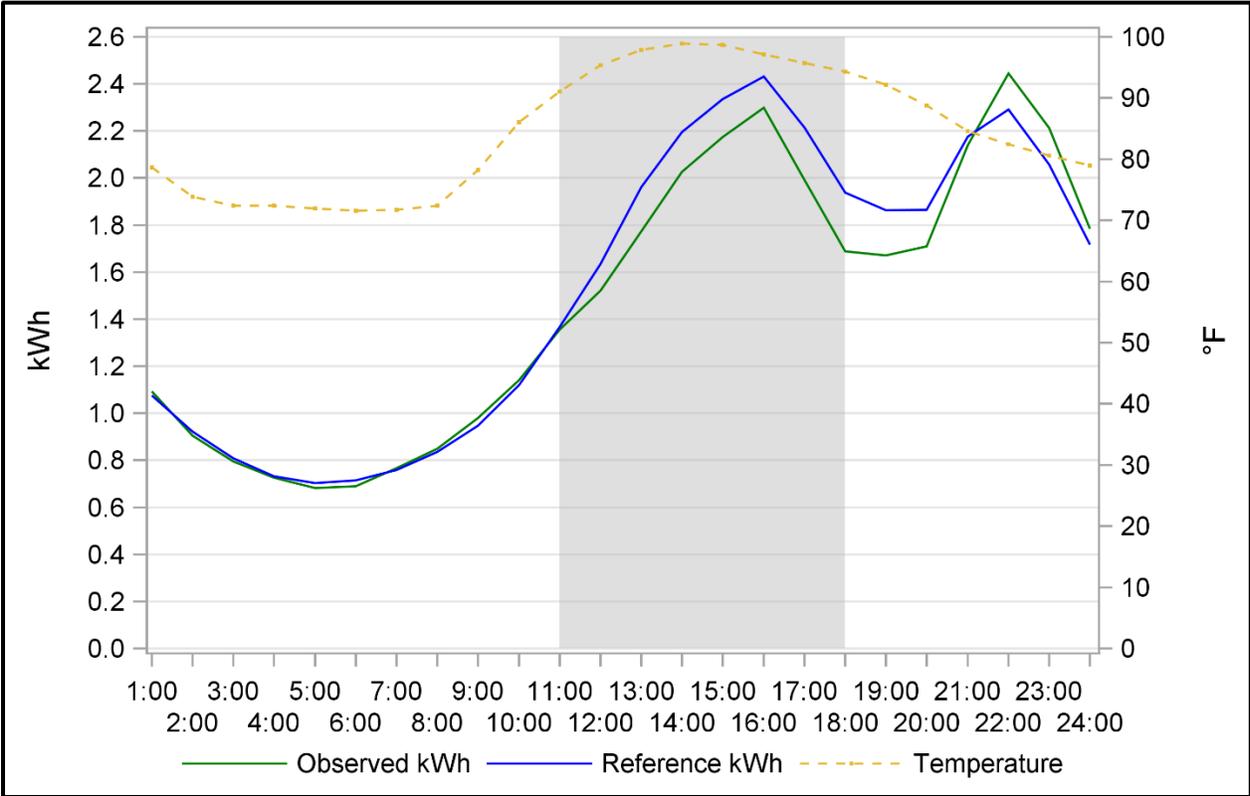
### 3.1.4 PTR Dually Enrolled in Summer Saver

As referenced above, there are subsets of customers that are enrolled in several energy-saving programs through SDG&E. This section examines the group of participants that are dually enrolled in the PTR and Summer Saver programs. These participants, in addition to receiving notifications on RYU event days, have a device installed on their central AC units that are activated on Summer Saver event days, cycling their AC on and off for several hours. In 2017, all PTR events were also Summer Saver events. The Summer Saver events ran from 4 p.m. to 8 p.m. Because this analysis focuses on the impact of the PTR program, the impacts described are incremental savings over and above those realized from the Summer Saver program. As a reminder, the control group for these dually enrolled participants are Summer Saver participants that are not dually enrolled in PTR. The Summer Saver-only impacts are evaluated under a different project. Figure 3-4 and Table 3-10 show the hourly PTR event load impacts for these dually enrolled customers. Their average event hour load reduction (during PTR event hours) was 0.18 kW,



which is higher than the overall PTR group. In general, Summer Saver participants have much higher peak consumption, and thus have a higher potential to save. Being dually-enrolled in PTR suggests that they are also well in-tune with demand response programs and may be more likely to lower their peak consumption. These larger savings resulted in an average aggregate load reduction during event hours of 0.39 MW, representing an 8.4% reduction compared to the reference load.

**FIGURE 3-4: HOURLY LOAD PROFILE FOR PTR CUSTOMERS DUALY ENROLLED IN SUMMER SAVER – ALL – 2017 EVENT AVERAGE**





**TABLE 3-10: SUMMARY OF PTR EVENT IMPACTS FOR CUSTOMERS DUALY ENROLLED IN SUMMER SAVER – 2017 AVERAGE**

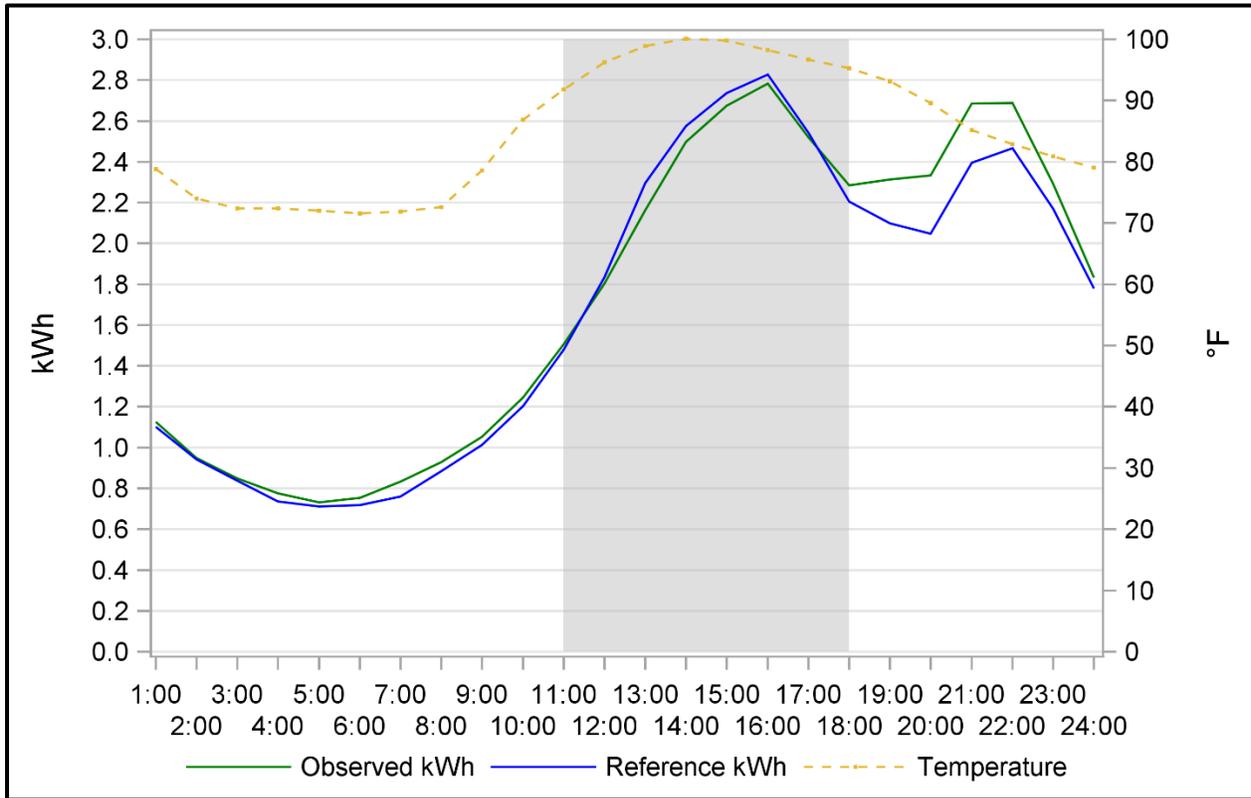
Hour Beg.	Hour End.	Event Hour	Mean °F	Mean Reference Load (kW)	Mean Observed Load (kW)	Mean Impact (kW)	% Load Reduction	Mean Active Participants	Aggregate Load Reduction (kW)
8:00	9:00	No	78.2	0.95	0.98	-0.032	-3.4%	2,217	-71
9:00	10:00	No	86.1	1.12	1.14	-0.022	-2.0%	2,217	-49
10:00	11:00	No	91.1	1.37	1.36	0.011	0.8%	2,217	25
11:00	12:00	Yes	95.3	1.63	1.52	0.114	7.0%	2,217	252
12:00	13:00	Yes	97.8	1.96	1.77	0.188	9.6%	2,217	416
13:00	14:00	Yes	98.9	2.19	2.03	0.17	7.7%	2,217	376
14:00	15:00	Yes	98.6	2.33	2.17	0.161	6.9%	2,217	358
15:00	16:00	Yes	97.1	2.43	2.3	0.131	5.4%	2,217	291
16:00	17:00	Yes	95.7	2.21	1.99	0.223	10.1%	2,217	493
17:00	18:00	Yes	94.3	1.94	1.69	0.249	12.9%	2,217	553
18:00	19:00	No	92.2	1.86	1.67	0.193	10.4%	2,217	428
19:00	20:00	No	88.8	1.86	1.71	0.156	8.4%	2,217	345
20:00	21:00	No	84.5	2.17	2.14	0.036	1.7%	2,217	80
<b>Total kWh- Entire Day</b>			84.4	36.66	35.41	1.245	3.4%	2,217	2,759
<b>Total kWh - Event Hours</b>			96.8	14.71	13.47	1.236	8.4%	2,217	2,740

### **PTR Dually Enrolled in Summer Saver by Cycling Strategy**

Figure 3-5 and Figure 3-6 show the hourly event load impacts for participants dually enrolled in PTR and Summer Saver by the two cycling strategies, 50% and 100%, respectively. The participants with 50% cycling showed a modest average load reduction of 0.05 kW during the first six hours of the PTR event, but then had slightly negative reduction for the last hour, resulting in an overall average event hour reduction of 0.03 kW. Those with 100% cycling had a significantly larger incremental load reduction of 0.34 kW.

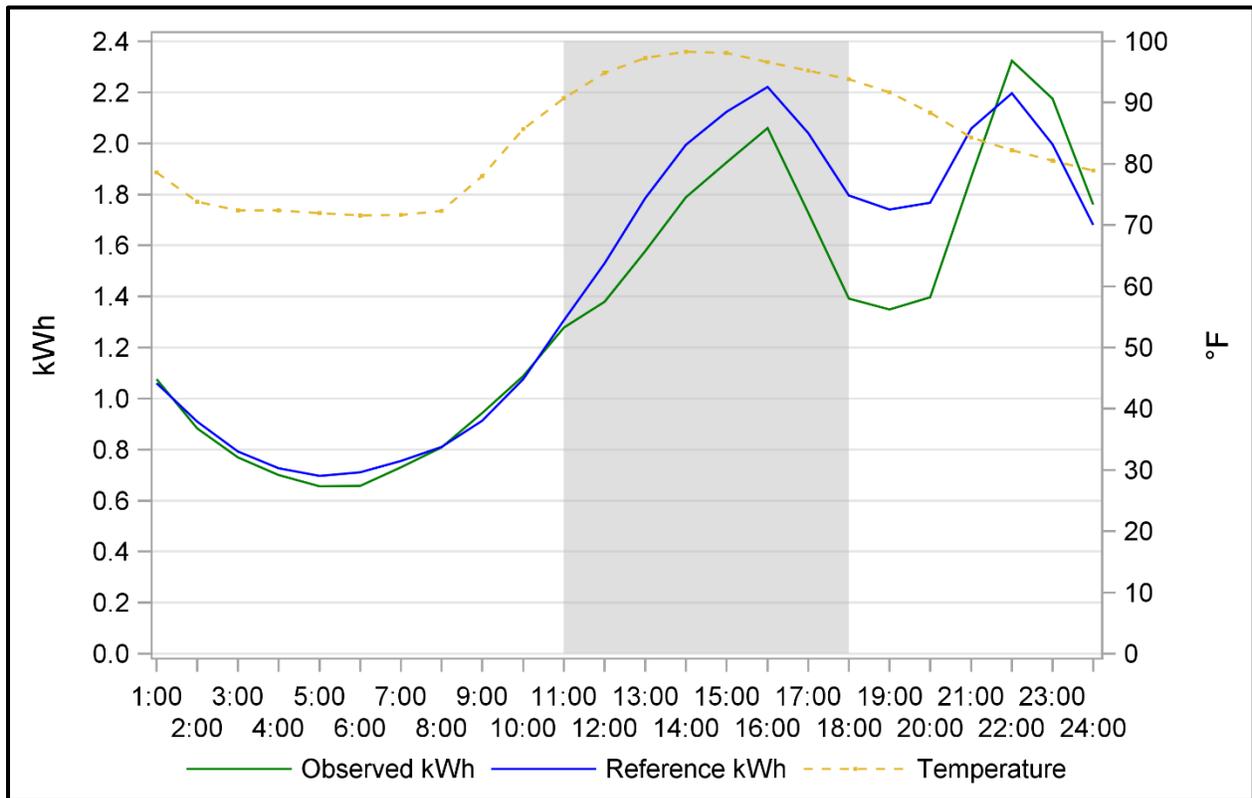


**FIGURE 3-5: HOURLY LOAD PROFILE FOR PTR CUSTOMERS DUALY ENROLLED IN SUMMER SAVER – 50% CYCLING – 2017 EVENT AVERAGE**





**FIGURE 3-6: HOURLY LOAD PROFILE FOR PTR CUSTOMERS DUALY ENROLLED IN SUMMER SAVER – 100% CYCLING – 2017 EVENT AVERAGE**



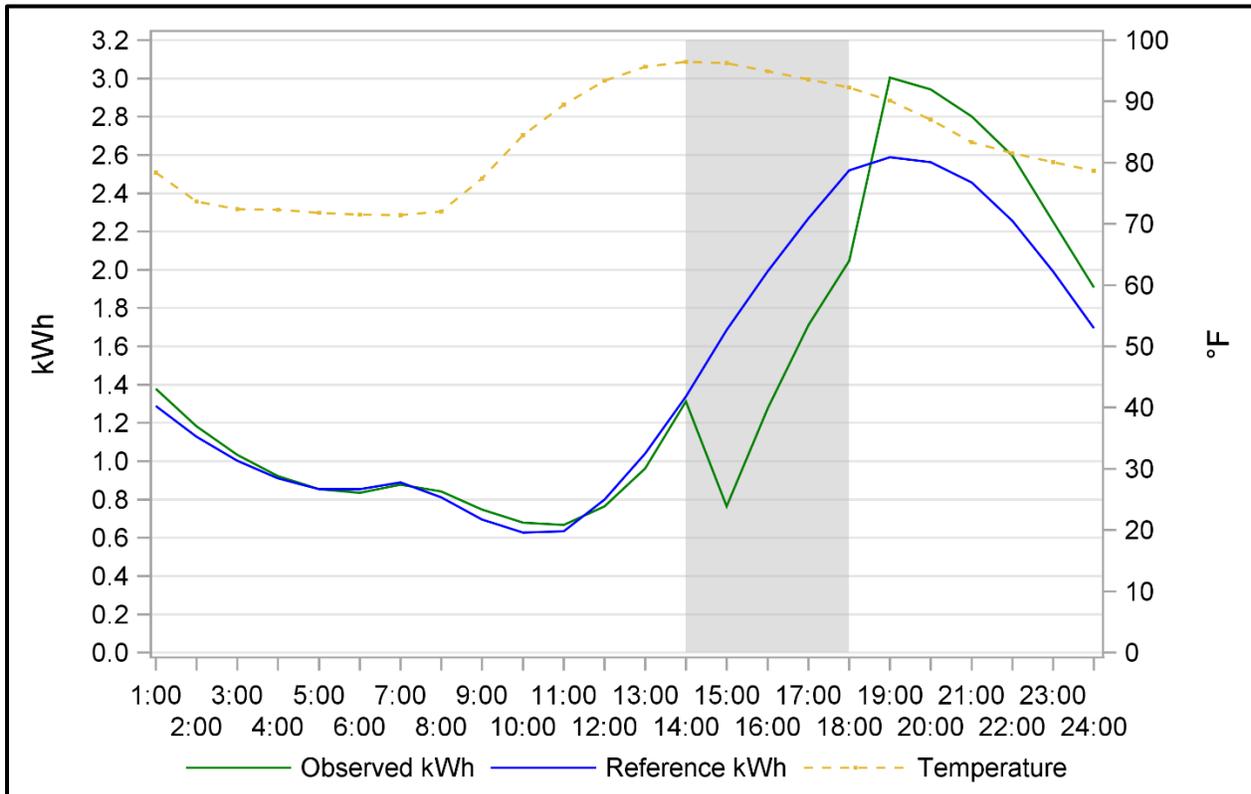
### 3.1.5 PTR Dually Enrolled in SCTD

SDG&E PTR customers are also eligible to participate in the SCTD program, which involves demand response enabling thermostats signaled through Wi-Fi. In 2017, all SCTD thermostats were subjected to a four degree thermostat setback on event days. The SCTD event hour window was only 4 hours long, from 2 p.m. to 6 p.m. Figure 3-7 and Table 3-11 show the hourly event load impacts for entire group of dually enrolled participants. Like the Summer Saver enrollees, the participant load shows a sharp drop as the demand response technology kicks in, and subsequently rising through the duration of the event and in the hour following. SCTD participants either received a free thermostat through the program, or enrolled using their own thermostat. The latter group is known as “Bring Your Own Thermostat,” or BYOT. Results for SCTD are presented by these two different thermostat sources. However, one of the BYOT vendors does not signal on weekends, so the minimal impacts from this group on the 2017 Saturday event are excluded from averages. With this adjustment, the average event hour load reduction (during PTR event hours) was 0.40 kW, which is about four times higher than the overall PTR group. The average load



reduction was 0.67 kW during the SCTD event hours from 2 p.m. to 6 p.m. In the hours of 11 a.m. to 2 p.m., when only the PTR event was in effect, the average load reduction was 0.05 kW. The average aggregate load reduction was 3.72 MW during PTR event hours, representing 24.09% of the reference load. The average aggregate reduction during SCTD event hours was 5.46 MW, or 31.5%. Lastly, the average aggregate reduction during the PTR-only hours (11 a.m. to 2 p.m.) was 0.37 MW, or 4.5%.

**FIGURE 3-7: HOURLY LOAD PROFILE FOR PTR CUSTOMERS DUALY ENROLLED IN SCTD – 2017 EVENT AVERAGE**





**TABLE 3-11: SUMMARY OF PTR EVENT IMPACTS FOR CUSTOMERS DUALY ENROLLED IN SCTD – 2017 AVERAGE**

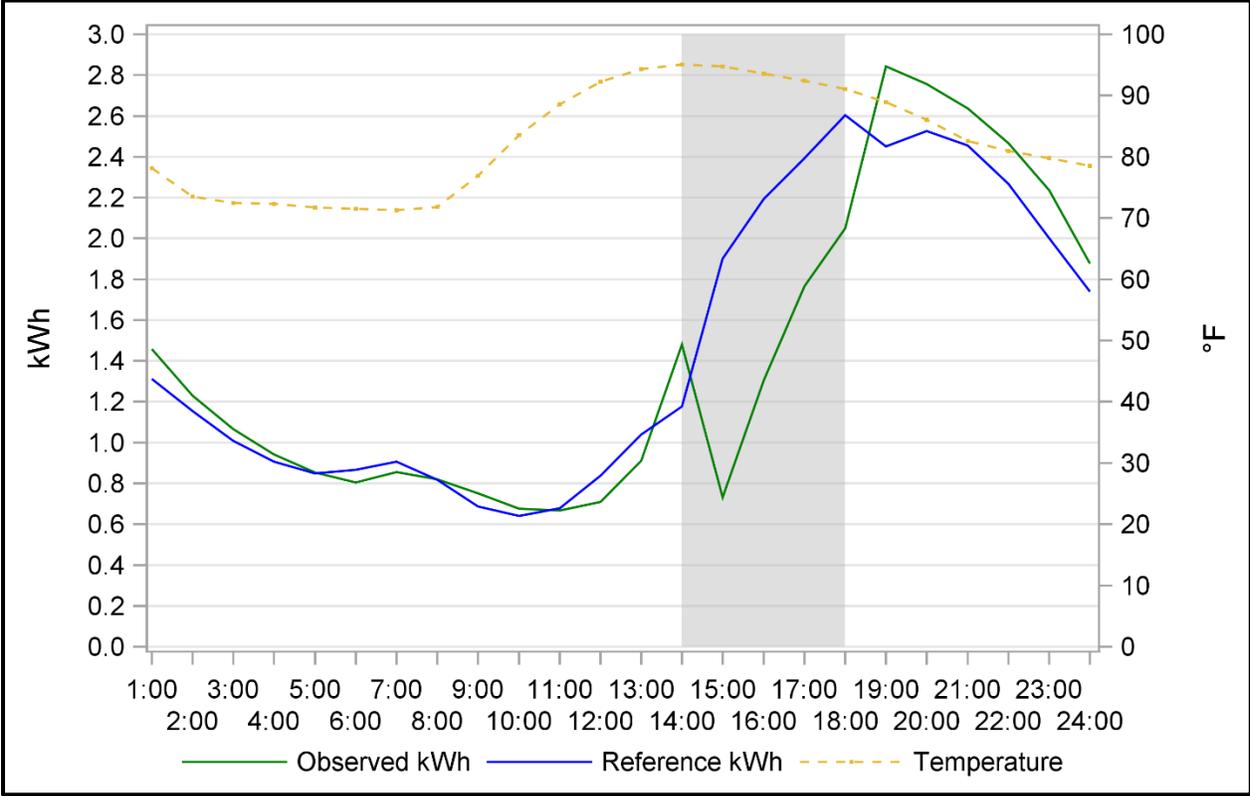
Hour Beg.	Hour End.	Event Hour	Mean °F	Mean Reference Load (kW)	Mean Observed Load (kW)	Mean Impact (kW)	% Load Reduction	Mean Active Participants	Aggregate Load Reduction (kW)
8:00	9:00	No	77.4	0.69	0.75	-0.053	-7.6%	8,179	-434
9:00	10:00	No	84.5	0.63	0.68	-0.054	-8.6%	8,179	-441
10:00	11:00	No	89.5	0.63	0.67	-0.034	-5.4%	8,179	-279
11:00	12:00	No	93.4	0.80	0.76	0.036	4.4%	8,179	291
12:00	13:00	No	95.6	1.04	0.96	0.077	7.4%	8,179	626
13:00	14:00	No	96.5	1.34	1.31	0.024	1.8%	8,179	198
14:00	15:00	Yes	96.2	1.69	0.76	0.922	54.7%	8,179	7,538
15:00	16:00	Yes	94.9	1.99	1.28	0.717	36.0%	8,179	5,862
16:00	17:00	Yes	93.6	2.27	1.71	0.559	24.6%	8,179	4,573
17:00	18:00	Yes	92.3	2.52	2.05	0.472	18.7%	8,179	3,858
18:00	19:00	No	90.1	2.59	3.00	-0.415	-16.0%	8,179	-3,392
19:00	20:00	No	87	2.56	2.94	-0.379	-14.8%	8,179	-3,099
20:00	21:00	No	83.3	2.46	2.80	-0.345	-14.0%	8,179	-2,820
<b>Total kWh- Entire Day</b>			83.2	34.88	34.35	0.530	1.5%	8,184	4,336
<b>Total kWh - Event Hours</b>			94.2	8.47	5.80	2.669	31.5%	8,184	21,831

### PTR Dually Enrolled in SCTD, by Thermostat Source

Figure 3-8 and Figure 3-9 **Error! Reference source not found.** show the hourly event load impacts for dually enrolled PTR and SCTD participants, by thermostat source. During SCTD event hours, both the free thermostat group and the BYOT thermostat group had different average hourly load reductions of 0.66 kW (31.2%) and 0.81 kW (35.6%), respectively. Over the entire event period, the free thermostat group had an average hourly load reduction of 0.40 kW (24.2%), while the BYOT thermostat group had an average of 0.46 kW (26.3%). During PTR-only hours (11 a.m. to 2 p.m.), the free thermostat group had higher average impacts of 0.06 kW, compared to -0.02 kW for the BYOT group.

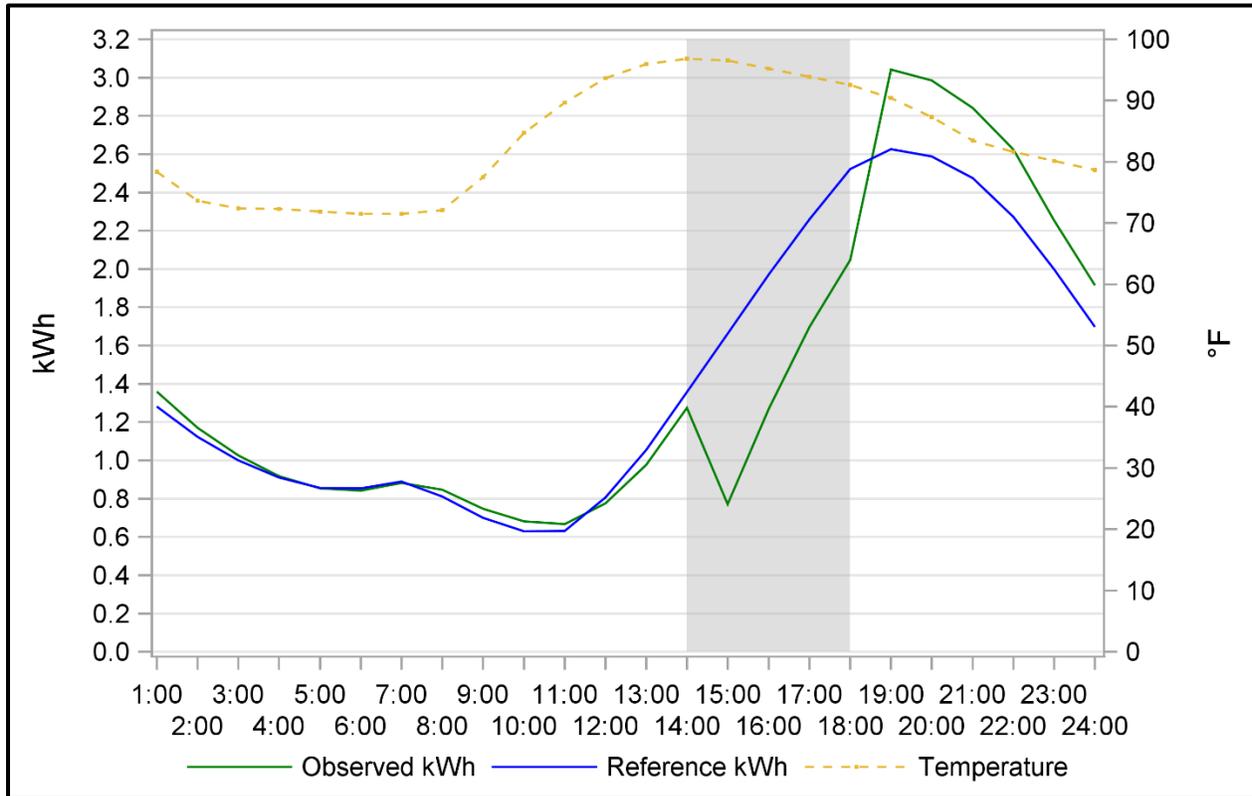


**FIGURE 3-8: HOURLY LOAD PROFILE FOR PTR CUSTOMERS DUALY ENROLLED IN SCTD – BYOT THERMOSTAT SOURCE– 2017 EVENT AVERAGE**





**FIGURE 3-9: HOURLY LOAD PROFILE FOR PTR CUSTOMERS DUALY ENROLLED IN SCTD – FREE THERMOSTAT SOURCE – 2017 EVENT AVERAGE**

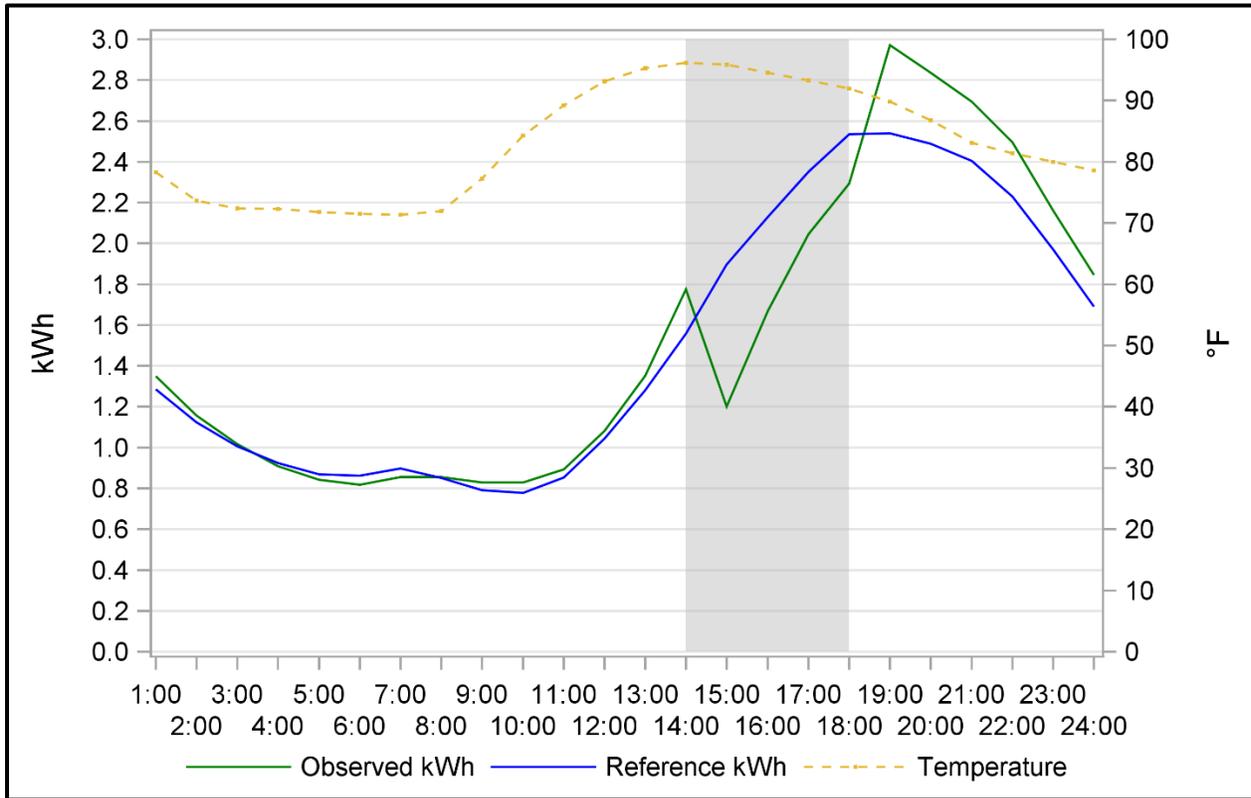


### 3.1.6 SCTD Not Enrolled in PTR

Figure 3-10 and Table 3-12 show the hourly event load impacts for SCTD customers that are not enrolled in the PTR program. There were slightly more participants in this group than the dually-enrolled group, comprised of those customers that have a SCTD-enabled thermostat but did not opt-in to the PTR program. During SCTD event hours, their average load reduction was 0.43 kW, which was lower than that of the dually-enrolled PTR-SCTD participants. The average aggregate impact during the SCTD event hours was 4.02 MW, representing 19.1% of the reference load. The group showed snapback effects averaging 12.3% during the hours following the SCTD event.



**FIGURE 3-10: HOURLY LOAD PROFILE FOR SCTD CUSTOMERS NOT ENROLLED IN PTR – 2017 EVENT AVERAGE**





**TABLE 3-12: SUMMARY OF EVENT IMPACTS FOR SCTD CUSTOMERS NOT ENROLLED IN PTR – 2017 AVERAGE**

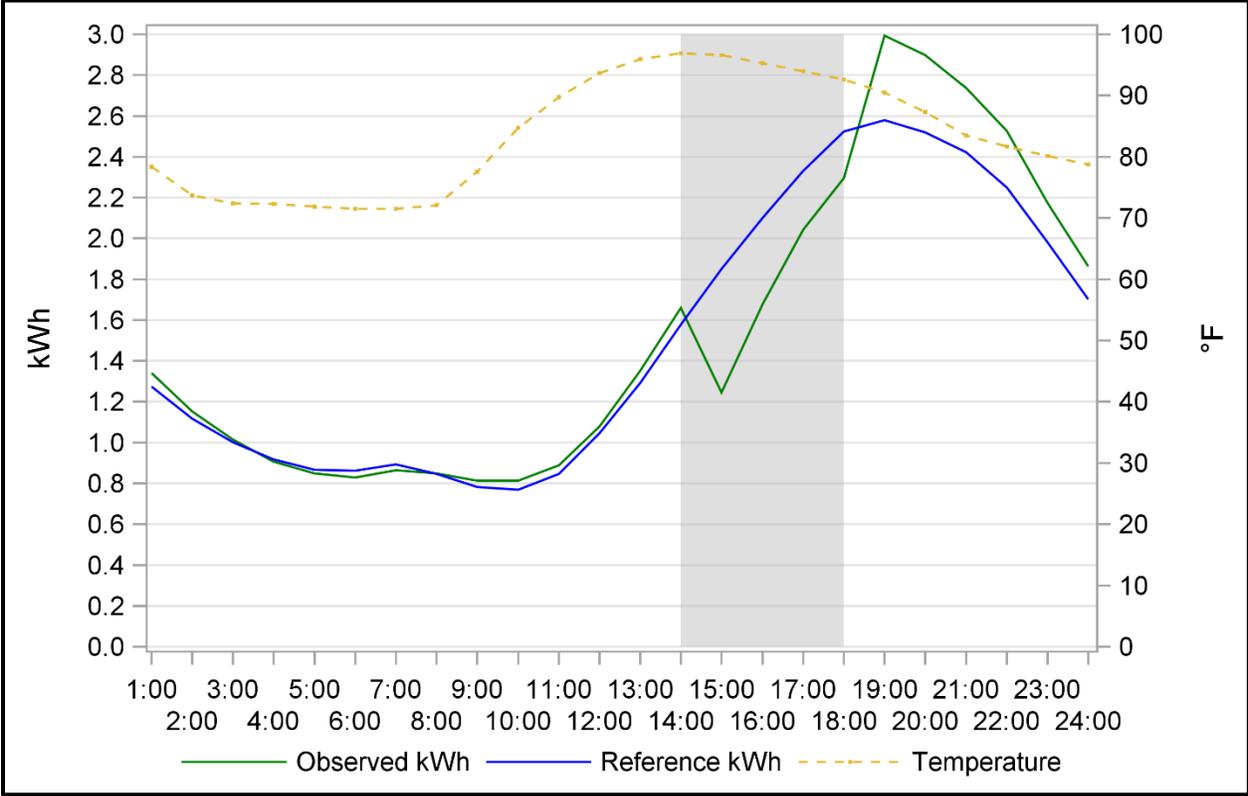
Hour Beg.	Hour End.	Event Hour	Mean °F	Mean Reference Load (kW)	Mean Observed Load (kW)	Mean Impact (kW)	% Load Reduction	Mean Active Participants	Aggregate Load Reduction (kW)
8:00	9:00	No	77.3	0.79	0.83	-0.038	-4.7%	9,438	-354
9:00	10:00	No	84.2	0.78	0.83	-0.051	-6.5%	9,438	-481
10:00	11:00	No	89.2	0.85	0.89	-0.041	-4.7%	9,438	-382
11:00	12:00	No	93.1	1.04	1.08	-0.039	-3.7%	9,438	-364
12:00	13:00	No	95.3	1.28	1.35	-0.073	-5.7%	9,438	-685
13:00	14:00	No	96.2	1.56	1.77	-0.216	-13.9%	9,438	-2,041
14:00	15:00	Yes	95.9	1.90	1.20	0.695	36.6%	9,438	6,559
15:00	16:00	Yes	94.6	2.13	1.67	0.462	21.7%	9,438	4,357
16:00	17:00	Yes	93.3	2.35	2.04	0.307	13.1%	9,438	2,898
17:00	18:00	Yes	92	2.54	2.29	0.241	9.5%	9,438	2,277
18:00	19:00	No	89.8	2.54	2.97	-0.432	-17.0%	9,438	-4,077
19:00	20:00	No	86.8	2.49	2.84	-0.348	-14.0%	9,438	-3,288
20:00	21:00	No	83.1	2.40	2.69	-0.29	-12.1%	9,438	-2,740
<b>Total kWh- Entire Day</b>			83.1	36.36	36.78	-0.418	-1.1%	9,438	-3,945
<b>Total kWh - Event Hours</b>			93.9	8.91	7.21	1.705	19.1%	9,438	16,091

### SCTD Not Enrolled in PTR, by Thermostat Source

Figure 3-11 and Figure 3-12 show the hourly event load impacts for SCTD participants that are not enrolled in PTR. The free thermostat participants had smaller event impacts than the BYOT thermostat participants. The former had an average event hour load reduction of 0.39 kW (17.5%) while the latter had an average of 0.64 kW (26.4%). The BYOT group also showed higher effects of pre-cooling in the hours leading up to the SCTD event.

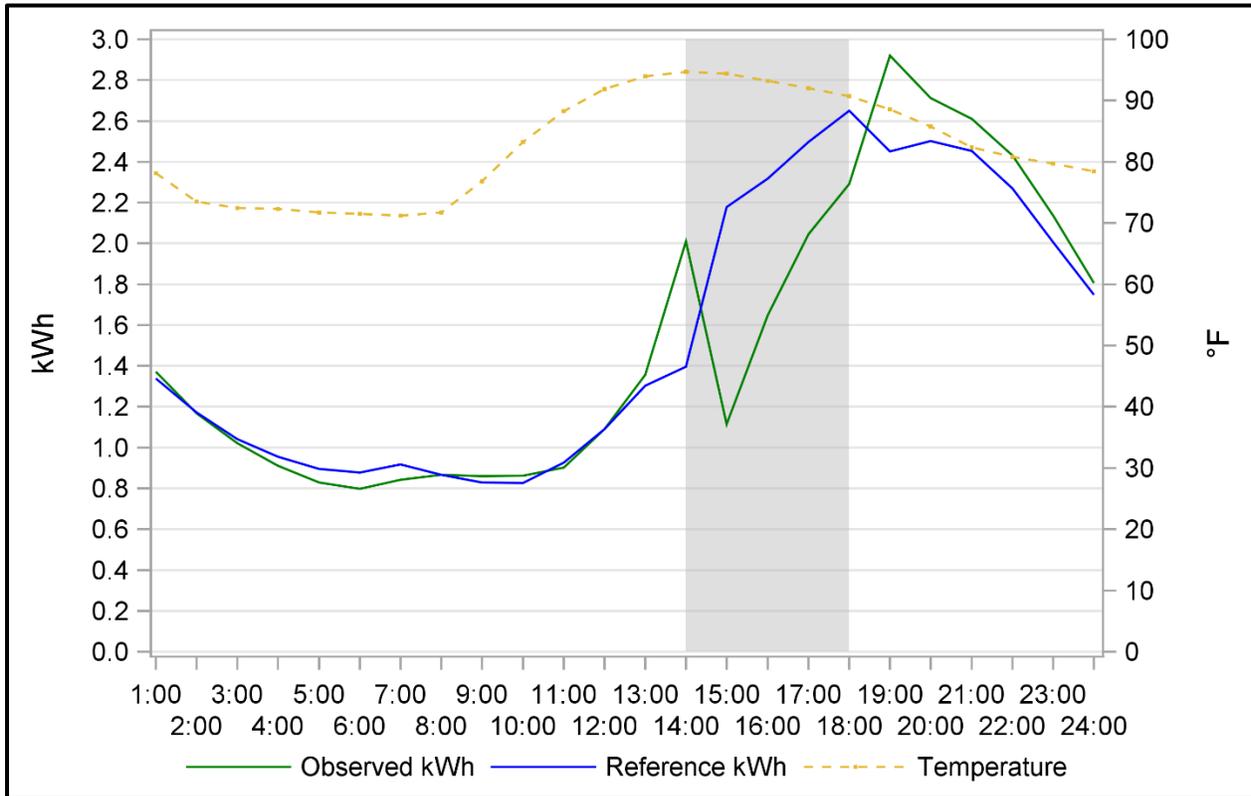


**FIGURE 3-11: HOURLY LOAD PROFILE FOR SCTD CUSTOMERS NOT ENROLLED IN PTR – FREE THERMOSTAT SOURCE – 2017 EVENT AVERAGE**





**FIGURE 3-12: HOURLY LOAD PROFILE FOR SCTD CUSTOMERS NOT ENROLLED IN PTR – BYOT THERMOSTAT SOURCE – 2017 EVENT AVERAGE**

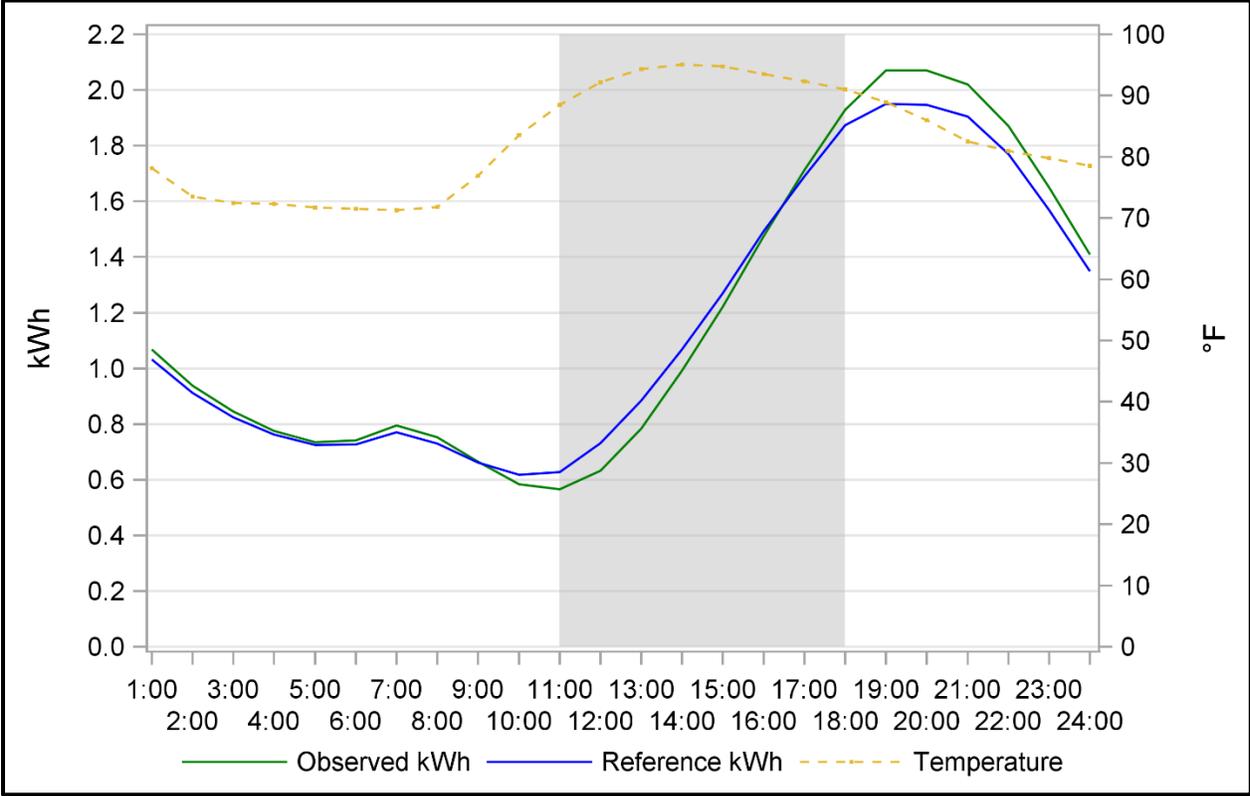


### 3.1.7 PTR without Load Control by Notification Type

There are three methods of notification for PTR events – email, text message, and phone call. Only about 8% of the final participant group had opted for phone notification (only 2% opted for phone-only notification), so this sub-group analysis focused on the email and text message notifications. About 55% of the analysis group opted for email-only notification, about 16% opted for text-only notification, and about 15% opted for both email and text notifications. Figure 3-13 through Figure 3-15 show the hourly event load impacts for each of these groups, respectively. The email-only notification group had an average event hour load reduction of 0.04 kW (2.9%), which is slightly lower than the general PTR without Load Control population average. The text message-only group had an average event hour load reduction of 0.06 kW (4.2%), which was approximately in line with the general average. The group with both types of notifications had the greatest average event hour reduction of 0.13 kW (9.1%), which was well above the overall population average. The email-only group also had the largest average snapback effects of 5.6%, compared to the text-only group, which had 4.1% and the group with both types, which had 4.3%.

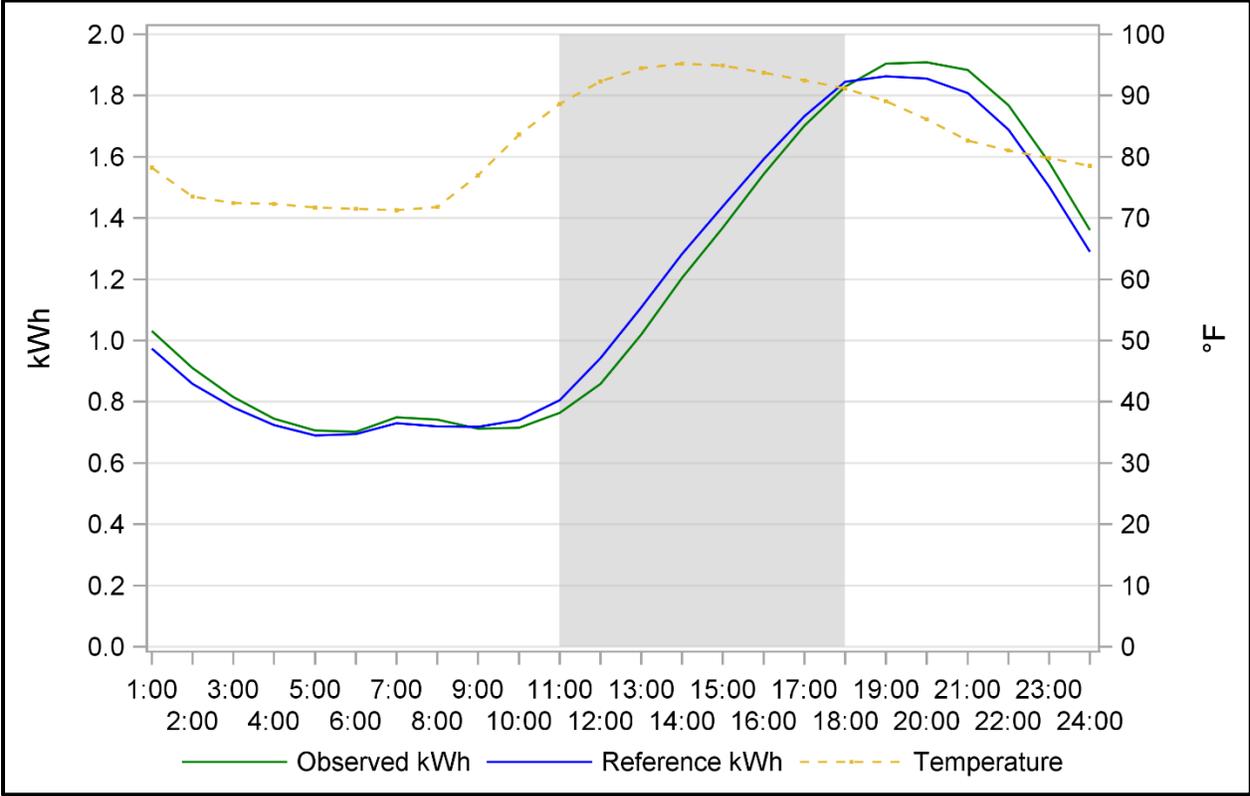


**FIGURE 3-13: HOURLY LOAD PROFILE FOR PTR CUSTOMERS WITHOUT ANY LOAD CONTROL – EMAIL-ONLY NOTIFICATION – 2017 EVENT AVERAGE**



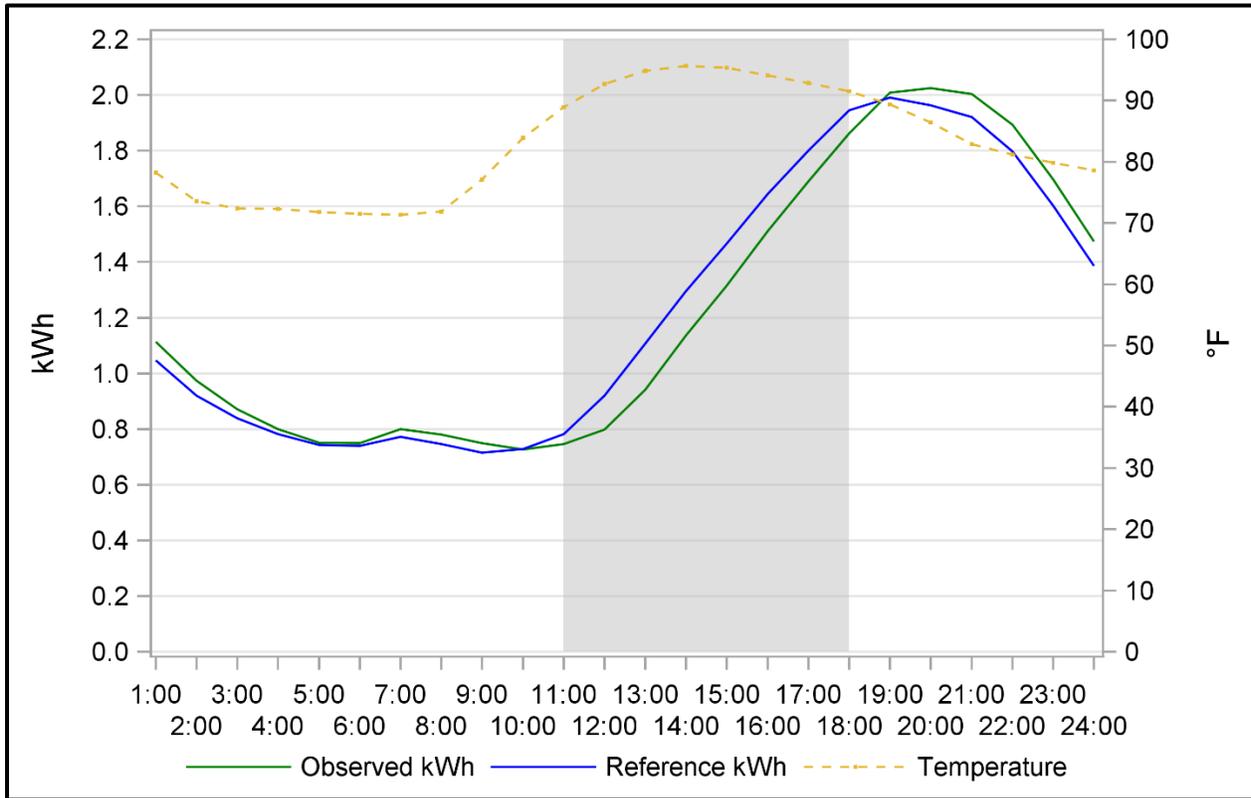


**FIGURE 3-14: HOURLY LOAD PROFILE FOR PTR CUSTOMERS WITHOUT ANY LOAD CONTROL – TEXT-ONLY NOTIFICATION – 2017 EVENT AVERAGE**





**FIGURE 3-15: HOURLY LOAD PROFILE FOR PTR CUSTOMERS WITHOUT ANY LOAD CONTROL – BOTH EMAIL AND TEXT NOTIFICATIONS – 2017 EVENT AVERAGE**

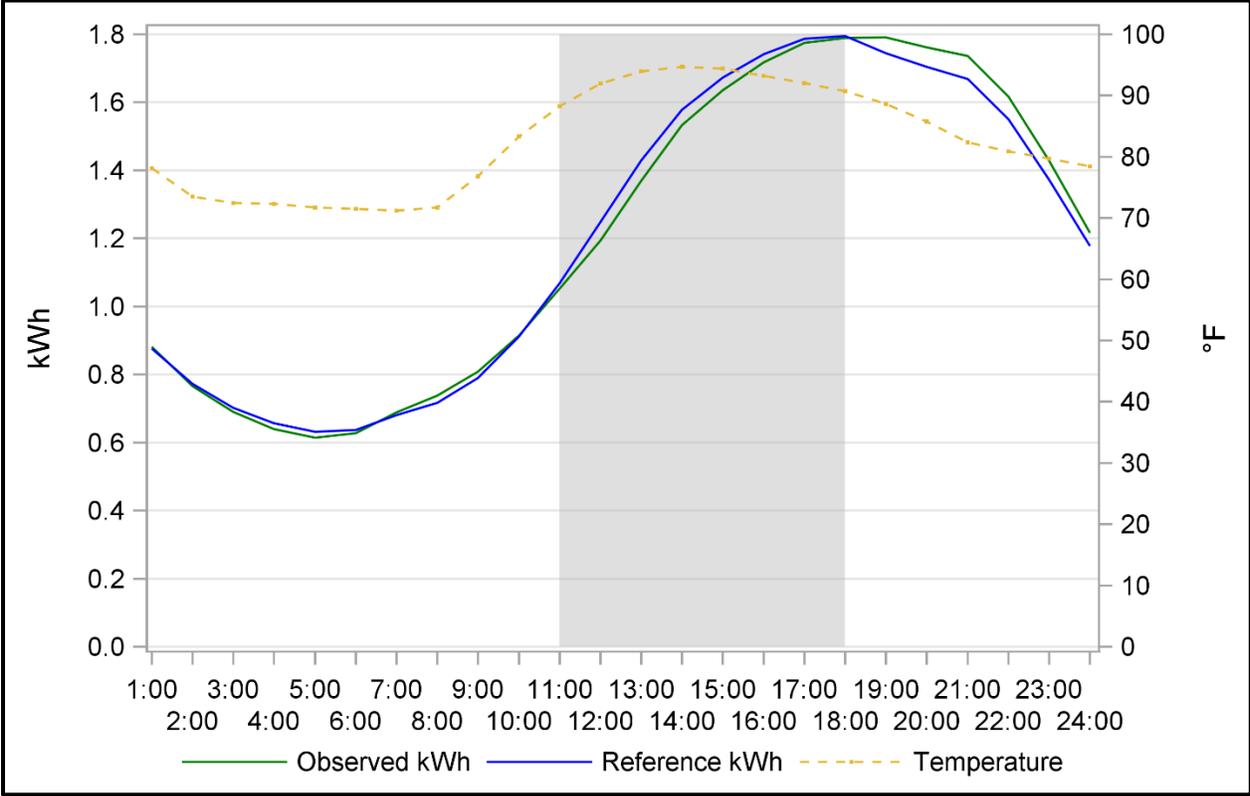


### 3.1.8 PTR without Load Control by Low Income Status

SDG&E has several programs that allow households with low incomes to receive a lower rate for their electricity use. Figure 3-16 and Figure 3-17 show the hourly event load impacts for both non-low income and low income PTR participants with no load control. Almost 17% of PTR participants had a low income billing rate. The non-low income participants had an average event hour load reduction of 0.03 kW (2.1%), which is slightly higher than the low income participants, who had minimal load reductions of 0.01 kW (0.5%) on average.

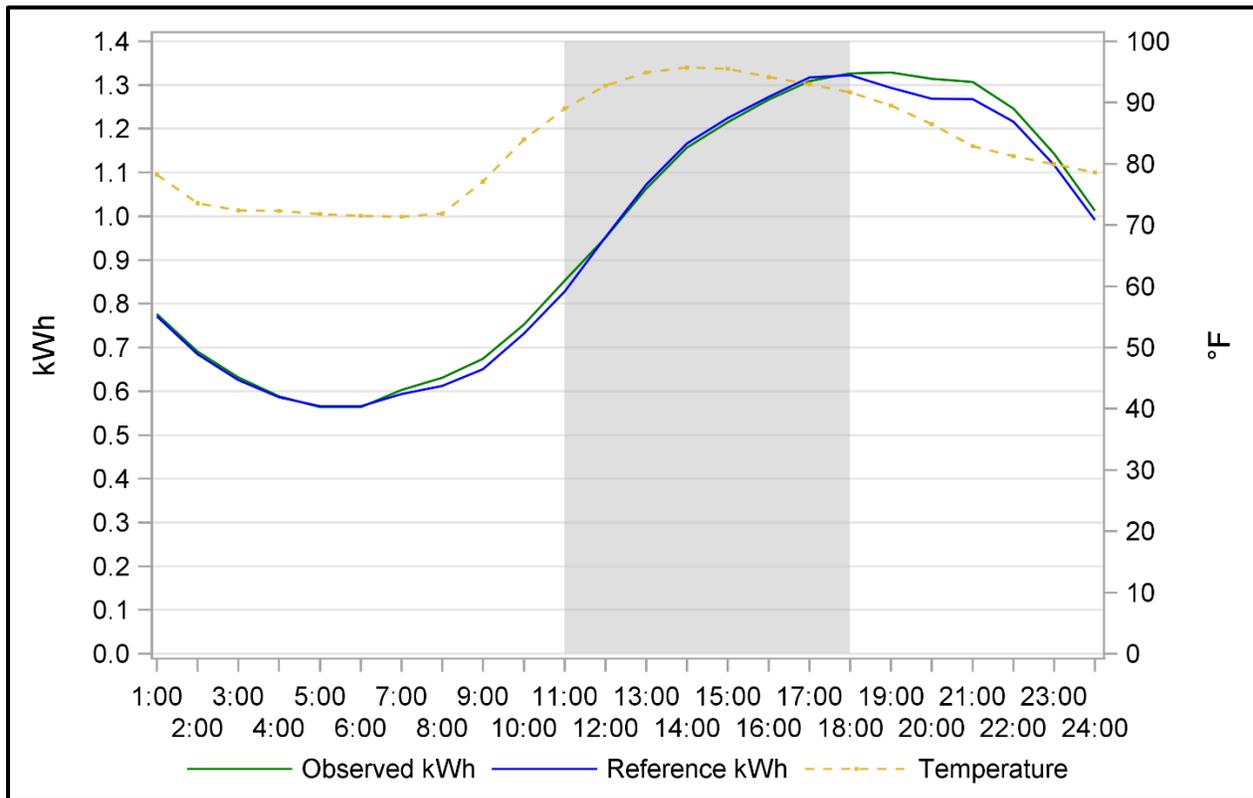


**FIGURE 3-16: HOURLY LOAD PROFILE FOR NON-LOW INCOME PTR CUSTOMERS WITHOUT ANY LOAD CONTROL – 2017 EVENT AVERAGE**





**FIGURE 3-17: HOURLY LOAD PROFILE FOR LOW INCOME PTR CUSTOMERS WITHOUT ANY LOAD CONTROL – 2017 EVENT AVERAGE**

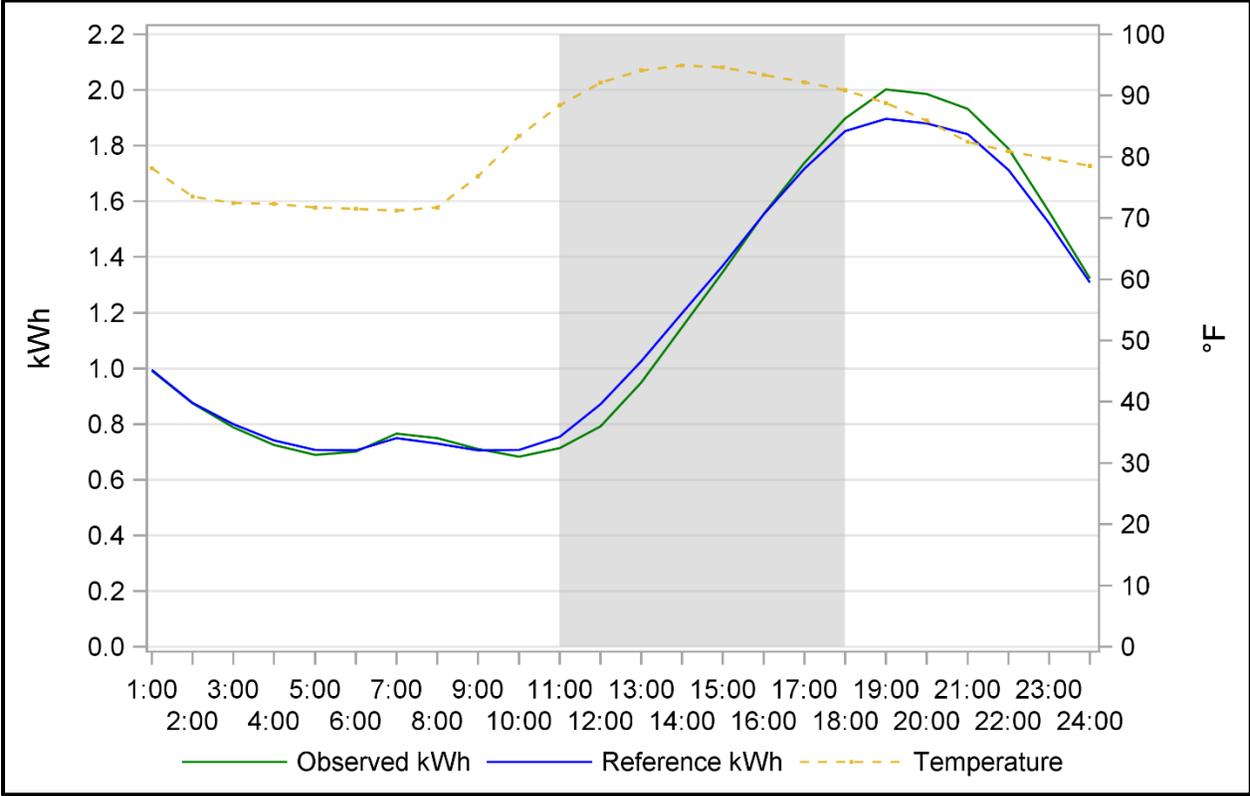


### 3.1.9 PTR without Load Control by First Year of Enrollment

Figure 3-18 through Figure 3-23 show the hourly event load impacts for PTR customers without any load control by their first year of enrollment in the PTR program, from 2012 to 2017. The participants who first enrolled in 2017 (the “newest” group) saved the most during the 2017 PTR event, with an average of 0.18 kW (16.3%) during event hours. This group also showed the most snapback effects, with an average increase of 6.2% from 6 p.m. to midnight. The effects of customers with PV are apparent in the average load shape of the 2017 enrollees, characterized by a large dip in usage in the middle of the day, when solar generation is generally highest. The “oldest” group of participants who first enrolled in 2012 had an average event hour load reduction of 0.02 kW (1.7%), and an average post-event snapback of 4.1%. Lastly, the 2013 enrollees had very little reduction during event hours of 0.02 kW (1.5%), and an average post-event snapback of 5.4%.

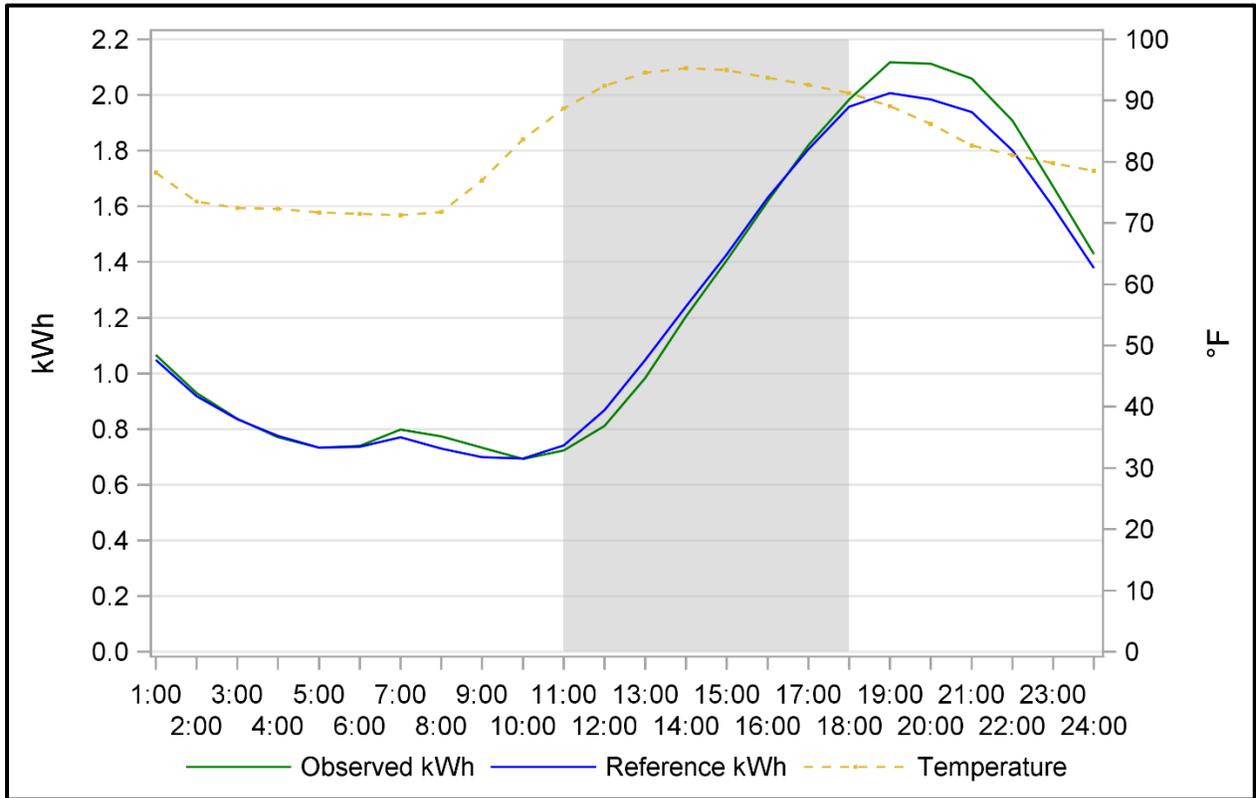


**FIGURE 3-18: HOURLY LOAD PROFILE FOR PTR CUSTOMERS WITHOUT ANY LOAD CONTROL – 2012 FIRST ENROLLMENT YEAR – 2017 EVENT AVERAGE**



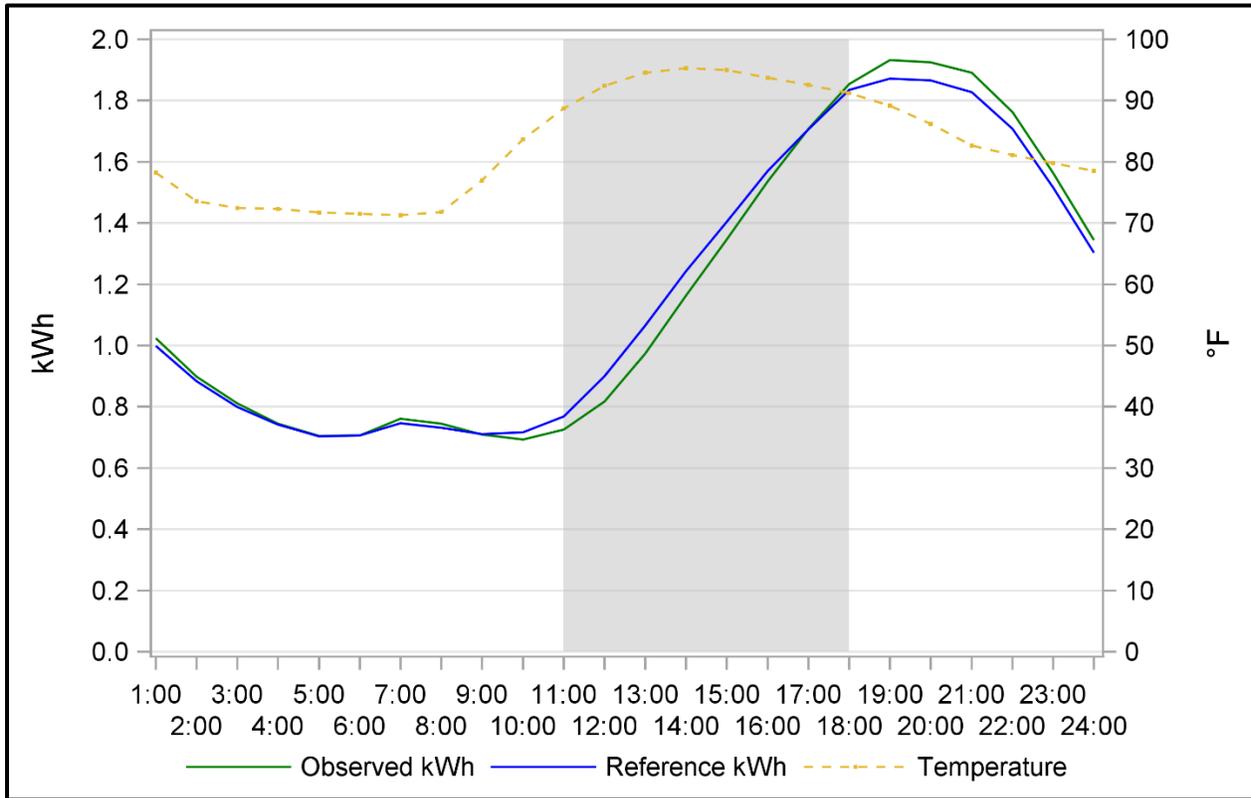


**FIGURE 3-19: HOURLY LOAD PROFILE FOR PTR CUSTOMERS WITHOUT ANY LOAD CONTROL – 2013 FIRST ENROLLMENT YEAR – 2017 EVENT AVERAGE**



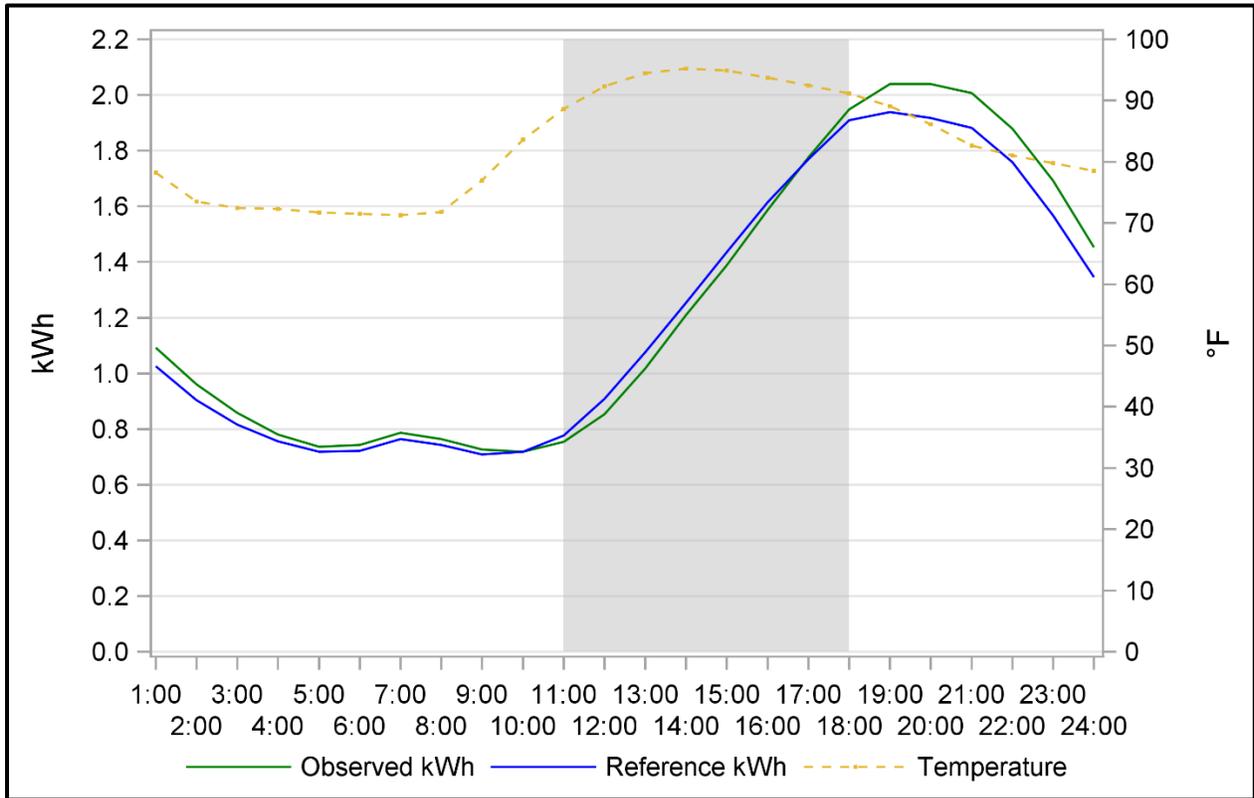


**FIGURE 3-20: HOURLY LOAD PROFILE FOR PTR CUSTOMERS WITHOUT ANY LOAD CONTROL – 2014 FIRST ENROLLMENT YEAR OF – 2017 EVENT AVERAGE**



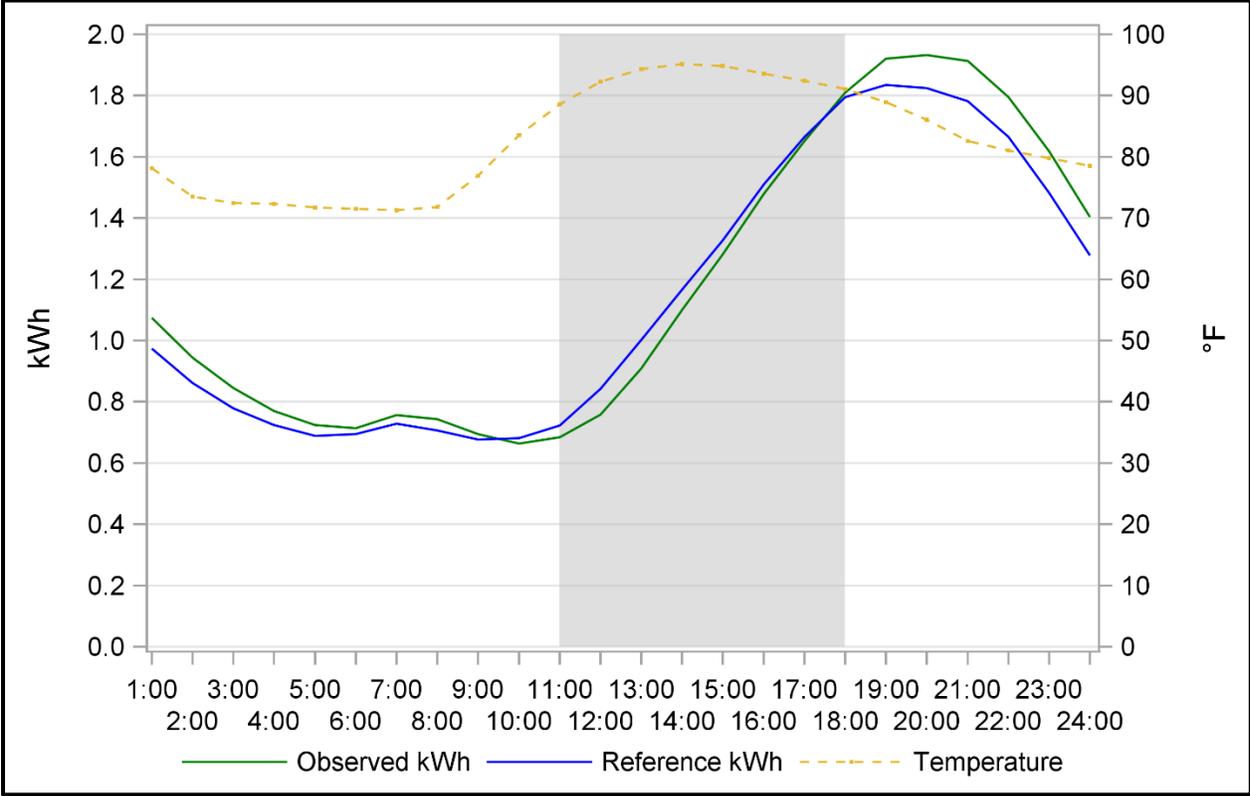


**FIGURE 3-21: HOURLY LOAD PROFILE FOR PTR CUSTOMERS WITHOUT ANY LOAD CONTROL – 2015 FIRST ENROLLMENT YEAR – 2017 EVENT AVERAGE**



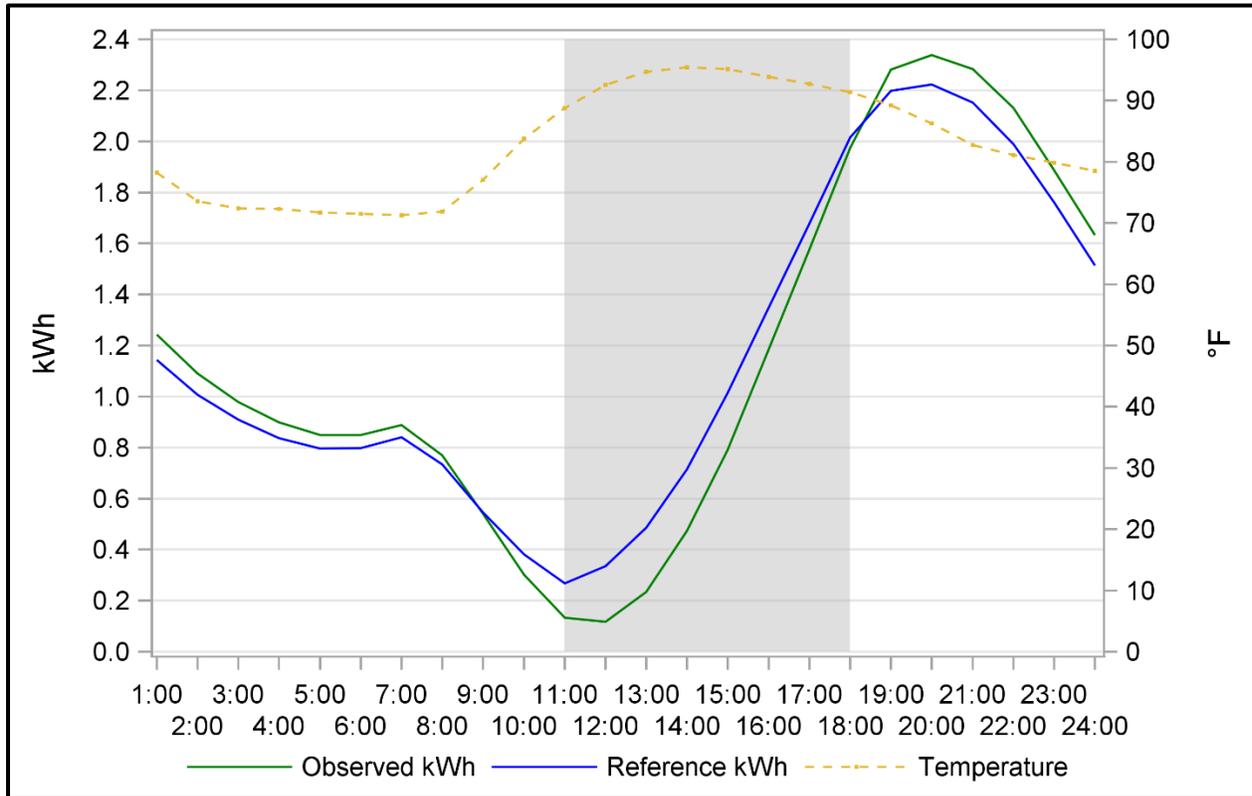


**FIGURE 3-22: HOURLY LOAD PROFILE FOR PTR CUSTOMERS WITHOUT ANY LOAD CONTROL – 2016 FIRST ENROLLMENT YEAR – 2017 EVENT AVERAGE**





**FIGURE 3-23: HOURLY LOAD PROFILE FOR PTR CUSTOMERS WITHOUT ANY LOAD CONTROL – 2017 FIRST ENROLLMENT YEAR – 2017 EVENT AVERAGE**



### 3.1.10 Net Energy Metered Ex Post Load Impacts

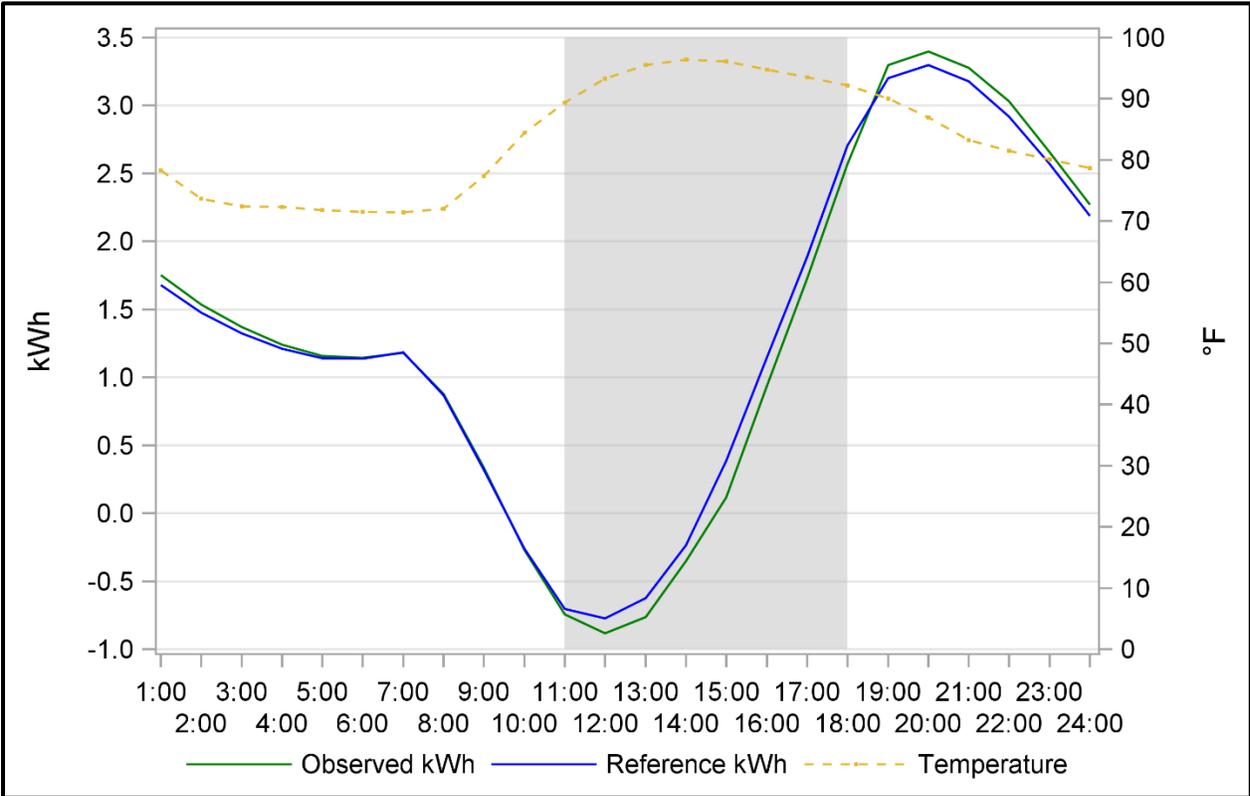
As part of its analysis, Itron modeled the impacts of the set of PTR participants with photovoltaic (PV) generation, or Net Energy Metering (NEM). These customers, in addition to standard consumption, are able to export excess PV generation back to the grid. Figure 3-24 and Table 3-13 show the hourly PTR event load impacts for the NEM participants without load control. The values reported reflect these customers' net consumption of energy consumed minus energy exported. A negative value indicates that PV generation exceeds household consumption. The average event hour net load reduction for these customers is substantially greater than the general PTR population, at 0.16 kW. The average aggregate event-induced load impact for these NEM customers was 2.9 MW, which is a considerable amount given that they comprise 23% of the overall PTR population.

The majority of PTR participants with NEM do not have load control. However, there are approximately 3,298 participants that have load control out of the total 17,747 NEM participants; either SCTD or Summer Saver. This incidence (19%) of load control is higher than for the general PTR population (13%). As seen



in Figure 3-24, the interactive effect of this PTR enabling technology with PV may not be desirable as it steepens the ramp of the event day load curve in the late afternoon and adds snap-back making the post event load higher than the reference load.

**FIGURE 3-24: HOURLY LOAD PROFILE FOR PTR NEM CUSTOMERS – 2017 EVENT AVERAGE**





**TABLE 3-13: SUMMARY OF PTR EVENT IMPACTS FOR NEM CUSTOMERS – 2017 AVERAGE**

Hour Beg.	Hour End	Event Hour	Mean °F	Mean Reference Load (kW)	Mean Observed Load (kW)	Mean Impact (kW)	% Load Reduction	Mean Active Participants	Aggregate Load Reduction (kW)
8:00	9:00	No	77.3	0.32	0.34	-0.017	-5.5%	17,747	-311
9:00	10:00	No	84.4	-0.26	-0.27	0.01	-4.0%	17,747	185
10:00	11:00	No	89.4	-0.7	-0.74	0.039	-5.6%	17,747	698
11:00	12:00	Yes	93.3	-0.77	-0.88	0.111	-14.3%	17,747	1,967
12:00	13:00	Yes	95.5	-0.63	-0.76	0.138	-22.0%	17,747	2,444
13:00	14:00	Yes	96.4	-0.24	-0.35	0.116	-49.2%	17,747	2,055
14:00	15:00	Yes	96.1	0.38	0.12	0.268	69.7%	17,747	4,761
15:00	16:00	Yes	94.8	1.15	0.94	0.209	18.2%	17,747	3,710
16:00	17:00	Yes	93.5	1.89	1.73	0.16	8.5%	17,747	2848
17:00	18:00	Yes	92.1	2.71	2.57	0.137	5.1%	17,747	2,429
18:00	19:00	No	90	3.2	3.3	-0.094	-2.9%	17,747	-1,661
19:00	20:00	No	86.9	3.3	3.4	-0.101	-3.1%	17,747	-1,785
20:00	21:00	No	83.2	3.18	3.28	-0.101	-3.2%	17,747	-1,785
<b>Total kWh- Entire Day</b>			83.2	31.22	30.86	0.354	1.1%	17,747	6,291
<b>Total kWh - Event Hours</b>			94.5	4.49	3.35	1.139	25.3%	17,747	20,213

# 4 EX-ANTE METHODOLOGY AND RESULTS

## 4.1 ESTIMATING EX-ANTE LOAD IMPACTS FOR THE PTR PROGRAM

Ex-ante impacts for the PTR program for four participant segments (Opt-In PTR-Only, PTR Dually Enrolled in Summer Saver, PTR Dually Enrolled in SCTD, and SCTD-Only) were estimated by combining the regression model results from the ex post impacts with two other sources of data. The first data source was a 10-year forecast of enrollment for four separate participant segments. The second data source was two separate versions of weather scenarios containing hourly weather for different types of weather years and day types for each month of the year, one from SDG&E and the second from CAISO. The results presented in this section use the weather conditions based on SDG&E estimates.

The *ex-ante* estimation process involved three main steps. The first step required estimating a similar model as the ex post regression model. Several changes were made to the ex post methodology for ex ante forecasting. These were: 1) excluding the event on September 2<sup>nd</sup>, which was a Saturday. Customers behave differently on weekends, and they are expected to respond differently for a weekday event than a weekend event. Therefore, the weekend event was excluded from the *ex-ante* analysis, since the major task here is to predict what would happen in the future when a weekday event is called. 2) For PTR, two dummy variables were used to model the impacts. The similar hourly weather conditions across the two weekday events was causing the model to give too much importance to temperature. Because the temperatures for the ex-ante scenarios are very different from those on the actual event days, the model estimated impacts that were much larger than were experienced on the actual events even though the temperature were lower. To resolve this problem, we have used the average load impacts from the ex post analysis and applied them to the modeled reference loads estimated using the ex-ante temperatures. For PTR, it is assumed that the impact does not change as weather changes, but depends more on the date; while for SCTD, the impact is estimated as a function of cooling degree hours. Since the SCTD program encourages customers to adjust their thermostats, it is intuitive that the impact would be weather dependent, rather than date dependent. 3) Given that there are only two weekday event days, and the two days were both very hot, the temperatures for some hours were very similar across the two days, especially for the inland areas. To estimate the impact as a function of weather variable for SCTD, it is required that there is variation in weather across the two days. Therefore, for SCTD ex ante model, the weighted average temperature was used, using number of customers in the whole population as weights.

In the second step, the re-estimated parameters were combined with the weather scenarios from the various year and day types to calculate per participant average reference loads, observed loads, and load



impacts. The standard errors from the impact variable parameters were used to calculate the uncertainty estimates.

The last step was to combine estimated per-participant impacts for the different weather scenarios and multiply them by the forecast of enrolled participants to generate the total program impacts. SDG&E forecasts that the PTR-only enrollments will stay constant through the end of 2018, when the program will be discontinued. By the end of 2018, the PTR program is expected to grow to over 82,000 participants (driven by dual enrollments from SCTD), and the SCTD program is expected to grow to over 28,000 participants. By the end of 2021, the SCTD program is forecasted to grow to over 56,000 participants. These projections are then expected to remain relatively constant throughout the remainder of the *ex-ante* forecast period.

The enrollment forecasts were based on total participants by participant segment, whereas the weather scenarios and estimated impacts have more detailed information. Consequently, the alignment of these data sources called for making certain assumptions about the allocation of program participants. Total participants from the forecast were allocated to climate zones and, for the SCTD and Summer Saver groups, to the cycling strategies based on the relative shares as of the event days from 2017. Additionally, since the weather scenarios were provided by climate zone, an average weather scenario was created using an average where the same participant shares were used as weights. Note that this weighting was program segment specific. For example, the overall weather for the SCTD 100% cycling participants was based on the shares by climate zone for that group. The shares used for the allocation of the enrollment forecast are presented in Table 4-1. Lastly, it should be noted that in 2018 and beyond, the SCTD program will be renamed to the AC Saver Day Ahead program. After 2018, participants with Net Energy Metering customers will not be able to participate in demand response.

**TABLE 4-1: SHARES FOR ALLOCATION OF ENROLLMENT FORECAST**

Participant Segment		Coastal	Inland	All
PTR-Only	All	53%	47%	100%
PTR Dually Enrolled in Summer Saver	100% Cycle	16%	50%	67%
	50% Cycle	3%	30%	33%
	All	19%	81%	100%
PTR Dually Enrolled in SCTD	BYOT	10%	9%	19%
	Free	31%	50%	81%
	All	41%	59%	100%



Participant Segment		Coastal	Inland	All
SCTD-Only	BYOT	44%	56%	100%
	Free	19%	14%	33%
	All	25%	42%	67%

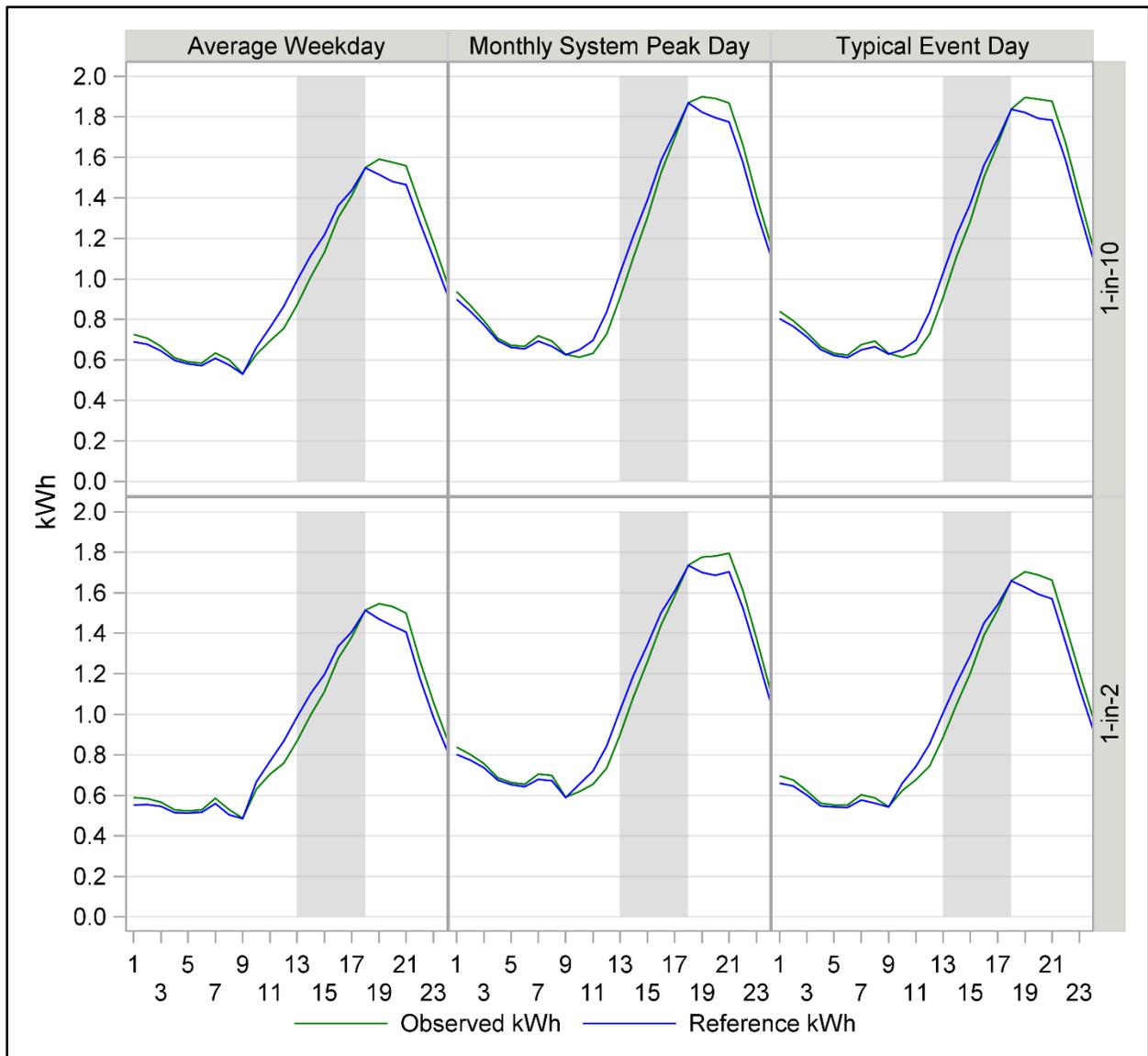
## 4.2 EX-ANTE LOAD IMPACT RESULTS

### 4.2.1 PTR-Only

Figure 4-1 and Table 4-2 show the *ex-ante* average load impact estimates for the average PTR-only customer on an average weekday, monthly system peak day, and a typical event day based on 1-in-2 and 1-in-10 weather year conditions for 2018. The average weekday and monthly system peak days are presented for June, July, and August, while the typical event day is presented for the month of August. For both 1-in-2 typical event day and 1-in-10 typical event day scenario, the estimated load reduction for the average participant is 0.055 kW during the Resource Adequacy hours (1:00pm to 6:00 pm), and the estimated aggregate load reduction is 3.98 MW. These estimates represent approximately 3.9% and 3.6% of the reference load, respectively, for each weather scenario.



FIGURE 4-1: 2018 EX-ANTE HOURLY LOAD PROFILE – PTR ONLY





**TABLE 4-2: 2018 EX-ANTE HOURLY LOAD IMPACT RESULTS – PTR-ONLY**

Day / Type	Month	1-in-10					1-in-2					
		Avg. Hourly Reference Load (kWh)	Avg. Hourly Observed Load (kWh)	Avg. Hourly Impact (kWh)	Percent Load Reduction	Avg. Total Hourly Impact (MWh)	Avg. Hourly Reference Load (kWh)	Avg. Hourly Observed Load (kWh)	Avg. Hourly Impact (kWh)	Percent Load Reduction	Avg. Total Hourly Impact (MWh)	
ALL	Average Weekday	Jun	1.00	0.95	0.055	5.5%	3.98	0.88	0.82	0.055	6.3%	3.98
		Jul	1.40	1.34	0.055	4.0%	3.98	1.29	1.24	0.055	4.3%	3.98
		Aug	1.34	1.28	0.055	4.1%	3.98	1.31	1.26	0.055	4.2%	3.98
	Monthly System Peak Day	Jun	1.28	1.22	0.055	4.3%	3.98	1.04	0.98	0.055	5.3%	3.98
		Jul	1.60	1.54	0.055	3.5%	3.98	1.45	1.39	0.055	3.8%	3.98
		Aug	1.56	1.5	0.055	3.6%	3.98	1.48	1.42	0.055	3.7%	3.98
	Typical Event Day	Aug	1.54	1.48	0.055	3.6%	3.98	1.42	1.36	0.055	3.9%	3.98

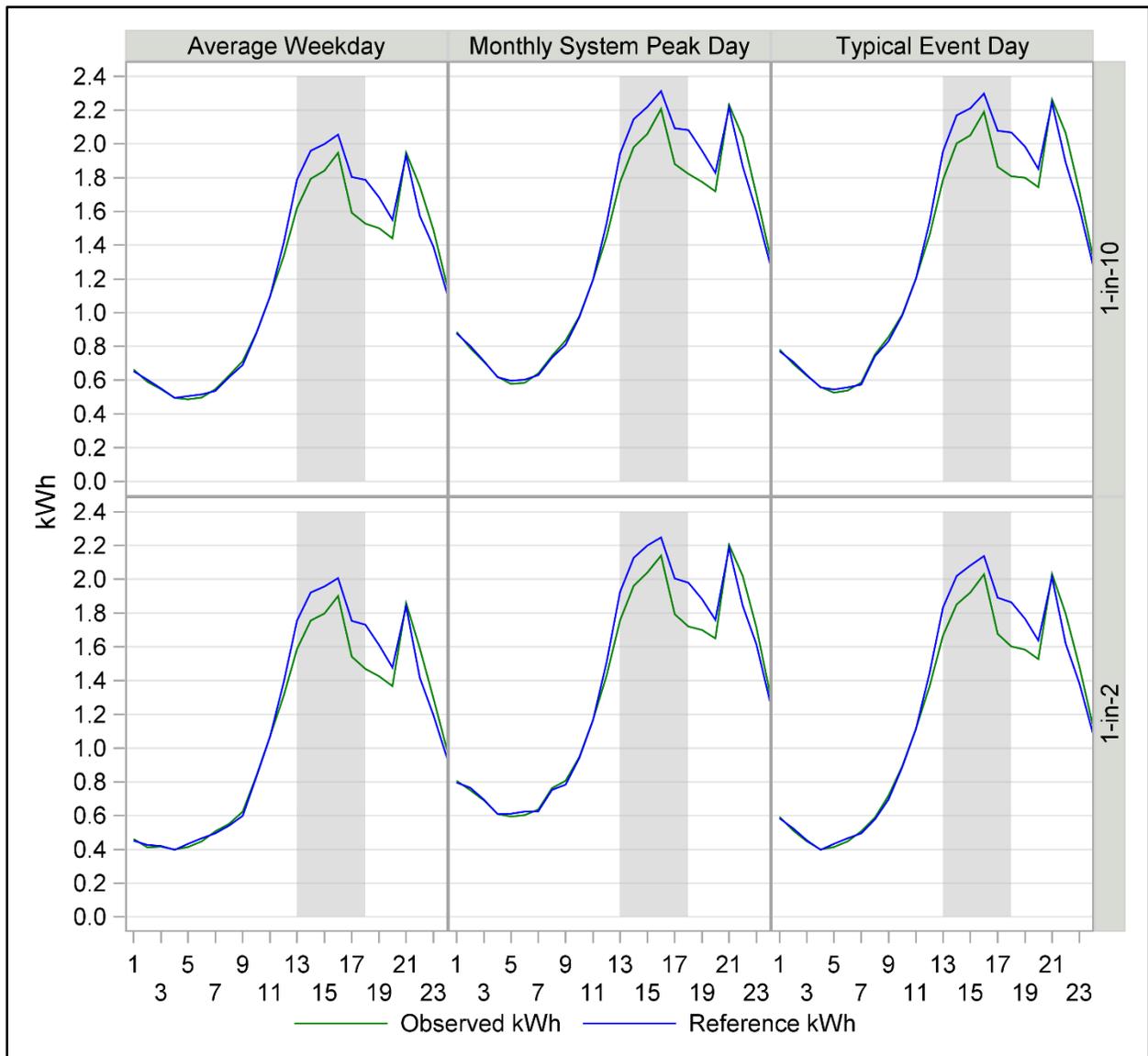
### 4.2.2 PTR Dually Enrolled in Summer Saver

Figure 4-2 and Table 4-3 show the *ex-ante* load impact estimates for the average PTR customer dually enrolled in Summer Saver for the various combinations of day types and weather scenarios for 2018. As a reminder, the control group for these dually enrolled participants are Summer Saver participants that are not dually enrolled in PTR, and the forecasted impacts are incremental savings over and above those realized from the Summer Saver program. Since the PTR model does not model the impact as a function of the weather variables, the predicted impacts are constant for all weather scenarios. Therefore, for both 1-in-2 and 1-in-10 typical event days, the estimated incremental load reduction for the average participant is 0.182 kW during event hours. These estimates are much higher than the PTR-only group. The estimated aggregate load reductions are 0.47 MW, which is about 9.1% in the 1-in-2 scenario and 8.4% in the 1-in-10 scenario. Note that the percentage reductions are different due to the different reference load predicted.

The 100% cycling group has an estimated load reduction during event hours of 0.252 kW, representing a 13.2% reduction from the reference load under the 1-in-2 scenario and a 12.3% reduction under the 1-in-10 conditions. The 50% cycling group has much lower estimated load reductions of 0.017 kW, about 0.8% and 0.7% of the reference load for 1-in-2 and 1-in-10 scenarios, respectively.



**FIGURE 4-2: 2018 EX-ANTE HOURLY LOAD PROFILE – PTR DUALY ENROLLED IN SUMMER SAVER**





**TABLE 4-3: 2018 EX-ANTE HOURLY LOAD IMPACT RESULTS – PTR DUALY ENROLLED IN SUMMER SAVER**

Cycle %	Day / Type	Month	1-in-10					1-in-2				
			Average Hourly Reference Load (kWh)	Average Hourly Observed Load (kWh)	Average Hourly Impact (kWh)	Percent Load Reduction	Average Total Hourly Impact (MWh)	Average Hourly Reference Load (kWh)	Average Hourly Observed Load (kWh)	Average Hourly Impact (kWh)	Percent Load Reduction	Average Total Hourly Impact (MWh)
100	Average Weekday	Jun	1.56	1.31	0.252	16.2%	0.44	1.39	1.13	0.252	18.2%	0.44
		Jul	1.94	1.69	0.252	13.0%	0.44	1.82	1.57	0.252	13.9%	0.44
		Aug	1.84	1.58	0.252	13.7%	0.44	1.80	1.55	0.252	14.0%	0.44
	Monthly System Peak Day	Jun	1.86	1.61	0.252	13.6%	0.44	1.59	1.34	0.252	15.8%	0.44
		Jul	2.18	1.93	0.252	11.6%	0.44	1.99	1.74	0.252	12.7%	0.44
		Aug	2.05	1.80	0.252	12.3%	0.44	2.00	1.75	0.252	12.6%	0.44
	Typical Event Day	Aug	2.05	1.79	0.252	12.3%	0.44	1.91	1.65	0.252	13.2%	0.44
50	Average Weekday	Jun	1.63	1.61	0.017	1.0%	0.01	1.34	1.32	0.017	1.3%	0.01
		Jul	2.18	2.16	0.017	0.8%	0.01	1.98	1.97	0.017	0.9%	0.01
		Aug	2.05	2.04	0.017	0.8%	0.01	1.99	1.97	0.017	0.9%	0.01
	Monthly System Peak Day	Jun	2.08	2.06	0.017	0.8%	0.01	1.68	1.66	0.017	1.0%	0.01
		Jul	2.55	2.53	0.017	0.7%	0.01	2.24	2.22	0.017	0.8%	0.01
		Aug	2.36	2.34	0.017	0.7%	0.01	2.30	2.28	0.017	0.7%	0.01
	Typical Event Day	Aug	2.36	2.34	0.017	0.7%	0.01	2.14	2.12	0.017	0.8%	0.01
ALL	Average Weekday	Jun	1.60	1.41	0.182	11.4%	0.47	1.38	1.20	0.182	13.1%	0.47
		Jul	2.03	1.85	0.182	8.9%	0.47	1.89	1.70	0.182	9.6%	0.47
		Aug	1.92	1.74	0.182	9.5%	0.47	1.87	1.69	0.182	9.7%	0.47
	Monthly System Peak Day	Jun	1.95	1.76	0.182	9.3%	0.47	1.63	1.45	0.182	11.1%	0.47
		Jul	2.32	2.14	0.182	7.8%	0.47	2.08	1.90	0.182	8.7%	0.47
		Aug	2.17	1.99	0.182	8.4%	0.47	2.11	1.93	0.182	8.6%	0.47
	Typical Event Day	Aug	2.16	1.98	0.182	8.4%	0.47	2.00	1.82	0.182	9.1%	0.47



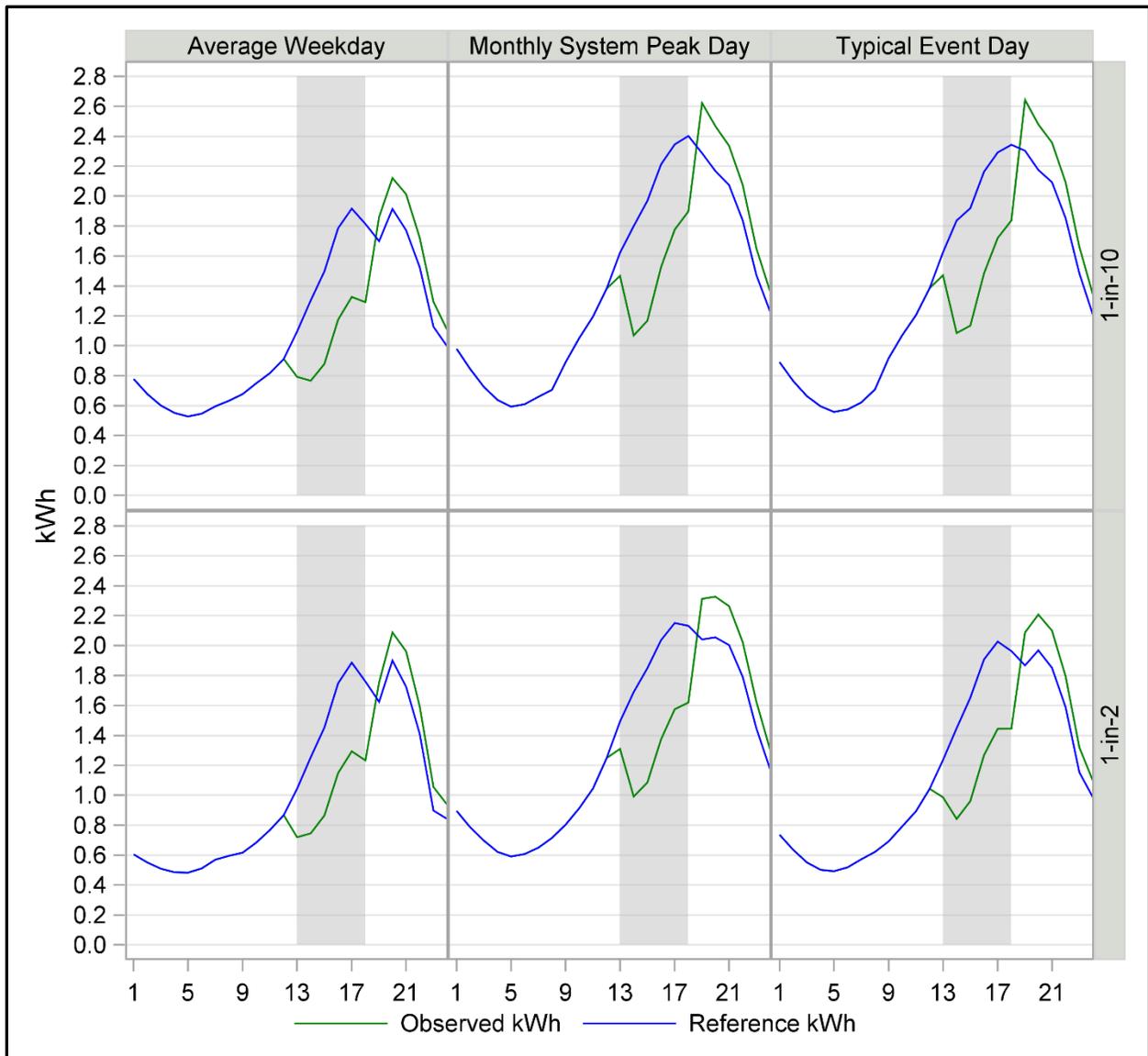
### 4.2.3 PTR Dually Enrolled in SCTD

Figure 4-3 and Table 4-4 show the *ex-ante* load impact estimates for the average PTR customer dually enrolled in SCTD for the various combinations of day types and weather scenarios for 2018. For a 1-in-2 typical event day, the estimated load reduction for the average dual PTR-SCTD participant is 0.608 kW during Resource Adequacy hours. For a 1-in-10 typical event day, the estimated load reduction is 0.659 kW. The average estimated aggregate load reductions are 5.07 MW (33.8%) and 5.50 MW (31.2%), respectively. The impacts were predicted to be different because the SCTD *ex ante* forecasts model the impact as a function of the weather variable. This is because the SCTD customers are assumed to save energy by adjusting their thermostats, and hence the energy-saving should intuitively be weather-dependent.

For those who had Free Thermostats, the average reduction is 0.574 kW (31.9%) and 0.625 kW (29.7%), for 1-in-2 and 1-in-10 scenarios, respectively. While for those BYOT participants, the average reduction is at 0.753 kW (41.8%) and 0.805 kW (37.6%).



**FIGURE 4-3: 2018 EX-ANTE HOURLY LOAD PROFILE – PTR DUALY ENROLLED IN SCTD**





**TABLE 4-4: 2018 EX-ANTE HOURLY LOAD IMPACT RESULTS – PTR DUALY ENROLLED IN SCTD**

Control Strategy	Day / Type	Month	1-in-10					1-in-2				
			Average Hourly Reference Load (kWh)	Average Hourly Observed Load (kWh)	Average Hourly Impact (kWh)	Percent Load Reduction	Average Total Hourly Impact (MWh)	Average Hourly Reference Load (kWh)	Average Hourly Observed Load (kWh)	Average Hourly Impact (kWh)	Percent Load Reduction	Average Total Hourly Impact (MWh)
BYOT	Average Weekday	Jun	1.26	0.60	0.656	52.1%	1.04	1.21	0.61	0.606	49.9%	0.96
		Jul	1.68	0.97	0.710	42.3%	1.12	1.54	0.87	0.669	43.5%	1.06
		Aug	1.61	0.90	0.714	44.2%	1.13	1.57	0.87	0.703	44.8%	1.11
	Monthly System Peak Day	Jun	1.76	0.99	0.765	43.6%	1.21	1.29	0.61	0.672	52.3%	1.06
		Jul	2.18	1.38	0.800	36.8%	1.27	1.78	1.04	0.737	41.4%	1.17
		Aug	2.20	1.40	0.805	36.6%	1.27	1.97	1.18	0.789	40.1%	1.25
Typical Event Day	Aug	2.14	1.34	0.805	37.6%	1.27	1.80	1.05	0.753	41.8%	1.19	
Free	Average Weekday	Jun	1.38	0.89	0.489	35.5%	3.30	1.40	0.96	0.437	31.2%	2.95
		Jul	1.75	1.21	0.540	30.8%	3.65	1.65	1.15	0.500	30.3%	3.38
		Aug	1.68	1.13	0.544	32.5%	3.68	1.63	1.10	0.533	32.6%	3.60
	Monthly System Peak Day	Jun	1.76	1.16	0.595	33.8%	4.02	1.39	0.89	0.504	36.2%	3.40
		Jul	2.19	1.57	0.624	28.5%	4.22	1.82	1.26	0.560	30.8%	3.79
		Aug	2.13	1.51	0.624	29.3%	4.22	1.97	1.36	0.608	30.8%	4.11
	Typical Event Day	Aug	2.10	1.48	0.625	29.7%	4.22	1.80	1.23	0.574	31.9%	3.88



**TABLE 4-4 (CONT'D): 2018 EX-ANTE HOURLY LOAD IMPACT RESULTS – PTR DUALY ENROLLED IN SCTD**

Control Strategy	Day / Type	Month	1-in-10					1-in-2				
			Average Hourly Reference Load (kWh)	Average Hourly Observed Load (kWh)	Average Hourly Impact (kWh)	Percent Load Reduction	Average Total Hourly Impact (MWh)	Average Hourly Reference Load (kWh)	Average Hourly Observed Load (kWh)	Average Hourly Impact (kWh)	Percent Load Reduction	Average Total Hourly Impact (MWh)
ALL	Average Weekday	Jun	1.35	0.83	0.519	38.3%	4.33	1.36	0.90	0.467	34.2%	3.90
		Jul	1.74	1.16	0.571	32.9%	4.76	1.63	1.10	0.531	32.6%	4.43
		Aug	1.66	1.09	0.576	34.6%	4.80	1.62	1.06	0.564	34.8%	4.71
	Monthly System Peak Day	Jun	1.76	1.13	0.627	35.7%	5.23	1.37	0.84	0.534	39.0%	4.46
		Jul	2.19	1.53	0.657	30.0%	5.48	1.81	1.22	0.593	32.7%	4.95
		Aug	2.15	1.49	0.659	30.7%	5.49	1.97	1.33	0.642	32.6%	5.36
	Typical Event Day	Aug	2.11	1.45	0.659	31.2%	5.50	1.80	1.19	0.608	33.8%	5.07



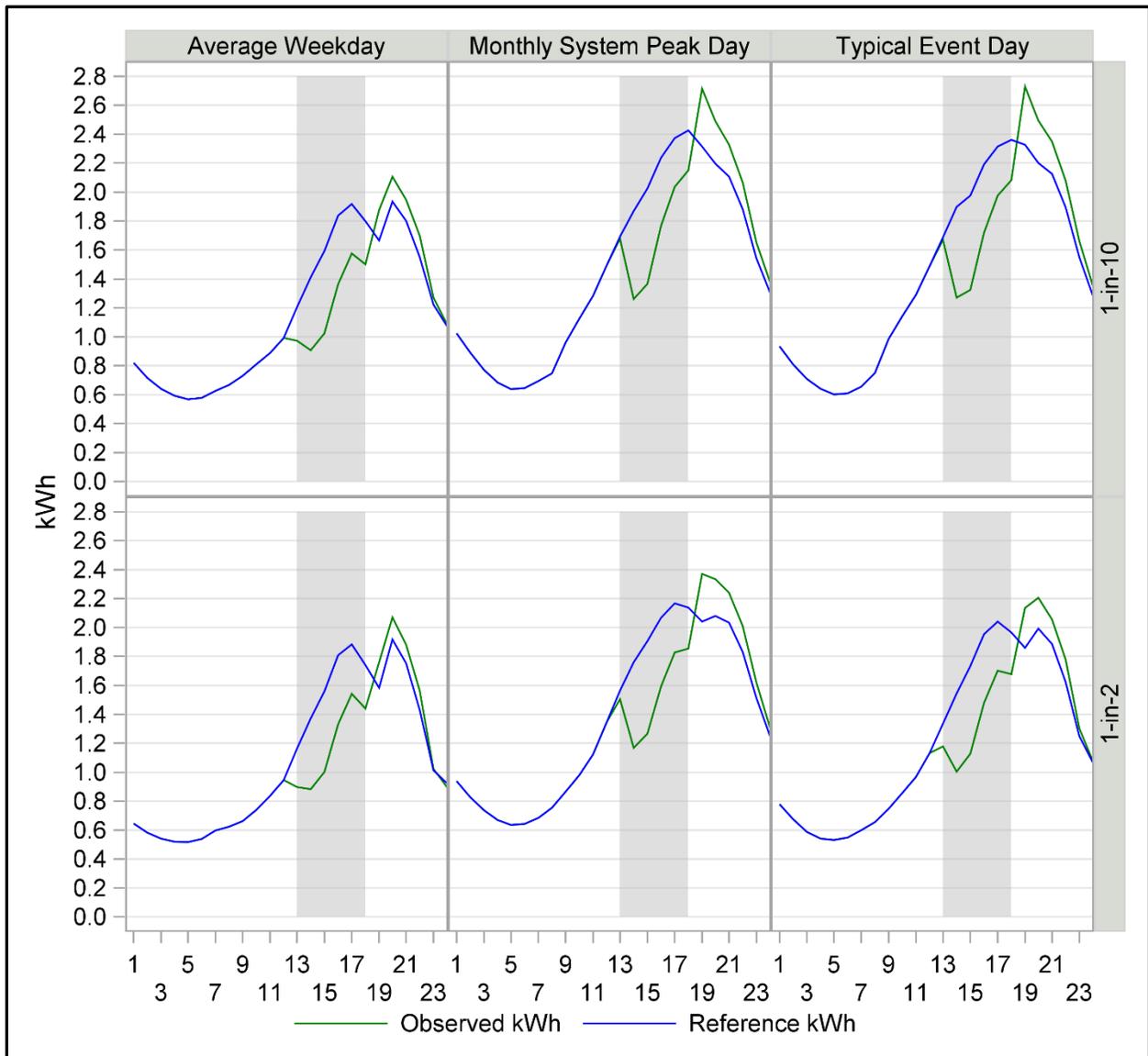
#### 4.2.4 SCTD Only

Figure 4-4 and Table 4-5 show the *ex-ante* load impact estimates for the average customer only enrolled in the SCTD program for the various combinations of day types and weather scenarios for 2018. For a 1-in-2 typical event day, the estimated load reduction for the average SCTD-only participant is 0.451 kW during the resource availability hours. For a 1-in-10 typical event day, the estimated load reduction is slightly higher, at 0.474 kW. The estimated aggregate load reductions are 4.49 MW (24.4%) and 4.72 MW (22.0%), respectively. As the enrollment in the SCTD programs continues to grow, these aggregate estimates will increase.

For the SCTD-only customers, those who received free thermostats are forecasted to reduce usage by 0.379 kW for the 1-in-2 weather condition, and by 0.396 kW for the 1-in-10 weather condition, which are about 20.7% and 18.6% of the corresponding reference usages, respectively. On the other hand, the BYOT customers are forecasted to reduce usage by 0.602 kW (31.8%), and 0.635 kW (28.9%), respectively. The forecasted program impact for the BYOT group is higher than that for group who received free thermostats.



**FIGURE 4-4: 2018 EX-ANTE HOURLY LOAD PROFILE – SCTD ONLY**





**TABLE 4-5: 2018 EX-ANTE HOURLY LOAD IMPACT RESULTS – SCTD ONLY**

Control Strategy	Day / Type	Month	1-in-10					1-in-2				
			Average Hourly Reference Load (kWh)	Average Hourly Observed Load (kWh)	Average Hourly Impact (kWh)	Percent Load Reduction	Average Total Hourly Impact (MWh)	Average Hourly Reference Load (kWh)	Average Hourly Observed Load (kWh)	Average Hourly Impact (kWh)	Percent Load Reduction	Average Total Hourly Impact (MWh)
BYOT	Average Weekday	Jun	1.41	0.86	0.549	39.1%	1.79	1.40	0.88	0.524	37.4%	1.71
		Jul	1.78	1.21	0.577	32.4%	1.89	1.68	1.12	0.556	33.1%	1.82
		Aug	1.73	1.15	0.580	33.6%	1.90	1.70	1.12	0.575	33.9%	1.88
	Monthly System Peak Day	Jun	1.82	1.20	0.618	34.0%	2.02	1.42	0.87	0.558	39.2%	1.82
		Jul	2.21	1.59	0.626	28.3%	2.05	1.87	1.28	0.592	31.6%	1.93
		Aug	2.26	1.62	0.634	28.1%	2.07	2.03	1.41	0.622	30.6%	2.03
	Typical Event Day	Aug	2.20	1.56	0.635	28.9%	2.07	1.89	1.29	0.602	31.8%	1.97
Free	Average Weekday	Jun	1.40	1.04	0.355	25.5%	2.38	1.41	1.07	0.341	24.2%	2.29
		Jul	1.79	1.42	0.369	20.6%	2.47	1.68	1.33	0.358	21.3%	2.40
		Aug	1.70	1.33	0.370	21.7%	2.48	1.66	1.30	0.366	22.0%	2.45
	Monthly System Peak Day	Jun	1.78	1.39	0.390	22.0%	2.61	1.41	1.05	0.360	25.5%	2.41
		Jul	2.22	1.83	0.394	17.7%	2.64	1.86	1.48	0.376	20.2%	2.52
		Aug	2.15	1.76	0.393	18.3%	2.63	2.00	1.60	0.390	19.6%	2.62
	Typical Event Day	Aug	2.12	1.73	0.396	18.6%	2.65	1.83	1.45	0.379	20.7%	2.54



**TABLE 4-5 (CONT'D): 2018 EX-ANTE HOURLY LOAD IMPACT RESULTS – SCTD ONLY**

Control Strategy	Day / Type	Month	1-in-10					1-in-2				
			Average Hourly Reference Load (kWh)	Average Hourly Observed Load (kWh)	Average Hourly Impact (kWh)	Percent Load Reduction	Average Total Hourly Impact (MWh)	Average Hourly Reference Load (kWh)	Average Hourly Observed Load (kWh)	Average Hourly Impact (kWh)	Percent Load Reduction	Average Total Hourly Impact (MWh)
ALL	Average Weekday	Jun	1.40	0.98	0.417	29.9%	4.16	1.40	1.01	0.398	28.4%	3.97
		Jul	1.79	1.35	0.436	24.4%	4.34	1.68	1.26	0.421	25.1%	4.20
		Aug	1.71	1.27	0.438	25.6%	4.36	1.67	1.24	0.433	25.9%	4.32
	Monthly System Peak Day	Jun	1.79	1.33	0.465	26.0%	4.63	1.41	0.99	0.423	29.9%	4.21
		Jul	2.22	1.75	0.470	21.2%	4.68	1.86	1.42	0.445	23.9%	4.44
		Aug	2.19	1.72	0.471	21.5%	4.69	2.01	1.54	0.466	23.2%	4.64
	Typical Event Day	Aug	2.15	1.67	0.474	22.0%	4.72	1.85	1.40	0.451	24.4%	4.49



## 4.2.5 Comparison of 2017 and 2016 Ex-Ante Estimates

Table 4-7 and Figure 4-5 through Figure 4-8 show the comparisons between the *ex-ante* estimates in the current evaluation and those reported in the previous evaluation for the forecast year 2018. The current *ex ante* impact estimates are similar for the PTR-only group –the current estimates are 0.06 kW for a 1-in-2 event day and a 1-in-10 event day, while the previous estimates are 0.04 kW and 0.05 kW, respectively. This consistency between the two weather scenarios supports the assumption that PTR-only impacts are relatively insensitive to weather. The percentage load reductions slightly decreased, from approximately 4.2% and 4.7% in the previous analysis to approximately 3.9% and 3.6% in the current analysis for 1-in-2 and 1-in-10 weather condition, respectively.

The estimates for the group dually enrolled in Summer Saver are higher in the current evaluation. The current estimates for incremental Summer Saver impacts are 0.18 kW for both a 1-in-2 event day and a 1-in-10 event day, almost doubled comparing to 0.08 kW and 0.11 kW in the previous evaluation. The percentage load reductions also increase in the current estimates, from approximately 7.8% in the previous analysis to approximately 8.4% in the current analysis for a 1-in-10 year.

The estimated impacts for the SCTD participants in the current analysis increase even more. For the dually enrolled participants, the previous analysis found estimates of 0.26 kW on 1-in-2 event days and 0.34 kW on 1-in-10 event days. The current analysis projects 0.61 kW on 1-in-2 event days and 0.66 kW on 1-in-10 event days, almost double the previous forecasts. The percentage load reduction estimates under the current analysis are also much higher. For example, in the 1-in-2 year, the previous results had load reductions of 19.8%, while the current estimates are 33.8%.

For the SCTD-only participants, the current forecasts are also much higher in both absolute impacts and percentage impacts. The previous analysis found estimates of 0.17 kW (11.4%) on 1-in-2 event days and 0.22 kW (12.3%) on 1-in-10 event days. The current analysis projects 0.45 kW (24.4%) on 1-in-2 event days and 0.47 kW (22.0%) on 1-in-10 event days. Both absolute impacts and percentage impacts are more than double of the previous estimates, except for the percentage impacts for 1-in-10 case, which has almost doubled as well. This is again largely driven by the differences in ex-post impacts between the two years. The average overall event hour impacts for SCTD-Only in the previous evaluation were 0.31 kW (16.6%). This year, the averages for the Thursday and Friday events (having excluded the Saturday event for ex ante purposes) were 0.52 kW (27.1%) and 0.51 kW (22.4%). This increase is assumed to be due to the effect of removing the lower-performing 50% AC Cycling option, as well as the higher incidence of BYOT thermostats signaled, which appear to have higher impacts than the free thermostats.

Shown in Figure 4-5 through Figure 4-8, the hourly load shapes for each of the groups are noticeably different between evaluation years. Reference loads are higher in the current evaluation, which is largely due to the timing of the events. The previous evaluation's shapes are based on only one event on Monday,



September 26<sup>th</sup>, 2016, and the current evaluation’s shapes are based on two weekday events – Thursday, August 31<sup>st</sup>, 2017 and Friday, September 1<sup>st</sup>, 2017. Reference loads are expected to be higher on the last two days of the week as well as earlier in the summer season. Even though the event set is still small, one more event day improves the estimation and smooths out the prediction significantly.

**TABLE 4-6: COMPARISON OF 2017 AND 2016 EX-ANTE ESTIMATES PER CUSTOMER – FORECAST YEAR 2018 1-IN-2 AUGUST SYSTEM PEAK DAYS, 1 P.M. TO 6 P.M.**

Participant Segment	Weather Year	Day / Type	Current				Previous			
			Average Hourly Reference Load	Average Hourly Observed Load	Average Hourly Impact	Percent Load Reduction	Average Hourly Reference Load	Average Hourly Observed Load	Average Hourly Impact	Percent Load Reduction
PTR Only	1-in-2	Monthly System Peak Day	1.48	1.42	0.06	3.7%	1.07	1.03	0.05	4.5%
PTR/SS	1-in-2	Monthly System Peak Day	2.11	1.93	0.18	8.6%	1.24	1.15	0.09	7.5%
PTR/SCTD	1-in-2	Monthly System Peak Day	1.97	1.33	0.64	32.6%	1.47	1.17	0.30	20.6%
SCTD Only	1-in-2	Monthly System Peak Day	2.01	1.54	0.47	23.2%	1.64	1.45	0.19	11.8%

**TABLE 4-7: COMPARISON OF 2017 AND 2016 EX-ANTE ESTIMATES PER CUSTOMER – FORECAST YEAR 2018, 1 P.M. TO 6 P.M.**

Participant Segment	Weather Year	Day / Type	Current				Previous			
			Average Hourly Reference Load	Average Hourly Observed Load	Average Hourly Impact	Percent Load Reduction	Average Hourly Reference Load	Average Hourly Observed Load	Average Hourly Impact	Percent Load Reduction
PTR Only	1-in-10	Monthly System Peak Day	1.56	1.50	0.06	3.6%	1.11	1.06	0.05	4.6%
		Typical Event Day	1.54	1.48	0.06	3.6%	1.15	1.10	0.05	4.7%
	1-in-2	Monthly System Peak Day	1.48	1.42	0.06	3.7%	1.07	1.03	0.05	4.5%
		Typical Event Day	1.42	1.36	0.06	3.9%	0.98	0.94	0.04	4.2%

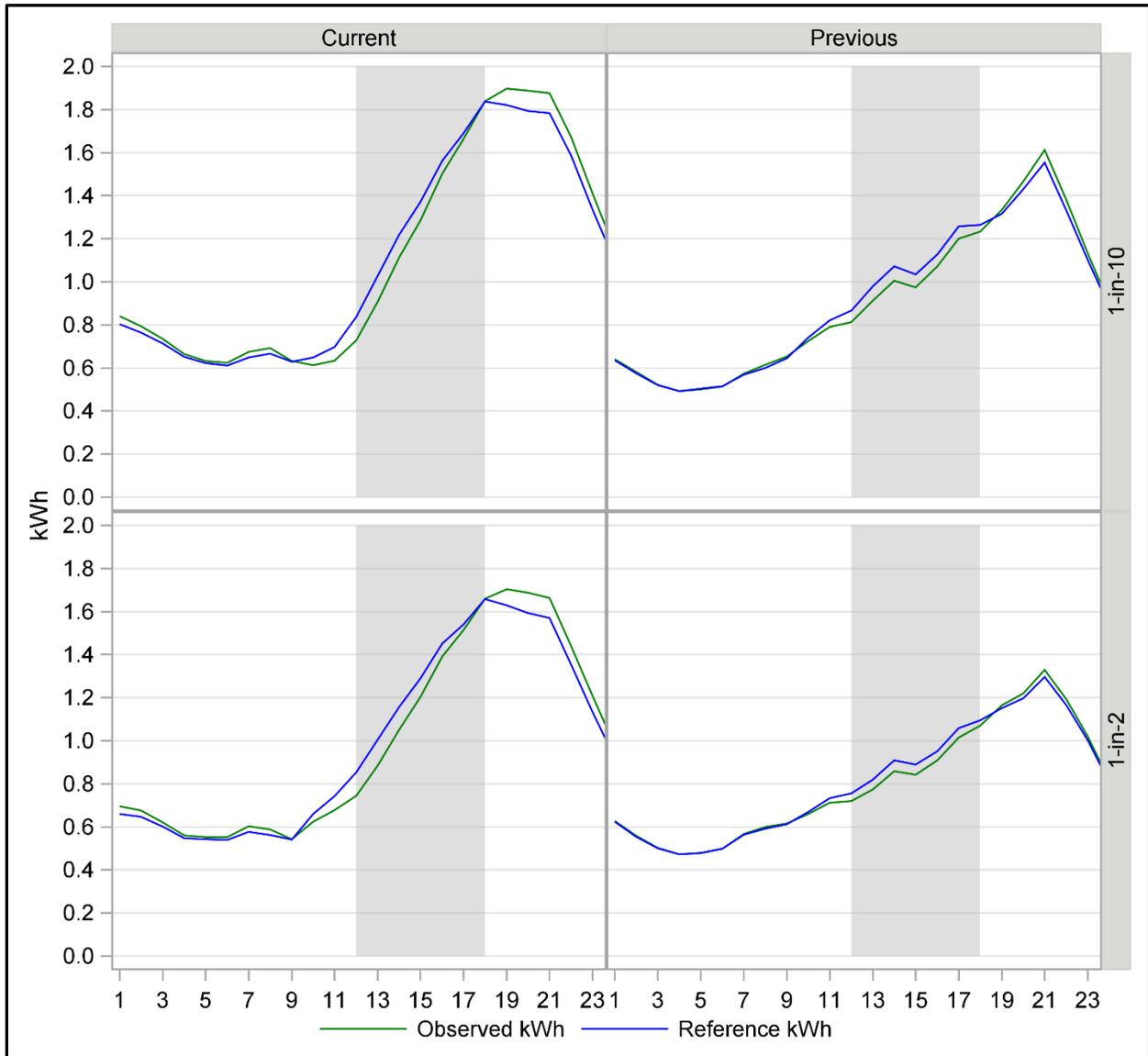


**TABLE 4-7 (CONT'D): COMPARISON OF 2017 AND 2016 EX-ANTE ESTIMATES PER CUSTOMER – FORECAST YEAR 2018, 1 P.M. TO 6 P.M.**

Participant Segment	Weather Year	Day / Type	Current				Previous			
			Average Hourly Reference Load	Average Hourly Observed Load	Average Hourly Impact	Percent Load Reduction	Average Hourly Reference Load	Average Hourly Observed Load	Average Hourly Impact	Percent Load Reduction
PTR/SS	1-in-10	Monthly System Peak Day	2.17	1.99	0.18	8.4%	1.28	1.18	0.10	7.6%
		Typical Event Day	2.16	1.98	0.18	8.4%	1.36	1.25	0.11	7.8%
	1-in-2	Monthly System Peak Day	2.11	1.93	0.18	8.6%	1.24	1.15	0.09	7.5%
		Typical Event Day	2.00	1.82	0.18	9.1%	1.14	1.06	0.08	7.1%
PTR/SCTD	1-in-10	Monthly System Peak Day	2.15	1.49	0.66	30.7%	1.52	1.21	0.32	20.8%
		Typical Event Day	2.11	1.45	0.66	31.2%	1.61	1.27	0.34	21.3%
	1-in-2	Monthly System Peak Day	1.97	1.33	0.64	32.6%	1.47	1.17	0.30	20.6%
		Typical Event Day	1.80	1.19	0.61	33.8%	1.33	1.07	0.26	19.8%
SCTD Only	1-in-10	Monthly System Peak Day	2.19	1.72	0.47	21.5%	1.70	1.50	0.20	11.9%
		Typical Event Day	2.15	1.67	0.47	22.0%	1.79	1.57	0.22	12.3%
	1-in-2	Monthly System Peak Day	2.01	1.54	0.47	23.2%	1.64	1.45	0.19	11.8%
		Typical Event Day	1.85	1.40	0.45	24.4%	1.49	1.32	0.17	11.4%

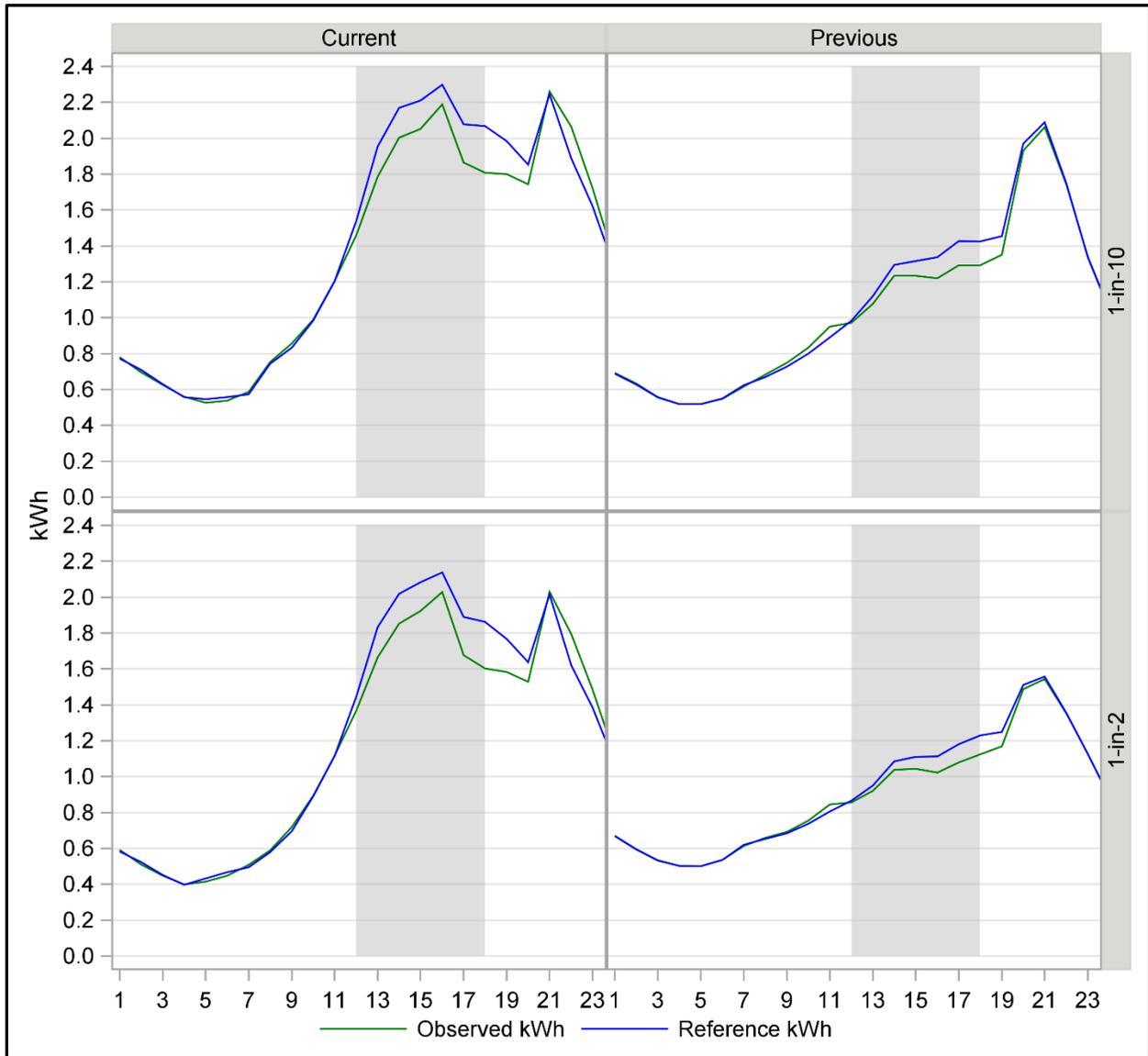


**FIGURE 4-5: COMPARISON OF 2017 AND 2016 EX-ANTE HOURLY LOAD PROFILES – PTR-ONLY – TYPICAL EVENT DAY**



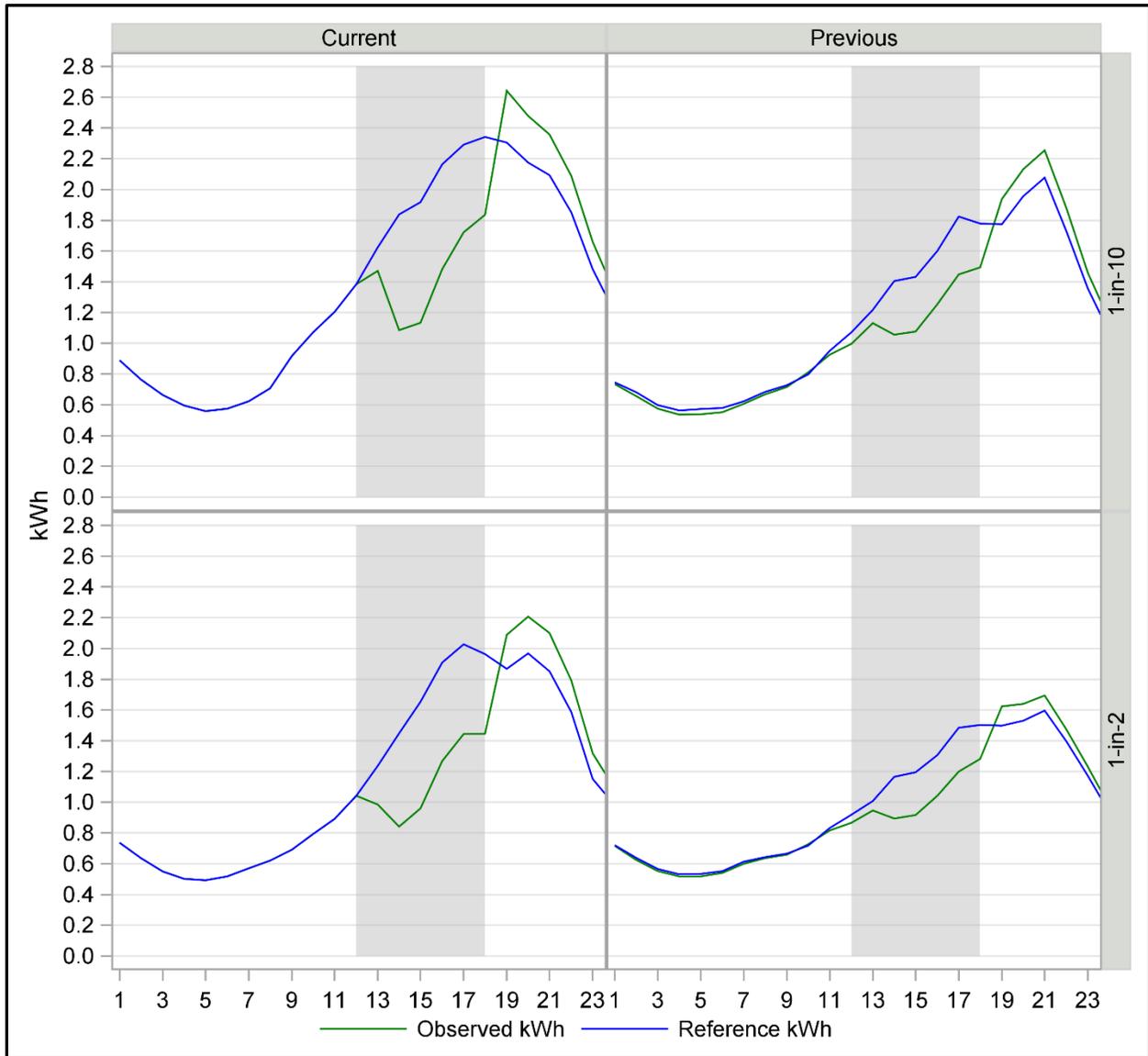


**FIGURE 4-6: COMPARISON OF 2017 AND 2016 EX-ANTE HOURLY LOAD PROFILES – PTR DUALY ENROLLED IN SUMMER SAVER – TYPICAL EVENT DAY**



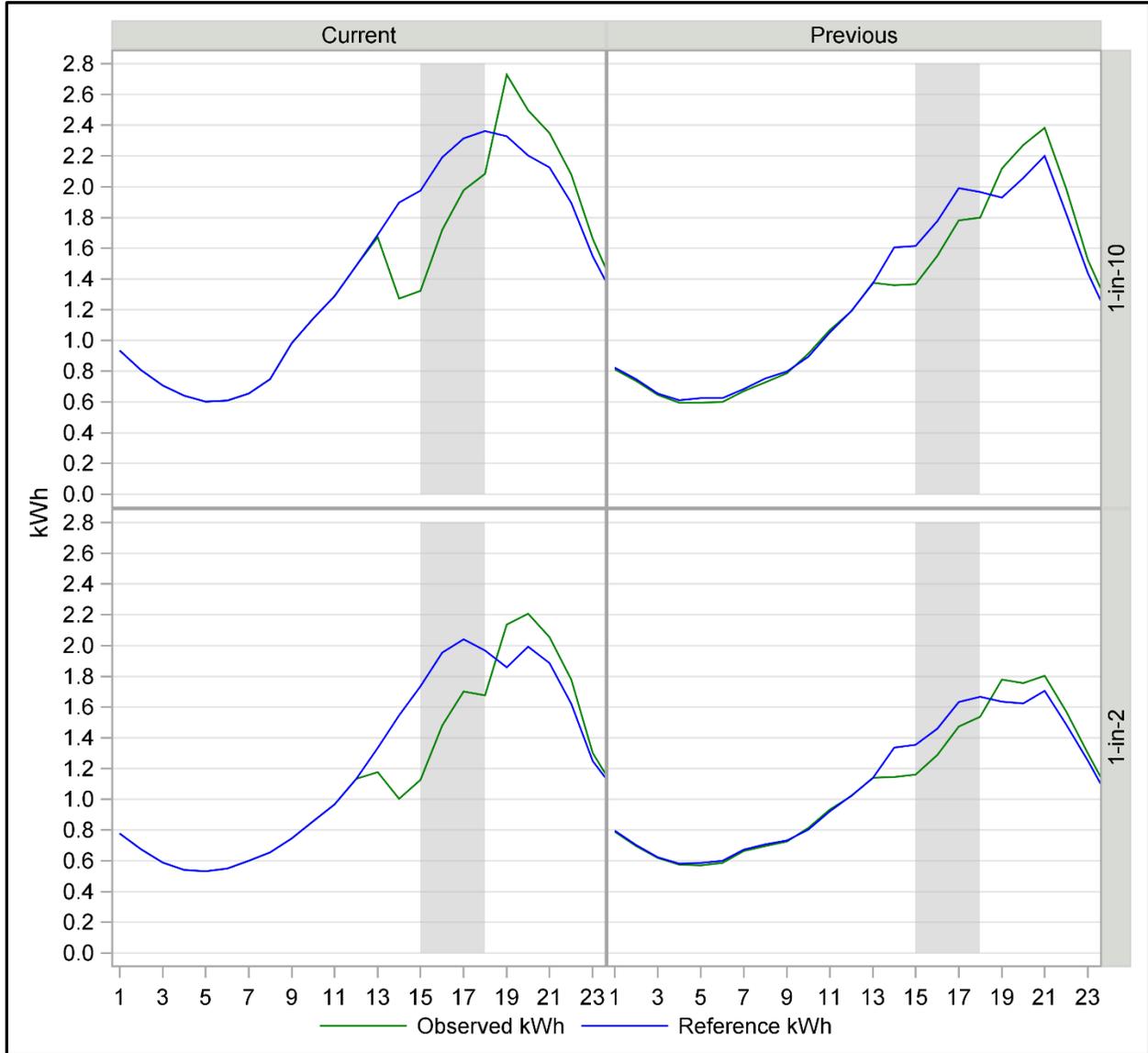


**FIGURE 4-7: COMPARISON OF 2017 AND 2016 EX-ANTE HOURLY LOAD PROFILES – PTR DUALY ENROLLED IN SCTD – TYPICAL EVENT DAY**





**FIGURE 4-8: COMPARISON OF 2017 AND 2016 EX-ANTE HOURLY LOAD PROFILES – SCTD-ONLY – TYPICAL EVENT DAY**





## 4.2.6 Relationship between Ex Post and Ex-Ante Estimates

Table 4-8 and Table 4-9 show comparisons between the *ex-ante* and *ex post* estimates from the PY2017 evaluation. For the overall PTR-only group and PTR/SS group, given that the impacts were modeled independent of weather condition, the *ex post* impacts and the *ex-ante* impacts are the same. For the PTR-only customers, the average event hour load reduction is estimated to be 0.06 kW, representing a 3.9% reduction in 1-in-2 typical event day weather scenario and a 3.6% reduction in 1-in-10 case, comparing to a 3.8% reduction in *ex post* analysis. For the overall PTR-Summer Saver dually enrolled group, the impact is estimated to be 0.18 kW, about 8.4% in 1-in-10 typical event day weather scenario and 9.1% in 1-in-2 scenario, comparing to 9.1% using *ex post* load as reference. For the 100% cycling sub-group, the average saving is 0.25 kW, and the percentage in 1-in-10, 1-in-2 and *ex post* scenarios are 12.3%, 13.2% and 14.0%, respectively. The 50% cycling sub-group had minimal impacts at about 0.02 kW, and the percentage savings are very similar across the three scenarios, at 0.7%, 0.8% and 0.7%.

For the dually enrolled PTR-SCTD and SCTD-only group, the impacts were modeled as a function of cooling degree days, and hence the predicted impacts are different given different temperature. For the dually enrolled PTR-SCTD group, the *ex post* estimates are slightly lower than the *ex-ante* estimates, both in terms of absolute value and percentage impacts. The *ex post* impact is 0.54 kW (22.8%), and the *ex-ante* impacts are 0.66 (31.2%) and 0.61 (33.8%) for the 1-in-10 and 1-in-2 typical event day weather scenarios. The estimates for the BYOT and Free sub-groups also have a similar relationship. For BYOT group, the *ex-ante* estimate is 0.81 kW (37.6%) for 1-in-10 weather scenario, and 0.59 kW (24.7%) for *ex post*; while for Free group, the *ex-ante* is 0.62 kW (29.7%) for 1-in-10, and 0.52 kW (22.4%) for *ex post*. The SCTD-only *ex post* estimates are also lower than the *ex-ante* estimates. The overall event hour load reduction estimate is 0.32 kW (13.3%) for the *ex post*, and 0.47 kW (22.0%) for the 1-in-10 *ex-ante*. The BYOT sub-group has averages of 0.36 kW (14.7%) for *ex post*, and 0.62 (30.6%) for the 1-in-10 *ex-ante* estimate. The Free sub-group has an *ex post* estimate of 0.29 kW (12.5%), compared to the *ex-ante* average of 0.40 (18.6%) for the 1-in-10 typical event day.



**TABLE 4-8: COMPARISON OF EX-ANTE 1-IN-2 AUGUST SYSTEM PEAK DAY AND EX POST AVERAGE EVENT DAY ESTIMATES PER CUSTOMER, 1 P.M. TO 6 P.M.**

Participant Segment	Control Strategy	Weather Year	Day / Type	Average Hourly Reference Load (kW)	Average Hourly Observed Load (kW)	Average Hourly Impact (kW)	Percent Load Reduction	Average °F
PTR Only	ALL	1-In-2	August System Peak Day	1.48	1.42	0.06	3.7%	89.20
		Ex Post	Ex Post	1.44	1.38	0.06	3.8%	92.85
PTR/SS	100%	1-In-2	August System Peak Day	2.00	1.75	0.25	12.6%	92.17
		Ex Post	Ex Post	1.81	1.55	0.25	14.0%	96.13
	50%	1-In-2	August System Peak Day	2.3	2.28	0.02	0.7%	93.82
		Ex Post	Ex Post	2.37	2.35	0.02	0.7%	97.94
	ALL	1-In-2	August System Peak Day	2.11	1.93	0.18	8.6%	92.72
		Ex Post	Ex Post	2.00	1.82	0.18	9.1%	96.73
PTR/SCTD	BYOT	1-In-2	August System Peak Day	1.97	1.18	0.79	40.1%	89.11
		Ex Post	Ex Post	2.38	1.79	0.59	24.7%	93.16
	Free	1-In-2	August System Peak Day	1.97	1.36	0.61	30.8%	90.76
		Ex Post	Ex Post	2.34	1.82	0.52	22.4%	95.14
	ALL	1-In-2	August System Peak Day	1.97	1.33	0.64	32.6%	90.45
		Ex Post	Ex Post	2.35	1.81	0.54	22.8%	94.76
SCTD Only	BYOT	1-In-2	August System Peak Day	2.03	1.41	0.62	30.6%	88.73
		Ex Post	Ex Post	2.43	2.08	0.36	14.7%	92.67
	Free	1-In-2	August System Peak Day	2.00	1.60	0.39	19.6%	90.81
		Ex Post	Ex Post	2.35	2.06	0.29	12.5%	95.15
	ALL	1-In-2	August System Peak Day	2.01	1.54	0.47	23.2%	90.13
		Ex Post	Ex Post	2.38	2.06	0.32	13.3%	94.33



**TABLE 4-9: DETAILED COMPARISON OF EX ANTE AND EX POST ESTIMATES PER CUSTOMER, 1 P.M. TO 6 P.M.**

Participant Segment	Control Strategy	Weather Year	Day / Type	Average Hourly Reference Load (kW)	Average Hourly Observed Load (kW)	Average Hourly Impact (kW)	Percent Load Reduction	Average °F
PTR Only	ALL	1-In-10	Monthly System Peak Day	1.56	1.50	0.06	3.6%	92.19
			Typical Event Day	1.54	1.48	0.06	3.6%	91.49
		1-In-2	Monthly System Peak Day	1.48	1.42	0.06	3.7%	89.20
			Typical Event Day	1.42	1.36	0.06	3.9%	86.62
		Ex Post	Ex Post	1.44	1.38	0.06	3.8%	92.85
PTR/SS	100	1-In-10	Monthly System Peak Day	2.05	1.80	0.25	12.3%	94.13
			Typical Event Day	2.05	1.79	0.25	12.3%	93.93
		1-In-2	Monthly System Peak Day	2.00	1.75	0.25	12.6%	92.17
			Typical Event Day	1.91	1.65	0.25	13.2%	88.56
		Ex Post	Ex Post	1.81	1.55	0.25	14.0%	96.13
	50	1-In-10	Monthly System Peak Day	2.36	2.34	0.02	0.7%	95.20
			Typical Event Day	2.36	2.34	0.02	0.7%	95.29
		1-In-2	Monthly System Peak Day	2.30	2.28	0.02	0.7%	93.82
			Typical Event Day	2.14	2.12	0.02	0.8%	89.63
		Ex Post	Ex Post	2.37	2.35	0.02	0.7%	97.94
	ALL	1-In-10	Monthly System Peak Day	2.17	1.99	0.18	8.4%	94.49
			Typical Event Day	2.16	1.98	0.18	8.4%	94.38
		1-In-2	Monthly System Peak Day	2.11	1.93	0.18	8.6%	92.72
			Typical Event Day	2.00	1.82	0.18	9.1%	88.92
		Ex Post	Ex Post	2.00	1.82	0.18	9.1%	96.73



**TABLE 4-9 (CONT'D): DETAILED COMPARISON OF EX ANTE AND EX POST ESTIMATES PER CUSTOMER, 1 P.M. TO 6 P.M.**

Participant Segment	Control Strategy	Weather Year	Day / Type	Average Hourly Reference Load (kW)	Average Hourly Observed Load (kW)	Average Hourly Impact (kW)	Percent Load Reduction	Average °F
PTR/SCTD	BYOT	1-In-10	Monthly System Peak Day	2.20	1.40	0.81	36.6%	92.13
			Typical Event Day	2.14	1.34	0.81	37.6%	91.41
		1-In-2	Monthly System Peak Day	1.97	1.18	0.79	40.1%	89.11
			Typical Event Day	1.80	1.05	0.75	41.8%	86.56
		Ex Post	Ex Post	2.38	1.79	0.59	24.7%	93.16
		Free	1-In-10	Monthly System Peak Day	2.13	1.51	0.62	29.3%
	Typical Event Day			2.10	1.48	0.62	29.7%	92.77
	1-In-2		Monthly System Peak Day	1.97	1.36	0.61	30.8%	90.76
			Typical Event Day	1.80	1.23	0.57	31.9%	87.64
	Ex Post		Ex Post	2.34	1.82	0.52	22.4%	95.14
	ALL		1-In-10	Monthly System Peak Day	2.15	1.49	0.66	30.7%
		Typical Event Day		2.11	1.45	0.66	31.2%	92.51
		1-In-2	Monthly System Peak Day	1.97	1.33	0.64	32.6%	90.45
			Typical Event Day	1.80	1.19	0.61	33.8%	87.43
		Ex Post	Ex Post	2.35	1.81	0.54	22.8%	94.76



**TABLE 4-9 (CONT'D): DETAILED COMPARISON OF EX ANTE AND EX POST ESTIMATES PER CUSTOMER, 1 P.M. TO 6 P.M.**

Participant Segment	Control Strategy	Weather Year	Day / Type	Average Hourly Reference Load (kW)	Average Hourly Observed Load (kW)	Average Hourly Impact (kW)	Percent Load Reduction	Average °F
SCTD Only	BYOT	1-In-10	Monthly System Peak Day	2.26	1.62	0.63	28.1%	91.88
			Typical Event Day	2.20	1.56	0.63	28.9%	91.10
		1-In-2	Monthly System Peak Day	2.03	1.41	0.62	30.6%	88.73
			Typical Event Day	1.89	1.29	0.60	31.8%	86.31
		Ex Post	Ex Post	2.43	2.08	0.36	14.7%	92.67
		Free	1-In-10	Monthly System Peak Day	2.15	1.76	0.39	18.3%
	Typical Event Day			2.12	1.73	0.40	18.6%	92.81
	1-In-2		Monthly System Peak Day	2.00	1.60	0.39	19.6%	90.81
			Typical Event Day	1.83	1.45	0.38	20.7%	87.67
	Ex Post		Ex Post	2.35	2.06	0.29	12.5%	95.15
	ALL		1-In-10	Monthly System Peak Day	2.19	1.72	0.47	21.5%
		Typical Event Day		2.15	1.67	0.47	22.0%	92.25
		1-In-2	Monthly System Peak Day	2.01	1.54	0.47	23.2%	90.13
			Typical Event Day	1.85	1.40	0.45	24.4%	87.23
		Ex Post	Ex Post	2.38	2.06	0.32	13.3%	94.33